

**REQUEST FOR PROPOSAL  
(FOR DESIGN & CONSTRUCTION)  
Solicitation No. W9128F23R0007**



**CONSOLIDATE PREP SCHOOL DORMITORIES  
PNXQPZ104002**

**US AIR FORCE ACADEMY, COLORADO**

**NOVEMBER 2022**



US ARMY CORPS OF ENGINEERS  
OMAHA DISTRICT

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**SPECIFICATIONS FOR  
DESIGN AND CONSTRUCTION  
OF**

**CONSOLIDATE PREP DORMITORIES, PNXQPZ104002**

**US AIR FORCE ACADEMY, COLORADO**

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## SECTION 01 30 00.24

OTHER ADMINISTRATIVE AND SPECIAL REQUIREMENTS  
12/21

## PART 1 GENERAL

## Attachments:

Project Sign Details  
AF103 - Base Civil Engineering Work Clearance Request  
USAFA Utility Outage and Road Closure Procedure

## 1.1 EQUIPMENT OWNERSHIP AND OPERATING EXPENSE SCHEDULE

In accordance with FAR 31.105(d)(2)(i)(b), for the predetermined schedule of construction equipment use rates, use Engineer Pamphlet (EP) 1110-1-8, Construction Equipment Ownership and Operating Expense Schedule. Copies of each regional schedule may be obtained through the following internet site:

<https://www.publications.usace.army.mil/USACE-Publications/Engineer-Pamphlets/>  
on pages 10 and 11 of 13.

## 1.2 DESIGN-BUILD CONSTRUCTION CONTRACTS (MAR 2019)

(a) Design-Build Contract Order of Precedence. The contract includes the standard contract clauses and schedules current at the time of contract award. It entails (1) the Solicitation in its entirety, including all drawings, cuts, and illustrations, and any amendments, and (2) the successful offeror's accepted proposal. The contract constitutes and defines the entire agreement between the Contractor and the Government. No documentation shall be omitted which in any way bears upon the terms of that agreement.

(1) In the event of conflict or inconsistency between any portion of this contract, precedence shall be given in the following order:

i. Betterments: Any portions of the accepted proposal which both conform to and exceed the requirements of the Solicitation.

ii. The requirements of the Solicitation. (See also FAR 52.236-21, Specifications and Drawings for Construction)

iii. All other elements of the accepted proposal.

iv. Any design products including, but not limited to, plans, specifications, engineering studies and analyses, shop drawings, equipment installation drawings, etc. These are "deliverables" under the contract and are not part of the contract itself. Design products must conform to all provisions of the contract, in the order of precedence herein.

(b) Personnel, subcontractors, and outside associates or consultants. In connection with this contract, any in-house personnel, subcontractors, and outside associates or consultants will be limited to individuals or firms that were specifically identified in the Contractor's

accepted proposal. The Contractor shall obtain the Contracting Officer's written consent before making any substitution for these designated in-house personnel, subcontractors, associates, or consultants. If the Contractor proposes a substitution, it shall submit the same type of information that was submitted in the accepted proposal to the Contracting Officer for evaluation and approval. The level of qualifications and experience submitted in the accepted proposal or that required by the Solicitation, whichever is greater, is the minimum standard for any substitution.

(c) Responsibility of the Contractor for Design. The Contractor shall be responsible for the professional quality, technical accuracy, and the coordination of all designs, drawings, specifications, and other non-construction services furnished by the Contractor under this contract. The Contractor shall, without additional compensation, correct or revise any errors or deficiency in its designs, drawings, specifications, and other non-construction services and perform any necessary rework or modifications, including any damage to real or personal property, resulting from the design error or omission.

(1) The standard of care for all design services performed under this agreement shall be the care and skill ordinarily used by members of the architectural or engineering professions practicing under similar conditions at the same time and locality. Notwithstanding the above, in the event that the contract specifies that portions of the Work be performed in accordance with a performance standard, the design services shall be performed so as to achieve such standards.

(2) Neither the Government's review, approval or acceptance of, nor payment for, the services required under this contract, shall be construed to operate as a waiver of any rights under this contract or of any cause of action arising out of the performance of this contract. The Contractor shall be and remain liable to the Government in accordance with applicable law for all damages to the Government caused by the Contractor's negligent performance of any of these services furnished under this contract.

(3) The rights and remedies of the Government provided for under this contract are in addition to any other rights and remedies provided by law.

(4) If the Contractor is comprised of more than one legal entity, each entity shall be jointly and severally liable hereunder.

(d) Contractor's Role during the Design Process. The Contractor's construction management key personnel shall be actively involved during the design process to effectively integrate the design and construction requirements of this contract. In addition to the typical required construction activities, the Contractor's involvement includes, but is not limited to actions such as: integrating the design schedule into the Master Schedule to maximize the effectiveness of fast-tracking design and construction (within the limits allowed in the contract), ensuring constructability and economy of the design, integrating the shop drawing and installation drawing process into the design, executing the material and equipment acquisition programs to meet critical schedules, effectively interfacing the design and construction quality control (QC) management programs with the design QC program, and maintaining and providing the design team with accurate, up-to-date redline and as-built documentation for eventual submission as Record Drawings.. The Contractor shall require

and manage the active involvement of key trade subcontractors in the above activities.

(e) Deviating from the Accepted Design. The Contractor must obtain the approval of the Designer of Record and the Government's concurrence, in the form of supplemental agreement to the contract, for any Contractor-proposed revision to the professionally stamped-and-sealed and Government-reviewed final design that has been released for Construction before proceeding with the revision. The Government reserves the right to disapprove such a revision.

(1) The Government reserves the right to non-concur with any revision to the final design that has been released for construction, including those which may impact furniture, furnishings, equipment selections or operations decisions that were made, based on the reviewed design.

(2) Any Contractor-proposed revision to the design which deviates from the contract requirements (i.e., the Request for Proposal (RFP) and the accepted proposal), will require a bilateral modification (e.g. supplemental agreement) to the contract before any work commences.

(3) Unless the Government initiates a change to the contract requirements, or the Government determines that the Government furnished design criteria are incorrect and must be revised, any Contractor initiated proposed change to the contract requirements, which results in additional cost, shall strictly be at the Contractor's expense.

(4) The Contractor shall track all approved revisions to the reviewed and accepted design and shall incorporate them into the as-built design documentation, in accordance with agreed procedures. The Designer of Record shall document its professional concurrence on the as-builts for any revisions in the stamped and sealed drawings and specifications.

(f) Value Engineering after Award. In reference to Federal Acquisition Regulation (FAR) 52.248-3, Value Engineering - Construction, the Government may refuse to entertain a "Value Engineering Change Proposal" (VECP) for those "performance oriented" aspects of the Solicitation documents which were addressed in the Contractor's accepted contract proposal and which were evaluated in competition with other offerors for award of this contract.

(1) The Government may consider a VECP for those "prescriptive" aspects of the Solicitation documents, not addressed in the Contractor's accepted contract proposal or addressed but evaluated only for minimum conformance with the Solicitation requirements.

(2) For purposes of this clause, the term "performance oriented" refers to those aspects of the design criteria or other contract requirements, which allow the offeror or Contractor certain latitude, choice of and flexibility to propose in its accepted proposal a choice of design, technical approach, design solution, construction approach or other approach to fulfill the contract requirements. Such requirements generally tend to be expressed in terms of functions to be performed, performance required or essential physical characteristics, without dictating a specific process or specific design solution for achieving the desired result.

(3) In contrast, for purposes of this clause, the term "prescriptive" refers to those aspects of the design criteria or other Solicitation requirements wherein the Government expressed the design solution or other requirements in terms of specific material, approaches, systems, and/or processes to be used. Prescriptive aspects typically allow the offerors little or no freedom in the choice of design approach, materials, fabrication techniques, methods of installation, or any other approach to fulfill the contract requirements.

(g) Warranty of Design. The Contractor warrants that the design shall be performed in accordance with the contract requirements. Design and design related construction not conforming to the Contract requirements shall be corrected at no additional cost to the Government. The standard of care for design is defined in paragraph c of this clause, Responsibility of the Contractor for Design.

(1) The period of this warranty shall commence upon final completion and the Government's acceptance of the work, or in the case of the Government's beneficial occupancy of all or part of the work for its convenience, prior to final completion and acceptance, at the time of such occupancy.

(2) This design warranty shall be effective from the above event through the Statute of Limitations and Statute of Repose or host nation law, as applicable to the place of construction performance.

(3) The rights and remedies of the Government provided for under this clause are in addition to any other rights and remedies provided in this contract or by law.

(h) Government Re-Use of Design. In conjunction with the Defense Federal Acquisition Regulation Supplement (DFARS) 252.227-7022, Government Rights (Unlimited), the Government will not ask for additional originals or copies of the design works after the Contractor provides all required design documentation and record drawing documentation under the instant contract. Further, if the Government uses the design for other projects without additional compensation to the Contractor for re-use, the Government releases the Contractor from liability in the design on the other projects, due to defects in the design that are not the result of fraud, gross mistake as amounts to fraud, gross negligence or intentional misrepresentation.  
(End of clause)

### 1.3 CONTRACTOR SUPPLY AND USE OF ELECTRONIC SOFTWARE FOR PROCESSING CONSTRUCTION WAGE RATE REQUIREMENTS STATUTE CERTIFIED LABOR PAYROLLS

a. Use a commercially-available electronic system to process and submit certified payrolls electronically to the Government. The requirements for preparing, processing and providing certified labor payrolls are established by the Wage Rate Requirements statute.

b. Obtain and provide for all access, licenses, and other services required to provide for receipt, processing, certifying, electronically transmitting to the Government, and storing weekly payrolls and other data required for the Contractor to comply with the Wage Rate Requirements statute. Use the electronic payroll service to prepare, process, and maintain the relevant payrolls and basic records during all work under this construction contract. The electronic payroll service must be capable of preserving these payrolls and related basic records for the required



three years after contract completion. Obtain and provide electronic system access to the Government, as required to comply with the Wage Rate Requirements over the duration of the construction contract.

c. The Contractor's provision and use of an electronic payroll processing system must meet the following basic functional criteria:

- (1) commercially available;
- (2) compliant with appropriate Wage Rate Requirements statute payroll provisions in the FAR;
- (3) able to accommodate the required numbers of employees and subcontractors planned to be employed under the contract;
- (4) capable of producing an Excel spreadsheet-compatible electronic output of weekly payroll records for export into an Excel spreadsheet to be imported into the contractor's mode of Resident Management System 3.0;
- (5) demonstrated security of data and data entry rights;
- (6) ability to produce Contractor-certified electronic versions of weekly payroll data;
- (7) ability to identify erroneous entries and track the data/time of all versions of the certified Wage Rate Requirements statute payrolls submitted to the government over the life of the contract;
- (8) capable of generating a durable record copy in a Compact Disc (CD) or Digital Versatile Disc (DVD) and Portable Document Format (PDF) file record of data from the system database at the end of the contract closeout. This durable record copy of data from the electronic payroll processing system must be provided to the Government during contract closeout.

d. All Contractor-incurred costs related to the Contractor's provision and use of an electronic payroll processing service must be included in the Contractor's price for the overall work under the contract. The costs for compliance with the Wage Rate Requirements statute by using electronic payroll processing services must not be a separately bid or reimbursed item under this contract.

#### 1.4 VETERANS EMPLOYMENT EMPHASIS FOR U.S. ARMY CORPS OF ENGINEERS CONTRACTS

In addition to complying with the requirements outlined in FAR Part 22.13, FAR Provision 52.222-38, FAR Clause 52.222-35, FAR Clause 52.222-37, DFARS 222.13 and Department of Labor regulations, U.S. Army Corps of Engineers (USACE) contractors and subcontractors at all tiers are encouraged to promote the training and employment of U.S. veterans while performing under a USACE contract. While no set-aside, evaluation preference, or incentive applies to the solicitation or performance under the resultant contract, USACE contractors are encouraged to seek out highly qualified veterans to perform services under this contract. The following resources are available to assist USACE contractors in their outreach efforts:

- U.S. Department of Labor Veterans' Employment and Training Service (VETS):  
<https://www.dol.gov/vets/>
- Federal Veteran Employment Information: <https://www.fedshirevets.gov/>

- Veterans Opportunity to Work (VOW) Program:  
<https://www.benefits.va.gov/vow/>
- U.S. Army Warrior Transition Command Employment Index:  
<https://wct.army.mil/modules/employers/index.html>
- Hiring Our Heroes: <https://www.uschamberfoundation.org/hiring-our-heroes>

## 1.5 SEQUENCE OF DESIGN CONSTRUCTION

(a) After receipt of the Contract Notice to Proceed (NTP), the Contractor must initiate design, comply with all design submission requirements as covered in Division 01 General Requirements of the advertised Solicitation, and obtain Government review of each submission. No construction may be started until the Government reviews the 100 Percent Corrected Design submission and determines it satisfactory for purposes of beginning construction. The Contractor has the option to submit the design as an entirely complete design package (design analysis, plans, and specifications and other design deliverables) or as two (2) separate complete design packages (design analysis, plans, and specifications and other design deliverables), one for the site work, foundations, long lead items and utilities and one for all other work. Each package will require the same design submittals, design reviews and design review conferences as set forth in the Contract. The Government will not grant any time extension for any design resubmittal required when, in the opinion of the Contracting Officer, the initial submission failed to meet the minimum quality requirements as set forth in the Contract.

(b) If the Government allows the Contractor to proceed with limited construction based on pending minor revisions to the reviewed 100 Percent Corrected Design submission, no payment will be made for any in-place construction related to the pending revisions until they are completed, resubmitted and are satisfactory to the Government. Proceeding with limited construction requires written authorization by the Contracting Officer.

## 1.6 CONTRACTOR PERFORMANCE EVALUATIONS

See Federal Acquisition Regulation (FAR) Subpart 42.1502(e) for the requirements on past performance evaluations for construction contracts. For construction contracts valued at or above \$750,000.00, including all modifications, the USACE will evaluate Contractor's performance using the web-based Contractors Performance Assessment Reporting System (CPARS). After the USACE drafts an evaluation (interim or final), the Contractor will have the opportunity to access, review, comment and either concur or non-concur with the evaluation in the CPARS system for a period of 60 days. Access to the CPARS system requires either specific software called PKI certification (recommended method) or a username and password. The PKI certification is a Department of Defense recommendation and to provide security in electronic transactions. The certification software could cost approximately \$110 - \$125 per certificate per year and may be purchased from an External Certificate Authorities (ECA) vendor. Current information about the PKI certification process and contacting vendors can be found on the web site: <https://www.cpars.gov>.

## 1.7 WORK RESTRICTIONS

The following times are included in the overall completion time stated. After award, the Government will provide specific dates for these events to the Contractor.

### 1.7.1 Delivery Restriction Days

USAF Academy will not permit deliveries during the following events:

- Football season 15 Aug - 30 Nov (Anticipate 6 home games, 6 days). No deliveries during home football games.
- Graduation (late May / early June). No deliveries the day before or the day of Graduation.
- Parent's Weekend, (usually in conjunction with Labor Day). No deliveries the Friday of Parent's Weekend.
- Cadet In-Processing (late June, 2 days) No deliveries during these days.

### 1.7.2 NO WORK DAYS

Allow 14 days throughout the duration of the project for unscheduled and unexpected work stoppage exclusive of any delays caused by work restrictions listed above. This time is included in the overall completion time stated.

### 1.8 ORDER OF WORK

Government must take Beneficial Occupancy of new facility prior to demolition of existing dormitories. Include at least four weeks from BOD to starting demolition so the Government can move into the new facility and vacate the existing dormitories.

### 1.9 REQUEST FOR PROPOSAL (RFP) DRAWINGS

Fourteen (14) calendar days after Notice to Proceed, the Government will provide the successful Contractor an electronic copy containing editable RFP CAD file drawings (file format and general CAD requirements are defined in Section 01 33 39.00 10 ADVANCED MODELING (BIM/CIM/GIS/CAD) REQUIREMENTS for use in preparation of design drawing deliverables. As-built drawing requirements are specified in Section 01 78 39.00 24 AS-BUILT DRAWINGS.

### 1.10 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit items below in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

#### SD-02 Shop Drawings

##### Equipment Room Drawings; G-RO.

This submittal is not required during construction, if equipment room drawings are shown on the 100 percent design submittal.

### 1.11 CONCURRENT CONSTRUCTION

Construction work closely related to and/or located at the site of the work under a concurrent contract may be in progress simultaneously with work under this contract. Cooperate with others as necessary in the interest of timely completion of all work. In the event of interference, the notify the Contracting Officer (CO) immediately for resolution and the CO decision is final.

## 1.12 PAYMENT

### 1.12.1 PROMPT PAYMENT ACT

Pay requests authorized in GENERAL CONDITIONS (CONTRACT CLAUSES) clause: "Payments Under Fixed-Price Construction Contracts", will be paid pursuant to the clause, "Prompt Payment for Construction Contracts". Submit pay requests on ENG Form 93 and 93a, "Payment Estimate-Contract Performance" and "Continuation". All information and substantiation required by the identified contract clauses must be submitted with the ENG Form 93, and the required certification included on the last page of the ENG Form 93a, signed by an authorized contractor official and dated when signed. The designated billing office is the Office of the Area Engineer.

### 1.12.2 PAYMENT FOR MATERIALS STORED OFFSITE

a. As allowed under (FAR) 52.232-5 "Payments Under Fixed Price Construction Contracts", the Administrative Contracting Officer, at their discretion, may authorize progress payments for any material stored off-site provided:

(1) The Contractor furnishes satisfactory evidence that it has acquired title to such material and that the material will be used to perform this contract,

(2) Material is stored in such a manner to protect it from damage, fire, theft, etc.

(3) The Contractor provides evidence of insurance for material, and,

(4) Material is clearly identified and delineated by contract number for use on the applicable project.

b. The Administrative Contracting Officer reserves the right to inspect any off-site material prior to authorizing progress payments. Provide paid invoices listing the value of material and labor incorporated in the items.

### 1.12.3 CONTRACTOR PAYROLL RECORD

Log payrolls for all employees and subcontractors utilizing ENG Form 3180. Each subcontractor requires a separate ENG 3180 for their payrolls. Maintain the ENG 3180, along with the payrolls, on site and make available for review by the Contracting Officer's Representative. Update the ENG 3180's weekly as payrolls are submitted. After making copies for their files, submit the originals of each week's payrolls to the Resident Office. Before final payment, provide the completed ENG 3180's to the Contracting Officer's Representatives. If the Contractor has elected to use an electronic payroll system, as described in paragraph CONTRACTOR SUPPLY AND USE OF ELECTRONIC SOFTWARE FOR PROCESSING CONSTRUCTION WAGE RATE REQUIREMENTS STATUTE CERTIFIED LABOR PAYROLLS, the payroll inventory produced by the electronic payroll system will satisfy the requirements in this paragraph and FAR 52.222-8, Payrolls and Basic Records.

## 1.13 AVAILABILITY OF UTILITY SERVICES

All reasonably required amounts of domestic water and electricity will be

made available to the Contractor by the Government from existing system outlets and supplies. The Contractor is responsible to, at their own expense, make all temporary connections and install distribution lines. Furnish to the Contracting Officer a complete system layout drawing showing type of materials to be used and method of installation for all temporary electrical systems. All temporary lines must be maintained in a workmanlike manner satisfactory to the Contracting Officer and removed by the Contractor in like manner prior to final acceptance of the construction. Normal quantities of electricity and water used to make final tests of completely installed systems will be furnished by the Government.

#### 1.14 UTILITY SERVICE INTERRUPTIONS

To request and notify for planned utility outages, submit a written request to the 10 CES/CENMP Inspector a minimum of 30 calendar days in advance of the outage in accordance with the attached "USAFA Utility Outage/Road Closure Procedure". Follow the procedures included in the attachment. The time and duration of all outage will be coordinated and approved with the Using Agency by the Contracting Officer.

#### 1.15 DIGGING PERMITS AND ROAD CLOSINGS

Maintain USAFA 30-day dig permit and marks throughout the entire period of performance set for this project. Allow a minimum of 30 calendar days from date of written application to receive permission to dig and to close roads. Only close roads one lane at a time and allow vehicular traffic to pass through the construction area. Flag work on or near roadways in accordance with the safety requirements in Safety and Health Requirements Manual EM 385-1-1, which forms a part of these specifications. In addition, all impacts to road shall require a PE stamped traffic control plan for review and approval at least 30 days prior to commencing work.

#### 1.16 TIME EXTENSIONS FOR UNUSUALLY SEVERE WEATHER

a. This provision specifies the procedure for the determination of time extensions for unusually severe weather in accordance with the GENERAL CONDITIONS (CONTRACT CLAUSES) clause entitled "Default: (Fixed-Price Construction)." In order for the Contracting Officer to award a time extension under this clause, the following conditions must be satisfied:

(1) The weather experienced at the project site during the contract period must be found to be unusually severe, that is, more severe than the adverse weather anticipated for the project location during any given month.

(2) The unusually severe weather must actually cause a delay to the completion of the project. The delay must be beyond the control and without the fault or negligence of the contractor.

b. The following schedule of monthly anticipated adverse weather delays is based on National Oceanic and Atmospheric Administration (NOAA) or similar data for the project location and will constitute the base line for monthly weather time evaluations. The Contractor's progress schedule must reflect these anticipated adverse weather delays in all weather dependent activities.

#### MONTHLY ANTICIPATED ADVERSE WEATHER DELAY

## WORK DAYS BASED ON (5) DAY WORK WEEK

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC  
 ( 5 ) ( 4 ) ( 3 ) ( 3 ) ( 3 ) ( 3 ) ( 5 ) ( 5 ) ( 2 ) ( 2 ) ( 2 ) ( 6 )

c. Upon acknowledgment of the Notice to Proceed (NTP) and continuing throughout the contract, the contractor will record on the RMS daily CQC report, any occurrence of adverse weather and resultant impact to normally scheduled work, within 24 hours of the event. Actual adverse weather delay days must prevent work on critical activities for 50 percent or more of the contractor's scheduled work day. Describe in the RMS daily CQC reports the critical path item that is being affected and provide the critical path activity number(s) from the current schedule. The COR must acknowledge and accept the agreed upon occurrence of each adverse weather delay in RMS for the delays to be considered as adverse weather delays.

At the end of each month, identify the number of actual adverse weather delay days that includes days impacted by actual adverse weather (even if adverse weather occurred in previous month), calculated chronologically from the first to the last day of each month, and recorded as full days. If the number of actual adverse weather delay days exceeds the number of days anticipated in paragraph b. above, the Contracting Officer will convert any qualifying delays to calendar days, giving full consideration for equivalent fair weather work days, and issue a modification in accordance with the GENERAL CONDITIONS (CONTRACT CLAUSES) clause entitled "Default (Fixed Price Construction)". (ER 415-1-15)

## 1.17 INSURANCE REQUIRED

In accordance with GENERAL CONDITIONS (CONTRACT CLAUSES) clause:  
 "Insurance Work on a Government Installation," procure the following minimum insurance:

Type	Amount
Workmen's Compensation and Employer's Liability Insurance	\$100,000
General Liability Insurance	\$500,000 per occurrence
Automobile Liability Insurance	
Bodily injury	\$200,000 per person and \$500,000 per occurrence
Property damage	\$ 20,000 per occurrence

(Coverages per FAR 28.307-2)

## 1.18 SECURITY REQUIREMENTS

## 1.18.1 Contractor's Employee Identification

The Contractor is responsible for furnishing to each employee and for requiring each employee engaged on the work to display such identification as may be approved and directed by the Contracting Officer. Upon release of any employees, deliver all prescribed identification immediately to the Contracting Officer for cancellation. When the contract involves work in restricted security areas, only employees who are U.S. citizens will be permitted to enter. Proof of U.S. citizenship is required prior to entry. When required by the Contracting Officer, obtain and submit

fingerprints of all persons employed or to be employed on the project.  
(Based on FAR 52.204-2)

#### 1.18.2 Entry Requirements

All commercial traffic must enter through the South Gate. All material deliveries are subject to search at the Large Vehicle Inspection Station, where delays of up to one hour may be anticipated during peak delivery periods. The contractor shall anticipate delays during vehicle inspection process as well during entry onto the USAFA property during morning peak rush hour. Large vehicles with a gross vehicle weight over 30 tons will require coordination with 10CES in order to cross bridges.

##### Access Procedures:

Contractors are required to possess a valid Defense Biometric Identification System (DBIDS) card or pass, even if they are working in the event or visitor cordon. Neither contractors/subcontractors are permitted to utilize a military identification card (active duty or retired) to obtain installation access to perform contracted services at USAFA or to invoke trusted traveler status circumventing identity proofing and vetting processes for contracted services.

The Prime contractor is responsible for completing the USAFA Form 13, Application For United States Air Force Academy Access Credential. The Government reasonably relies upon the accuracy of information provided by the prime and all subcontractors. The originating party/organization providing personal information may be prosecuted for false, fictitious, or fraudulent information. This also applies specifically to an individual's status as a Foreign National vs. U.S. Citizen.

The USAFA Form 13 shall be completed electronically; electronic images, copies, and manually prepared forms will not be accepted. The form should be submitted to USACE at least three (3) days prior to the requirement to be on base. The Government reserves the right to deny access to any questionable individuals.

Contractor DBIDS cards will be issued to contractors performing duties on USAFA as identified on the USAFA Form 13 who require weekly access to the installation for a period of time exceeding 90 days. DBIDS passes will be issued to contractors who require weekly access for 90 or fewer days.

If an applicant has not obtained the requested credentials by Form 13 expiration, USACE shall be notified by the Prime within three (3) business days.

Contractors with sponsor authority (Escort privileges) should sponsor workers who do not need weekly access. Escorts are required to process their sponsored personnel through Pass & Registration for a background check. Subcontractors may be given Escort privileges when the prime contractor subcontracts out a majority of the work to be completed.

The Prime contractor shall return local access credentials, regardless of media type, to USACE when a contractor employee no longer requires access to the project site for any reason. The Prime contractor shall notify USACE immediately if a contractor refuses to return issued access media. If an access credential is not returned, the Installation Commander may consider barment, and USACE may disapprove future requests from the sub-contractor and/or provide only limited-duration access.

All personnel must immediately report a lost or stolen access credential to USACE and Security Forces, and a written, signed statement must be provided for reissuance of credential to be considered.

Conditions caused by Force Majeure (acts of war, terrorism, nature, etc.) shall be addressed via contract time extension at no cost only. The Contractor shall anticipate that in the event of heightened alert, access to the U.S. Air Force Academy may be denied for approximately three to five days. The Contractor shall also anticipate that during periods of heightened alert, time required to access the U.S. Air Force Academy may increase threefold for a period of seven days.

#### 1.19 CONTRACTOR QUALITY CONTROL (CQC)

See Section 01 45 00.00 10 QUALITY CONTROL.

#### 1.20 NONDOMESTIC CONSTRUCTION MATERIALS

The list of excepted nondomestic construction materials or their components referenced in the Buy American Construction Material Contract Clauses includes the list set forth in paragraph 25.104 of the Federal Acquisition Regulation.

#### 1.21 DAILY WORK SCHEDULES AND WEEKLY COORDINATION MEETINGS

In order to closely coordinate work under this contract, prepare a written agenda/meeting minutes and attend a weekly coordination meeting with the Contracting Officer and Using Service at which time the Contractor must submit for coordination and approval, their proposed daily work schedule for the next two week period. Provide a copy of modifications (MODs), Serial Letters, Requests for Information (RFIs) and any other information that is needed in the minutes of the meeting. Include required temporary utility services, time and duration of interruptions, and protection of adjoining areas with the Contractor's proposed 2-week work schedule. At this meeting, the Contractor must also submit their schedule of proposed dates and times of all preparatory inspections to be performed during the next 2 weeks. All schedules shall be developed in accordance with Section 01 32 01.00 10 PROJECT SCHEDULE Coordination action by the Contracting Officer relative to these schedules will be accomplished during these weekly meetings. Daily reports must be completed and given to the Contracting Officer or Representative within 24 hours of work. All official correspondence such as serial letters and RFIs, with attachments are to be provided in one hardcopy original with original signatures and one electronic (Adobe pdf format) copy by email. The Government will consider the correspondence to be received when the official hardcopy or electronic copy is received by the designated office.

#### 1.22 AS-BUILT DRAWINGS

See SECTION 01 78 39.00 24 - AS-BUILT DRAWINGS

#### 1.23 SIGN

On commencement of work on this project, furnish and erect the temporary sign in the location selected by the Contracting Officer near the project site. Maintain the sign in good condition through the project construction period. Upon completion of the project remove the sign from the premises. The project sign must conform to standard drawing attached



to this section. A decal of the "Engineer Castle" and the U. S. Air Force emblem will be furnished the Contractor upon request.

#### 1.24 EQUIPMENT ROOM DRAWINGS

Prior to construction, prepare and submit room plans (see paragraph SUBMITTALS for conditions regarding this submittal under Design/Build procurement) for all mechanical, electrical, and communication rooms or similar areas. The plans must be consolidated for all trades, be to scale, and show all pertinent structural features. All equipment must be accessible and laid out in a good design and workmanship manner and layouts for communications rooms shall be completed as early as possible. In addition, other items such as doors, windows, and cabinets required for installation and which will affect the available space, must be shown. All mechanical and electrical equipment and accessories must be shown to scale in plan and elevation and/or section in their installed positions. All duct work and piping must be shown.

#### 1.25 CONTRACTOR FURNISHED EQUIPMENT DATA

See Section 01 78 36.00 24 WARRANTY OF CONSTRUCTION AND DESIGN for Contractor Furnished Equipment Data to be submitted as part of the Warranty Equipment Booklet.

#### 1.26 ACCOMMODATIONS FOR GOVERNMENT INSPECTORS

Furnish furnish a temporary office facility approximately 10 feet x 20 feet with a minimum of 200 square feet of floor space. Locate the temporary office facility where directed and it must be reserved for Government personnel only. Furnish and maintain drinking water facilities, adequate lighting, broadband internet air-conditioning, heating equipment, and a partition enclosed chemical toilet. The office must be furnished with one legal size filing cabinet with four drawers, one drafting table with stool, one plan rack, one desk, and three chairs. Used furniture, in good condition, will be acceptable. Equip entrance doors with a substantial lock. The Contractor must provide janitor service, fuel for the heating facilities, electricity, internet and water, all at no cost to the Government, except the Contractor will not be liable for Government long-distance calls. The entire facility, including furniture, will remain the property of the Contractor and removed from the site after completion of the work.

#### 1.27 PARTNERING

To most effectively accomplish this Contract, the Contractor and Government must form a cohesive partnership with the common goal of drawing on the strength of each organization in an effort to achieve a successful project without safety mishaps, conforming to the Contract, within budget and on schedule. The partnering team must consist of personnel from both the Government and Contractor including project level and corporate level leadership positions. Key Personnel from the supported command, end user, Contractor, key subcontractors and the Designer of Record are required to participate in the Partnering process.

##### 1.27.1 Team-Led (Informal) Partnering

- a. The Contracting Officer will coordinate the initial Team-Led (Informal) Partnering Session with key personnel of the project team, including Contractor and Government personnel. The Partnering Session

will be co-led by the Government Construction Manager and Contractor's Project Manager.

- b. Hold partnering sessions at a location mutually agreed to by the Contracting Officer and the Contractor, typically at a conference room on-base or at the Contractor's temporary trailer.
- c. Conduct the Initial Team-Led Partnering Session and facilitate using electronic media (a video and accompanying forms) provided by the Contracting Officer.
- d. The Partners will determine the frequency of the follow-on sessions.
- e. Participants will bear their own costs for meals, lodging and transportation associated with Partnering.

#### 1.28 PROFIT

a. Use the weighted guidelines method of determining profit on any equitable adjustment change order or modification issued under this contract. The profit factors must be as follows:

Factor	Rate	Weight	Value
Degree of Risk	20	See Item	
Relative difficulty of work	15	b. below	
Size of Job	15		
Period of performance	15		
Contractor's investment	5		
Assistance by Government	5		
Subcontracting	25		
	100		

b. Based on the circumstances of each procurement action, each of the above factors must be weighted from .03 to .12 as indicated below. Obtain the value by multiplying the rate by the weight. The value column when totaled indicates the fair and reasonable profit percentage under the circumstances of the particular procurement.

(1) Degree of Risk. Where the work involves no risk or the degree of risk is very small, the weighting should be .03; as the degree of risk increases, the weighting should be increased up to a maximum of .12. Lump sum items will have, generally, a higher weighted value than the unit price items for which quantities are provided. Other things to consider: the portion of the work to be done by subcontractors, nature of work, where work is to be performed, reasonableness of negotiated costs, amount of labor included in costs, and whether the negotiation is before or after performance of work.

(2) Relative Difficulty of Work. If the work is most difficult and complex, the weighting should be .12 and should be proportionately reduced to .03 on the simplest of jobs. This factor is tied in to some extent with the degree of risk. Some things to consider: the nature of the work, by whom it is to be done, where, and what is the time schedule.

(3) Size of Job. All work not in excess of \$100,000 shall be weighted at .12. Work estimated between \$100,000 and \$5,000,000 shall be proportionately weighted from .12 to .05.

(4) Periods of Performance. Jobs in excess of 24 months are to

be weighted at .12. Jobs of lesser duration are to be proportionately weighted to a minimum of .03 for jobs not to exceed 30 days. No weight where additional time not required.

(5) Contractor's Investment. To be weighted from .03 to .12 on the basis of below average, average, and above average. Things to consider: amount of subcontracting, mobilization payment item, Government furnished property, equipment and facilities, and expediting assistance.

(6) Assistance by Government. To be weighted from .12 to .03 on the basis of average to above average. Things to consider: use of Government-owned property, equipment and facilities, and expediting assistance.

(7) Subcontracting. To be weighted inversely proportional to the amount of subcontracting. Where 80 percent or more of the work is to be subcontracted, the weighting is to be .03 and such weighting proportionately increased to .12 where all the work is performed by the Contractor's own forces.

#### 1.29 LABOR CONDITIONS APPLICABLE TO TEMPORARY FACILITIES

It is the position of the Department of Defense that the Davis-Bacon Act, 40 U.S.C. 276a is applicable to temporary facilities such as job headquarters, tool yards, batch plants, borrow pits, sandpits, rock quarries, and similar operations, provided they are dedicated exclusively, or nearly so, to performance of the contract or project, and provided they are adjacent or virtually adjacent to the site of the work and are established after receipt of the proposal or bid. Clause "Payrolls and Basic Records" of the GENERAL CONDITIONS (CONTRACT CLAUSES) is applicable to such operations.

#### 1.30 DRAWING SCALES

All scales shown on the RFP project drawings are based on a standard drawing size of 22" x 34". If any other size drawings are furnished or plotted, the contractor adjust the scales accordingly. The Contractor must also advise their sub-contractors of the above.

#### 1.31 FEDERAL HOLIDAYS

The following Federal legal holidays are observed by this installation:

New Year's Day	1 January
Martin Luther King's Birthday	Third Monday in January
President's Day	Third Monday in February
Memorial Day	Last Monday in May
Juneteenth	19 June
Independence Day	4 July
Labor Day	First Monday in September
Columbus Day	Second Monday in October
Veterans Day	11 November
Thanksgiving Day	Fourth Thursday in November
Christmas Day	25 December

If a wage determination applies the number of holidays specified on it, it has priority over this requirement.

## 1.32 BASE HOURS

Base operation hours are 6:00 a.m. to 6:00 p.m. daily (Monday through Friday), excluding federal holidays. Access to the base during other times must be requested in writing from the Contracting Officer and will be granted only for extenuating circumstances. Federal Holidays and weekends are considered as scheduled non-workdays.

## 1.33 COST AND TIME IMPACT (CTI) LOG

a. Any changes with an absolute value under the Simplified Acquisition Threshold (SAT) at the time of initiation of the change and within the Administrative Contracting Officer's (ACO) authority, may be executed using the Cost and Time Impact Log (CTI Log) processes as described herein. The purpose of the CTI Log is to provide efficient and effective change management process for the mutual benefit of the Government and the Contractor while partnering to execute this contract.

b. The CTI Log process is a collaborative, proactive, and efficient change management process. In general, the CTI Log process is as described below.

1. The CTI Log is designated for use on work items determined to be changes where individual costs are anticipated to be less than the SAT. The process starts with a discussion between USACE on-site Contracting Officer's Representative (COR) or ACO and the prime contractor's authorized field representative. If it appears the issue cannot be resolved through a no-cost clarification of the contract requirements, the USACE COR will request the contractor to submit a confirming Request for Information (RFI). Where the solution to the problem is not apparent and not initially resolvable at the field level, the Contractor may submit to USACE a "non-confirming" RFI and USACE shall provide technical direction. If the absolute value of the change is anticipated to exceed the SAT, the contractor will be advised that a Request for Proposal (RFP) for the change will be forthcoming and that the CTI Log process shall not be utilized.

2. The contractor submits the confirming RFI identifying the potential Cost and/or Time impact issue as previously discussed between the USACE COR and the contractor's field representative, along with a proposed solution. In addition to the technical details, the RFI shall contain, to the maximum extent practicable, a proposal for the change from the contractor with an acceptable breakdown of all costs (representing both the prime and each of the applicable subcontractors' costs) to include labor, equipment and material. Time impacts, if applicable, must include a Time Impact Analysis (TIA) of work activities. The prime and subcontractor(s) will provide their markups for each of the individual changes as they arise, to include profit development in accordance with (IAW) the alternate Weighted Profit Guidelines approach per UAI 5115.404-73. If mutually agreed upon by both the Government and Contractor, the Contractor may submit the confirming RFI without the detailed cost proposal and/or the Time Impact Analysis, but shall contain a ROM of cost impacts and time impacts. If it is mutually agreed that the Contractor's cost proposal and TIA may not be included in the confirming RFI, the Contractor shall submit both the proposal and TIA as soon as

practicable or by the date specified in the Government's response to the RFI, whichever is sooner.

3. If the proposal and TIA are included in the RFI from the Contractor, the Government shall evaluate the Contractor's technical recommendation in the RFI, the Contractor's proposal, and the TIA. When the technical solution is determined and any cost and/or time impacts are discussed, negotiated (if necessary), and determined to be fair and reasonable, the Government ACO will return the RFI with the technical solution and note that the formal price and time agreement will be captured on the CTI Log. Under no circumstances will the RFI response act as a Notice to Proceed (NTP) to incur increased costs or time impacts. The official NTP for the applicable change will be granted upon signing of the CTI Log. If the RFI is submitted and signed by the Government without cost and time impacts known, the Government shall return the RFI with the technical direction and request the proposal and TIA by an established suspense date. In either instance, the CTI Log will note the agreed upon price for the change (if any), time extension (if any), and will establish the NTP for the technical direction captured in the RFI.

4. After arriving at a bilateral agreement on price and time impacts associated with the change, the ACO and the contractor's representative will enter the RFI number and the agreed upon "reasonable price" on the contract CTI Log. At this time, the ACO will electronically sign the applicable log entries, authorizing the contractor to proceed with the scope described by the RFI and at the reasonable price agreed upon. The contractor's authorized representative must also acknowledge the cost and time impact by signing the CTI Log item, prior to proceeding with the work. The official NTP will occur when both the Government and Contractor have both signed the CTI Log.

5. When the aggregate absolute value of changes approaches the appointed ACO's warrant threshold, the individual CTI Log entries (and associated RFIs) shall be captured in a single modification document (SF 30). The "SCOPE" paragraph of the modification will contain a summary list of the incorporated CTI Log items. These aggregate modifications will be processed at least once every month, at a different interval as mutually agreed upon, or when expedited processes are needed to pay for critical features of work such that subcontractors have the ability to bill for work completed in the field. The ACO will sign the SF 30 and provide to the contractor for its signature and return. After the SF30 is executed, the Contractor can bill for the earnings included in the associated CTI Log items listed on the SF30.

6. The CTI Log process may be utilized during the performance of this contract unless termination or suspension of this change management process is desired by either party.

PART 2 NOT USED

PART 3 NOT USED

-- End of Section --

<b>BASE CIVIL ENGINEERING WORK CLEARANCE REQUEST</b> <i>(See Instructions on Reverse)</i>		<b>DATE PREPARED</b>																																	
<b>1. Clearance is requested to proceed with work at</b> _____																																			
<b>on Work Order No.</b> _____, <b>Contract No.</b> _____, involving excavation or utility disturbance per attached sketch. <b>This area</b> <input type="checkbox"/> has <input type="checkbox"/> has not been staked or clearly marked.																																			
<b>2. TYPE OF FACILITY/WORK INVOLVED</b>																																			
<input type="checkbox"/> A. PAVEMENTS <input type="checkbox"/> D. FIRE DETECTION & PROTECTION SYSTEMS <input type="checkbox"/> G. AIRCRAFT OR VEHICULAR TRAFFIC FLOW <input type="checkbox"/> B. DRAINAGE SYSTEMS <input type="checkbox"/> E. UTILITY <input type="checkbox"/> OVERHEAD <input type="checkbox"/> UNDERGROUND <input type="checkbox"/> H. SECURITY <input type="checkbox"/> C. RAILROAD TRACKS <input type="checkbox"/> F. COMM <input type="checkbox"/> OVERHEAD <input type="checkbox"/> UNDERGROUND <input type="checkbox"/> I. OTHER																																			
<b>3. DATE CLEARANCE REQUIRED</b>		<b>4. EMAIL</b>																																	
<b>5. SIGNATURE OF REQUESTING OFFICIAL</b> <b>Sign/Print:</b>		<b>6. TELEPHONE NO.</b>																																	
<b>7. ORGANIZATION</b>																																			
<b>8.</b> <b>B</b> <b>A</b> <b>S</b> <b>E</b>  <b>C</b> <b>I</b> <b>V</b> <b>I</b> <b>L</b>  <b>E</b> <b>N</b> <b>G</b> <b>I</b> <b>N</b> <b>E</b> <b>E</b> <b>R</b> <b>I</b> <b>N</b> <b>G</b>	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;">ORGANIZATION</th> <th style="width: 40%;">REMARKS <i>(Use Reverse for additional comments)</i></th> <th style="width: 30%;">REVIEWER'S NAME AND INITIALS</th> </tr> </thead> <tbody> <tr> <td>A. ELECTRICAL DISTRIBUTION</td> <td></td> <td></td> </tr> <tr> <td>B. STEAM DISTRIBUTION</td> <td></td> <td></td> </tr> <tr> <td>C. WATER DISTRIBUTION</td> <td></td> <td></td> </tr> <tr> <td>D. POL DISTRIBUTION</td> <td style="text-align: center;">N/A</td> <td style="text-align: center;">See Line #14</td> </tr> <tr> <td>E. SEWER DISTRIBUTION</td> <td></td> <td></td> </tr> <tr> <td>F. ENVIRONMENTAL</td> <td></td> <td></td> </tr> <tr> <td>G. PAVEMENTS/ GROUNDS</td> <td></td> <td></td> </tr> <tr> <td>H. FIRE PROTECTION</td> <td style="text-align: center;">N/A</td> <td>Pre-arrange/call 72 hours prior if services are needed</td> </tr> <tr> <td>I. ZONE _____</td> <td style="text-align: center;">N/A</td> <td></td> </tr> <tr> <td>J. OTHER <i>(Specify)</i></td> <td style="text-align: center;">N/A</td> <td></td> </tr> </tbody> </table>	ORGANIZATION	REMARKS <i>(Use Reverse for additional comments)</i>	REVIEWER'S NAME AND INITIALS	A. ELECTRICAL DISTRIBUTION			B. STEAM DISTRIBUTION			C. WATER DISTRIBUTION			D. POL DISTRIBUTION	N/A	See Line #14	E. SEWER DISTRIBUTION			F. ENVIRONMENTAL			G. PAVEMENTS/ GROUNDS			H. FIRE PROTECTION	N/A	Pre-arrange/call 72 hours prior if services are needed	I. ZONE _____	N/A		J. OTHER <i>(Specify)</i>	N/A		
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<b>10. SAFETY</b>																																			
<b>11. COMMUNICATIONS</b>																																			
<b>12. BASE OPERATIONS</b>		Coordinate w/Airfield Mgmnt. 5 days prior to work start																																	
<b>13. CABLE TV</b>		N/A See Line #14																																	
<b>14. COMMERCIAL UTILITY COMPANY</b> <input type="checkbox"/> TELEPHONE <input type="checkbox"/> GAS <input type="checkbox"/> ELECTRIC		Get ticket number prior to processing Call 811 / 800-922-1987 or Web: <a href="http://co811.org">co811.org</a> <b>Ticket #</b> _____																																	
<b>15. OTHER <i>(Specify)</i></b> _____																																			
<b>16. REQUESTED CLEARANCE</b> <input type="checkbox"/> APPROVED <input type="checkbox"/> DISAPPROVED																																			
<b>17. TYPED NAME AND SIGNATURE OF APPROVING OFFICER <i>(Chief of Operations Flight or Chief of Engineering Flight)</i></b>		<b>17a. DATE SIGNED</b>																																	

### INSTRUCTIONS

The BCE work clearance request is used for any work (contract or in-house) that may disrupt aircraft or vehicular traffic flow, base utility services, protection provided by fire and intrusion alarm system, or routine activities of the installation. This form is used to coordinate the required work with key base activities and keep customer inconvenience to a minimum. It is also used to identify potentially hazardous work conditions in an attempt to prevent accidents. The work clearance request is processed just prior to the start of work. If delays are encountered and the conditions at the job site change (or may have changed) this work clearance request must be reprocessed.

18. REMARKS. (This section must describe specific precautionary measure to be taken before and during work accomplishment. Specific comments concerning the approved method of excavation, hand or powered equipment, should be included.)

- Describe the project in detail, including the reason for the project. Is the project over an Acre in Land Disturbance?

- Method of Excavation(s) - What equipment is being used for excavation?

- Maximum depth of digging?



# USAFA UTILITY OUTAGE/ROAD CLOSURE PROCEDURE

Date: 10/6/2021

## CONSTRUCTION MANAGEMENT SECTION

Whenever a request for shutting off any utilities (i.e. gas, sewer, storm water, water (domestic or fire), electrical, or communications), or closing a portion of a road, parking lot or building needs to happen, this document applies.

### AT THIRTY (30) CALENDAR DAYS FROM OUTAGE OR CLOSURE:

A written request for a Utility Outage or Road Closure shall be submitted to the 10 CES/CENMP Inspector a minimum of thirty (30) calendar days from the date of the requested outage or closure. This written request shall be an email to the 10 CES/CENMP Inspector.

REQUESTED DATE: *(Example: Mon 10/18/2021, min. 30 days prior)*

TYPE OF OUTAGE/CLOSURE: *(Example: domestic hot and cold water)*

DURATION/TIME: *(Example: 4 hrs, 0800-1200)*

PURPOSE: *(Example: to install water heater)*

BLDG/LOCATION: *(Example: Sijan Hall, SW corner, 3<sup>rd</sup> floor)*

POC: *(Name, Company, phone no., email address)*

Note: Allow a minimum of seven (7) calendar for the 10 CES/CENMP Inspector to route the requested date to all stakeholders for review and coordination. A proposed Outage or Closure date is NOT considered approved until all stakeholders have been notified and coordinated.

*(Note to 10 CES/CENMP Inspectors: use the 'Utility Outage/Road Closure Internal Worksheet' to determine all applicable stakeholders. Worksheet is not for distribution. Send out 30 Notice email and map to all stakeholders).*

### 10 CES ACTIONS:

A. CENMP Inspector will coordinate the outage in the following order:

1. Coordinate proposed date with Production Control and impacted CE Ops shop first
2. Coordinate proposed date with other stakeholders via email, cc 10 CES/CC, 10 CES/CD, 10 CES Admin and 10 CES Taskers, with the information below (as available):

PURPOSE:

ADDITIONAL DETAILS:

UTILITIES IMPACTED:

# USAFA UTILITY OUTAGE/ROAD CLOSURE PROCEDURE

Date: 10/6/2021

PROPOSED DATE:  
DURATION and PROPOSED TIME:  
LOCATION (Bldg # and name):  
TRAFFIC IMPACT:  
PARKING IMPACT:  
PEDESTRIAN IMPACT:  
BUILDING IMPACT:  
POC:

A 'Thirty (30) Day Outage-Closure Voting Email' to all people listed on the Outage/Closure Internal Worksheet. This 'Voting Email' will allow the stakeholders to 'Approve' or 'Reject' the proposed Outage or Closure. The 'Voting Email' asks the stakeholders for a vote response NLT five (5) calendar days from the day the 'Voting Email' was sent out.

Note: If anyone votes 'Reject' (or does not agree to the proposed outage), the 10 CES/CENMP Inspector will contact that person to work through the issue.

3. Only after the 10 CES review, coordination and approval will the Requestor be notified of the approved date and time.
4. The 10 CES/ CENMP Inspector will immediately post the Outage/Closure on the 10 CES CENMP Construction Management Org Box calendar.
5. 10 CES/CENMP Construction Manager will make the following weekly updates/notifications:
  - Update Outage/Closure section of the CES weekly SITREP on Mondays with those Outages/Closures with high impact
  - Update the KIRA Tuesday staff meeting slide
  - Update the 10 CES Thursday staff meeting slide

# USAFA UTILITY OUTAGE/ROAD CLOSURE PROCEDURE

Date: 10/6/2021

## IF AN OUTAGE OR CLOSURE IS REQUESTED SOONER THAN THIRTY (30) DAYS:

If an Outage or Closure is requested sooner than thirty (30) calendar days, the requestor must provide information to the 10 CES/CENMP Inspector. Refer to the Variance Request Form below for the required information that the Inspector will need.

### Variance Request Form



USAFA - Civil Engineering Contract #FA700019C0001

WORK ORDER #: AWIMS	N/A	MAXIMO	N/A
Date WO/Project/Task Requested:		WORK PRIORITY:	
Materials Ordered Date:		Estimated Delivery Date:	
WRRB APPROVED DATE:			
WORK DESCRIPTION:	(what type of outage/closure?)		
LOCATION OF WORK:	(where exactly is the outage/closure? - create map)		
Requesting Dept. /Office:	(who is requesting the outage/closure?)		

#### VARIANCE/WAIVER REQUEST (Justification/Reason):

(Code Blue, Materials, Gov/Military/FM/ME/Cust request, COVID, Natural Disaster, Weather, etc....)

Request a variance to PWS 3.4.21.1.5 for the 30-day and 14-day outage notification. The contractor made the request on xx/xx/202x for an (type of outage) to start on xx/xx/202x till xx/xx/202x. At this time, there are no known impacts with this outage to other facilities. This is a (type of project).

Requestor Name/Phone/Email:  
Project No./Project Name: XQPZxxxxxx (ACES project name)  
10 CES/CENMP Inspector Name/Phone/Email:  
Requested Date/Duration: Starting xx/xx/202x to xx/xx/202x  
Electrical work required per (state the requirement)

AMOUNT OF ADDITIONAL TIME REQUESTED:	N/A
ESTIMATED COMPLETION DATE:	

#### APPROVAL(S):

Signature	
Joseph E. Castro, 10 CES/CENPD KIRA Civil Engineering Manager	+
Signature	
Japhet W. Henderson, 10 CES/CENPE KIRA Quality Control Manager	
Signature	
Steven D. Austin, 10 CES/CEOH Base Maintenance Support Contract Chief COR	

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PAGE 1 of 1

ALWAYS REFER TO AFA CE SHAREPOINT LIBRARY TO REFERENCE CURRENT POLICIES, PROCEDURES AND FORMS.

Once the 10 CES/CENMP Inspector has the required information from the requestor, the Inspector will complete the Variance Request Form and route it for approval signatures.

# USAFA UTILITY OUTAGE/ROAD CLOSURE PROCEDURE

Date: 10/6/2021

## AT FOURTEEN (14) CALENDAR DAYS FROM OUTAGE OR CLOSURE:

### ACTIONS:

- A. 10 CES/CENMP Inspector will prepare and send a '14 Day Reminder' Outage (or Closure) email notice with the same information as the '30 Day' email notice, but completed, including current map.
- B. At the same time the 10 CES/CENMP Construction Manager will prepare a draft e-mail for major outages for the 10 CES/CC or CD to send to senior leadership.

## AT THREE (3) DAYS FROM OUTAGE OR CLOSURE:

- A. The 10 CES/CENMP Inspector will send a '3 Day Reminder' email to distribute with map to all stakeholders.
- B. At the same time the 10 CES/CENMP Construction Manager will prepare a draft e-mail for major outages for the 10 CES/CC or CD to send to senior leadership.

Note: If after the fourteenth (14th) day, an Outage/Closure is cancelled or re-scheduled after notification, the 10 CES/CENMP Inspector will send an email to notify them of the cancellation or re-scheduling.

## OPS SHOPS COORDINATING OUTAGES:

### Implementation

**Maintenance Shops (CEO)-coordinated outages/closures and PC (CEOER) – coordinated email outages/closures.**

- A. Upon lead identification of a required outage/closure, the lead will complete KFSS-700-CL-001 Outage Coordination Checklist. By Performance Work Statement (PWS), the checklist should be completed 30 days prior to the requested outage/closure when possible/practical. The FAS is aware there are certain circumstances where the OPS Branch receives emergency outages that are less than 10 days prior to the outage.
- B. The Outage Coordination sheet includes the following information:
- C. Type of Outage/Closure
- D. Start and Completion Time of the Outage/Closure
- E. Facilities/Road/Parking Areas/Activity Affected by the Outage/Closure.
- F. Purpose of the Outage. In this section: who, what, when, where and why for the outage/closure should be restated in narrative format. This section will be cut/pasted into an e-mail forwarded to the 10 CES Command staff with the intent

# USAFA UTILITY OUTAGE/ROAD CLOSURE PROCEDURE

Date: 10/6/2021

of approving and forwarding further to the 10 MSG Command Staff. It becomes the framework for any Distribution O E-Mail that is sent out to the entire USAFA team.

G. Example:

What: Electrical Power Outage  
Where: Aero lab Bldg. 2140  
When: Saturday, 29 Jan, 0800 - 1600  
Why: To support on-going construction work  
POC: Mr. John, 896-XXXX

- H. For road closures, the lead includes an electronic site map created by the KFSS CAD/GIS section using the standard template, identifying the affected area and information on the outage.
- I. Once the Outage Coordination Sheet is completed and all notifications are made, the form should be provided via email to Maintenance Operations Manager, the Work Control Manager and also emailed to 10CES.CEOPCSBASE.US.AF.MIL. The Production Control Technician will assign a Maximo work order number for any required in-house support. The Maintenance Operations Section will add the outage to a PowerPoint slide shown each week at the BCE Update and KFSS Managers/Supervisor's meeting. The Maintenance Operations Manager, or Work Control Manager continues processing of the outage request.
- J. The Work Control Manager creates an e-mail with the above information and sends to a pre-identified working level list of outage/closure points of contacts and/or squadron tasker e-mail boxes to include BCE and DCE and 10 CES/Taskers. Focus is given to the differences in the .mil and .edu networks to ensure the notice is received by both mail systems. Consider including personal e-mails to the Dean of Faculty Chief of Staff, and the Commandants Training Chief (CWT). The Maintenance Operations Manager and the outage assigned project inspector collect any feedback, objections, or recommendations from the Mission Elements and squadron commander/representatives. This feedback may result in an update outage date or time.

# USAFA UTILITY OUTAGE/ROAD CLOSURE PROCEDURE

Date: 10/6/2021

**Consideration for critical communication facilities, high interest, high traffic impact, outages that affect special events of mission events.**

## **Critical communications facilities.**

- A. Extra actions to support outages are required when the outage affects a critical communication facility as identified in the Base Recovery Plan or as identified by the requestor. In these facilities, it is critical to meet prior to the outage and confirm the on-site representation of the Civil Engineer (EMCS Controls, HVAC, electrician, project inspector), Communications Squadron, Fire Department, Force Support Squadron, and any other USAFA member that would be important to be present before, during and after an outage to ensure restoration of the facility after an outage.

## **Other Critical Facilities**

- A. Other critical facilities for consideration in coordinating outages include Base Operations and associate flight safety facilities during flying hours, Control Tower, Sewage Lift Stations, Medical Clinic, Mitchell Dining Hall, High Country Dining Hall, Waste Water Treatment Plant, Central Heat Plant, Cadet Dorms, Cadet Athletic facilities, Command and control centers, Harmon Hall, and Weapon Storage Areas.
- B. Each of these outage situations require discussion and interaction with USAFA organizations that may be required to assist in recovery after an outage.

48"



UNITED STATES  
**AIR FORCE ACADEMY**

## FY17 Front Gates Force Protection

Investment:

Estimated Completion:

CUSTOMER:

10TH CES

ADMINISTRATIVE AGENT:

US Army Corps of Engineers

ARCHITECT:

ENGINEER:

CONTRACTOR:

**Galloway**  
Planning. Architecture. Engineering.

96"

### NOTES:

1. Above is an example project sign for USAFA in the preferred format, coordinate required project display information with the Contracting Officer.
2. Army Star logo and USACE castle must be added to project sign in accordance with ECB 2020-1. See example project sign from ECB 2020-1 attached after this detail.

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**02/15**

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## SECTION 01 32 01.00 10

PROJECT SCHEDULE  
02/15

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

## AACE INTERNATIONAL (AACE)

AACE 29R-03 (2011) Forensic Schedule Analysis

AACE 52R-06 (2006) Time Impact Analysis - As Applied  
in Construction

## U.S. ARMY CORPS OF ENGINEERS (USACE)

ER 1-1-11 (2017) Administration -- Project Schedules

## 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29 SUSTAINABILITY REQUIREMENTS AND REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

## SD-01 Preconstruction Submittals

Project Scheduler Qualifications; G, RO

Preliminary Project Schedule; G, RO

Initial Project Schedule; G, RO

Periodic Schedule Update; G, RO

## 1.3 PROJECT SCHEDULER QUALIFICATIONS

Designate an authorized representative to be responsible for the preparation of the schedule and all required updating and production of reports. The authorized representative must have a minimum of 2-years experience scheduling construction projects similar in size and nature to this project with scheduling software that meets the requirements of this specification. Representative must have a comprehensive knowledge of CPM scheduling principles and application.

## PART 2 PRODUCTS

### 2.1 SOFTWARE

The scheduling software utilized to produce and update the schedules required herein must be capable of meeting all requirements of this specification.

#### 2.1.1 Government Default Software

The Government default software is Primavera P6.

#### 2.1.2 Contractor Software

Scheduling software used by the contractor must be commercially available from the software vendor for purchase with vendor software support agreements available. The software routine used to create the required sdef file must be created and supported by the software manufacturer.

##### 2.1.2.1 Primavera

If Primavera P6 is selected for use, provide the "xer" export file in a version of P6 importable by the Government system.

##### 2.1.2.2 Other Than Primavera

Use of software other than Primavera P6 must be approved by the Contracting Officer. If a different software system is approved, the Contracting Officer may require the Contractor to provide for the Government's use up to two licenses, two computers, and training for two Government employees in the use of the software. These computers will be stand-alone and not connected to Government network. Computers and licenses will be returned at project completion.

## PART 3 EXECUTION

### 3.1 GENERAL REQUIREMENTS

Prepare for approval a Project Schedule, as specified herein, pursuant to FAR Clause 52.236-15 Schedules for Construction Contracts. Show in the schedule the proposed sequence to perform the work and dates contemplated for starting and completing all schedule activities. The scheduling of the entire project is required. The scheduling of design and construction is the responsibility of the Contractor. Contractor management personnel must actively participate in its development. Designers, Subcontractors and suppliers working on the project must also contribute in developing and maintaining an accurate Project Schedule. Provide a schedule that is a forward planning as well as a project monitoring tool. Use the Critical Path Method (CPM) of network calculation to generate all Project Schedules. Prepare each Project Schedule using the Precedence Diagram Method (PDM).

### 3.2 BASIS FOR PAYMENT AND COST LOADING

The schedule is the basis for determining contract earnings during each update period and therefore the amount of each progress payment. The aggregate value of all activities coded to a contract CLIN must equal the value of the CLIN.

### 3.2.1 Activity Cost Loading

Activity cost loading must be reasonable and without front-end loading. Provide additional documentation to demonstrate reasonableness if requested by the Contracting Officer.

### 3.2.2 Withholdings / Payment Rejection

Failure to meet the requirements of this specification may result in the disapproval of the preliminary, initial or periodic schedule updates and subsequent rejection of payment requests until compliance is met.

In the event that the Contracting Officer directs schedule revisions and those revisions have not been included in subsequent Project Schedule revisions or updates, the Contracting Officer may withhold 10 percent of pay request amount from each payment period until such revisions to the project schedule have been made.

## 3.3 PROJECT SCHEDULE DETAILED REQUIREMENTS

### 3.3.1 Level of Detail Required

Develop the Project Schedule to the appropriate level of detail to address major milestones and to allow for satisfactory project planning and execution. Failure to develop the Project Schedule to an appropriate level of detail will result in its disapproval. The Contracting Officer will consider, but is not limited to, the following characteristics and requirements to determine appropriate level of detail:

### 3.3.2 Activity Durations

Reasonable activity durations are those that allow the progress of ongoing activities to be accurately determined between update periods. Less than 2 percent of all non-procurement activities may have Original Durations (OD) greater than 20 work days or 30 calendar days.

### 3.3.3 Design and Permit Activities

Include design and permit activities with the necessary conferences and follow-up actions and design package submission dates. Include the design schedule in the project schedule, showing the sequence of events involved in carrying out the project design tasks within the specific contract period. Provide at a detailed level of scheduling sufficient to identify all major design tasks, including those that control the flow of work. Also include review and correction periods associated with each item.

### 3.3.4 Procurement Activities

Include activities associated with the critical submittals and their approvals, procurement, fabrication, and delivery of long lead materials, equipment, fabricated assemblies, and supplies. Long lead procurement activities are those with an anticipated procurement sequence of over 90 calendar days.

### 3.3.5 Mandatory Tasks

Include the following activities/tasks in the initial project schedule and all updates.

- a. Submission, review and acceptance of SD-01 Preconstruction Submittals (individual activity for each).
- b. Submission, review and acceptance of design packages.
- c. Submission of mechanical/electrical/information systems layout drawings.
- d. Long procurement activities
- e. Submission and approval of O & M manuals.
- f. Submission and approval of as-built drawings.
- g. Submission and approval of DD1354 data and installed equipment lists.
- h. Submission and approval of testing and air balance (TAB).
- i. Submission of TAB specialist design review report.
- j. Submission and approval of fire protection specialist.
- k. Submission and approval of Building Commissioning Plan, test data, and reports: Develop the schedule logic associated with testing and commissioning of mechanical systems to a level of detail consistent with the contract commissioning requirements. All tasks associated with all building testing and commissioning will be completed prior to submission of building commissioning report and subsequent contract completion.
- l. Air and water balancing.
- m. Building commissioning - Functional Performance Testing.
- n. Controls testing plan submission.
- o. Controls testing.
- p. Performance Verification testing.
- q. Other systems testing, if required.
- r. Contractor's pre-final inspection.
- s. Correction of punch list from Contractor's pre-final inspection.
- t. Government's pre-final inspection.
- u. Correction of punch list from Government's pre-final inspection.
- v. Final inspection.

#### 3.3.6 Government Activities

Show Government and other agency activities that could impact progress. These activities include, but are not limited to: acceptance, design reviews, environmental permit approvals by State regulators, inspections, utility tie-in, Government Furnished Equipment (GFE) and Notice to Proceed (NTP) for phasing requirements.



### 3.3.7 Standard Activity Coding Dictionary

Use the activity coding structure defined in the Standard Data Exchange Format (SDEF) in ER 1-1-11. This exact structure is mandatory. Develop and assign all Activity Codes to activities as detailed herein. A template SDEF compatible schedule backup file is available on the web site: <http://rms.usace.army.mil>.

The SDEF format is as follows:

Field	Activity Code	Length	Description
1	WRKP	3	Workers per day
2	RESP	4	Responsible party
3	AREA	4	Area of work
4	MODF	6	Modification Number
5	BIDI	6	Bid Item (CLIN)
6	PHAS	2	Phase of work
7	CATW	1	Category of work
8	FOW	20	Feature of work*
*Some systems require that FEATURE OF WORK values be placed in several activity code fields. The notation shown is for Primavera P6. Refer to the specific software guidelines with respect to the FEATURE OF WORK field requirements.			

#### 3.3.7.1 Workers Per Day (WRKP)

Assign Workers per Day for all field construction or direct work activities, unless directed otherwise by the Contracting Officer. Workers per day is based on the average number of workers expected each day to perform a task for the duration of that activity.

#### 3.3.7.2 Responsible Party Coding (RESP)

Assign responsibility code for all activities to the Prime Contractor, Subcontractor(s) or Government agency(ies) responsible for performing the activity.

- a. Activities coded with a Government Responsibility code include, but are not limited to: Government approvals, Government design reviews, environmental permit approvals by State regulators, Government Furnished Property/Equipment (GFP) and Notice to Proceed (NTP) for phasing requirements.
- b. Activities cannot have more than one Responsibility Code. Examples of acceptable activity code values are: DOR (for the designer of record); ELEC (for the electrical subcontractor); MECH (for the mechanical

subcontractor); and GOVT (for USACE).

#### 3.3.7.3 Area of Work Coding (AREA)

Assign Work Area code to activities based upon the work area in which the activity occurs. Define work areas based on resource constraints or space constraints that would preclude a resource, such as a particular trade or craft work crew from working in more than one work area at a time due to restraints on resources or space. Examples of Work Area Coding include different areas within a floor of a building, different floors within a building, and different buildings within a complex of buildings. Activities cannot have more than one Work Area Code.

Not all activities are required to be Work Area coded. A lack of Work Area coding indicates the activity is not resource or space constrained.

#### 3.3.7.4 Modification Number (MODF)

Assign a Modification Number Code to any activity or sequence of activities added to the schedule as a result of a Contract Modification, when approved by Contracting Officer. Key all Code values to the Government's modification numbering system. An activity can have only one Modification Number Code.

#### 3.3.7.5 Bid Item Coding (BIDI)

Assign a Bid Item Code to all activities using the Contract Line Item Schedule (CLIN) to which the activity belongs, even when an activity is not cost loaded. An activity can have only one BIDI Code.

#### 3.3.7.6 Phase of Work Coding (PHAS)

Assign Phase of Work Code to all activities. Examples of phase of work are design phase, procurement phase and construction phase. Each activity can have only one Phase of Work code.

- a. Code proposed fast track design and construction phases proposed to allow filtering and organizing the schedule by fast track design and construction packages.
- b. If the contract specifies phasing with separately defined performance periods, identify a Phase Code to allow filtering and organizing the schedule accordingly.

#### 3.3.7.7 Category of Work Coding (CATW)

Assign a Category of Work Code to all activities. Category of Work Codes include, but are not limited to design, design submittal, design reviews, review conferences, permits, construction submittal, procurement, fabrication, weather sensitive installation, non-weather sensitive installation, start-up, and testing activities. Each activity can have no more than one Category of Work Code.

#### 3.3.7.8 Feature of Work Coding (FOW)

Assign a Feature of Work Code to appropriate activities based on the Definable Feature of Work to which the activity belongs based on the approved QC plan.

Definable Feature of Work is defined in Section 01 45 00.00 10 QUALITY CONTROL. An activity can have only one Feature of Work Code.

### 3.3.8 Contract Milestones and Constraints

Milestone activities are to be used for significant project events including, but not limited to, project phasing, project start and end activities, or interim completion dates. The use of artificial float constraints such as "zero free float" or "zero total float" are prohibited.

Mandatory constraints that ignore or effect network logic are prohibited. No constrained dates are allowed in the schedule other than those specified herein. Submit additional constraints to the Contracting Officer for approval on a case by case basis.

#### 3.3.8.1 Project Start Date Milestone and Constraint

The first activity in the project schedule must be a start milestone titled "NTP Acknowledged," which must have a "Start On" constraint date equal to the date that the NTP is acknowledged.

#### 3.3.8.2 End Project Finish Milestone and Constraint

The last activity in the schedule must be a finish milestone titled "End Project."

Constrain the project schedule to the Contract Completion Date in such a way that if the schedule calculates an early finish, then the float calculation for "End Project" milestone reflects positive float on the longest path. If the project schedule calculates a late finish, then the "End Project" milestone float calculation reflects negative float on the longest path. The Government is under no obligation to accelerate Government activities to support a Contractor's early completion.

#### 3.3.8.3 Interim Completion Dates and Constraints

Constrain contractually specified interim completion dates to show negative float when the calculated late finish date of the last activity in that phase is later than the specified interim completion date.

##### 3.3.8.3.1 Start Phase

Use a start milestone as the first activity for a project phase. Call the start milestone "Start Phase X" where "X" refers to the phase of work.

##### 3.3.8.3.2 End Phase

Use a finish milestone as the last activity for a project phase. Call the finish milestone "End Phase X" where "X" refers to the phase of work.

### 3.3.9 Calendars

Schedule activities on a Calendar to which the activity logically belongs. Develop calendars to accommodate any contract defined work period such as a 7-day calendar for Government Acceptance activities, concrete cure times, etc. Develop the default Calendar to match the physical work plan with non-work periods identified including weekends and holidays. Develop sSeasonal Calendar(s) and assign to seasonally affected

activities as applicable.

If an activity is weather sensitive it should be assigned to a calendar showing non-work days on a monthly basis, with the non-work days selected at random across the weeks of the calendar, using the anticipated adverse weather delay work days provided in Section 01 30 00.24 OTHER ADMINISTRATIVE AND SPECIAL REQUIREMENTS. Assign non-work days over a seven-day week as weather records are compiled on seven-day weeks, which may cause some of the weather related non-work days to fall on weekends.

#### 3.3.10 Open Ended Logic

Only two open ended activities are allowed: the first activity "NTP Acknowledged" may have no predecessor logic, and the last activity -"End Project" may have no successor logic.

Predecessor open ended logic may be allowed in a time impact analyses upon the Contracting Officer's approval.

#### 3.3.11 Default Progress Data Disallowed

Actual Start and Finish dates must not automatically update with default mechanisms included in the scheduling software. Updating of the percent complete and the remaining duration of any activity must be independent functions. Disable program features that calculate one of these parameters from the other. Activity Actual Start (AS) and Actual Finish (AF) dates assigned during the updating process must match those dates provided in the Contractor Quality Control Reports. Failure to document the AS and AF dates in the Daily Quality Control report will result in disapproval of the Contractor's schedule.

#### 3.3.12 Out-of-Sequence Progress

Activities that have progressed before all preceding logic has been satisfied (Out-of-Sequence Progress) will be allowed only on a case-by-case basis subject to approval by the Contracting Officer. Propose logic corrections to eliminate out of sequence progress or justify not changing the sequencing for approval prior to submitting an updated project schedule. Address out of sequence progress or logic changes in the Narrative Report and in the periodic schedule update meetings.

#### 3.3.13 Added and Deleted Activities

Do not delete activities from the project schedule or add new activities to the schedule without approval from the Contracting Officer. Activity ID and description changes are considered new activities and cannot be changed without Contracting Officer approval.

#### 3.3.14 Original Durations

Activity Original Durations (OD) must be reasonable to perform the work item. OD changes are prohibited unless justification is provided and approved by the Contracting Officer.

#### 3.3.15 Leads, Lags, and Start to Finish Relationships

Lags must be reasonable as determined by the Government and not used in place of realistic original durations, must not be in place to artificially absorb float, or to replace proper schedule logic.

- a. Leads (negative lags) are prohibited.
- b. Start to Finish (SF) relationships are prohibited.

#### 3.3.16 Retained Logic

Schedule calculations must retain the logic between predecessors and successors ("retained logic" mode) even when the successor activity(s) starts and the predecessor activity(s) has not finished (out-of-sequence progress). Software features that in effect sever the tie between predecessor and successor activities when the successor has started and the predecessor logic is not satisfied ("progress override") are not be allowed.

#### 3.3.17 Percent Complete

Update the percent complete for each activity started, based on the realistic assessment of earned value. Activities which are complete but for remaining minor punch list work and which do not restrain the initiation of successor activities may be declared 100 percent complete to allow for proper schedule management.

#### 3.3.18 Remaining Duration

Update the remaining duration for each activity based on the number of estimated work days it will take to complete the activity. Remaining duration may not mathematically correlate with percentage found under paragraph entitled Percent Complete.

#### 3.3.19 Cost Loading of Closeout Activities

Cost load the "Correction of punch list from Government pre-final inspection" activity(ies) not less than 1 percent of the present contract value. Activity(ies) may be declared 100 percent complete upon the Government's verification of completion and correction of all punch list work identified during Government pre-final inspection(s).

##### 3.3.19.1 As-Built Drawings

If there is no separate contract line item (CLIN) for as-built drawings, cost load the "Submission and approval of as-built drawings" activity not less than \$35,000 or 1 percent of the present contract value, whichever is greater, up to \$200,000. Activity will be declared 100 percent complete upon the Government's approval.

##### 3.3.19.2 O & M Manuals

Cost load the "Submission and approval of O & M manuals" activity not less than \$20,000. Activity will be declared 100 percent complete upon the Government's approval of all O & M manuals.

#### 3.3.20 Early Completion Schedule and the Right to Finish Early

An Early Completion Schedule is an Initial Project Schedule (IPS) that indicates all scope of the required contract work will be completed before the contractually required completion date.

- a. No IPS indicating an Early Completion will be accepted without being

fully resource-loaded (including crew sizes and manhours) and the Government agreeing that the schedule is reasonable and achievable.

- b. The Government is under no obligation to accelerate work items it is responsible for to ensure that the early completion is met nor is it responsible to modify incremental funding (if applicable) for the project to meet the contractor's accelerated work.

### 3.4 PROJECT SCHEDULE SUBMISSIONS

Provide the submissions as described below. The files, reports, and network diagrams required for each submission are contained in paragraph SUBMISSION REQUIREMENTS. If the Contractor fails or refuses to furnish the information and schedule updates as set forth herein, then the Contractor will be deemed not to have provided an estimate upon which a progress payment can be made.

Review comments made by the Government on the schedule(s) do not relieve the Contractor from compliance with requirements of the Contract Documents.

#### 3.4.1 Preliminary Project Schedule Submission

Within 15 calendar days after the NTP is acknowledged submit the Preliminary Project Schedule defining the planned operations detailed for the first 90 calendar days for approval. The approved Preliminary Project Schedule will be used for payment purposes not to exceed 90 calendar days after NTP. Completely cost load the Preliminary Project Schedule to balance the contract award CLINS shown on the Price Schedule. The Preliminary Project Schedule may be summary in nature for the remaining performance period. It must be early start and late finish constrained and logically tied as specified. The Preliminary Project Schedule forms the basis for the Initial Project Schedule specified herein and must include all of the required plan and program preparations, submissions and approvals identified in the contract (for example, Quality Control Plan, Safety Plan, and Environmental Protection Plan) as well as design activities, planned submissions of all early design packages, permitting activities, design review conference activities, and other non-construction activities intended to occur within the first 90 calendar days. Government acceptance of the associated design package(s) and all other specified Program and Plan approvals must occur prior to any planned construction activities. Activity code any activities that are summary in nature after the first 90 calendar days with Bid Item (CLIN) code (BIDI), Responsibility Code (RESP) and Feature of Work code (FOW).

#### 3.4.2 Initial Project Schedule Submission

Submit the Initial Project Schedule for approval within 42 calendar days after notice to proceed is issued. The schedule must demonstrate a reasonable and realistic sequence of activities which represent all work through the entire contract performance period. Include in the design-build schedule detailed design and permitting activities, including but not limited to identification of individual design packages, design submission, reviews and conferences; permit submissions and any required Government actions; and long lead item acquisition prior to design completion. Also cover in the initial design-build schedule the entire construction effort with as much detail as is known at the time but, as a minimum, include all construction start and completion milestones, and detailed construction activities through the dry-in milestone, including all activity coding and cost loading. Include the remaining construction,

including cost loading, but it may be scheduled summary in nature. As the design proceeds and design packages are developed, fully detail the remaining construction activities concurrent with the monthly schedule updating process. Constrain construction activities by Government acceptance of associated designs. When the design is complete, incorporate into the then approved schedule update all remaining detailed construction activities that are planned to occur after the dry-in milestone. No payment will be made for work items not fully detailed in the Project Schedule.

#### 3.4.2.1 Design Package Schedule Submission

With each design package submitted to the Government, submit a fragment schedule extracted from the then current Preliminary, Initial or Updated schedule which covers the activities associated with that Design Package including construction, procurement and permitting activities.

#### 3.4.3 Periodic Schedule Updates

Update the Project Schedule routinely at an interval approved by the Contracting Officer or designated representative. Provide a draft Periodic Schedule Update for review at the schedule update meetings as prescribed in the paragraph PERIODIC SCHEDULE UPDATE MEETINGS. These updates will enable the Government to assess Contractor's progress. Update the schedule to include detailed construction activities as the design progresses, but not later than the submission of the final un-reviewed design submission for each separate design package. The Contracting Officer may require submission of detailed schedule activities for any distinct construction that is started prior to submission of a final design submission if such activity is authorized.

- a. Update information including Actual Start Dates (AS), Actual Finish Dates (AF), Remaining Durations (RD), and Percent Complete is subject to the approval of the Government at the meeting.
- b. AS and AF dates must match the date(s) reported on the Contractor's Quality Control Report for an activity start or finish.

### 3.5 SUBMISSION REQUIREMENTS

Submit the following items for the Preliminary Schedule, Initial Schedule, and every Periodic Schedule Update throughout the life of the project:

#### 3.5.1 Submission

Submit the current project schedule, the narrative report and all required schedule reports electronically using the project submittal/transmittal process or by serialized letter. Each schedule must have a unique file name and use project specific settings.

#### 3.5.2 Narrative Report

Provide a Narrative Report with each schedule submission. The Narrative Report is expected to communicate to the Government the thorough analysis of the schedule output and the plans to compensate for any problems, either current or potential, which are revealed through that analysis. Include the following information as minimum in the Narrative Report:

- a. Identify and discuss the work scheduled to start in the next update

period.

- b. A description of activities along the two most critical paths where the total float is less than or equal to 20 work days.
- c. A description of current and anticipated problem areas or delaying factors and their impact and an explanation of corrective actions taken or required to be taken.
- d. Identify and explain why activities based on their calculated late dates should have either started or finished during the update period but did not.
- e. Identify and discuss all schedule changes by activity ID and activity name including what specifically was changed and why the change was needed. Include at a minimum new and deleted activities, logic changes, duration changes, calendar changes, lag changes, resource changes, and actual start and finish date changes.
- f. Identify and discuss out-of-sequence work.

### 3.5.3 Schedule Reports

The format, filtering, organizing and sorting for each schedule report will be as directed by the Contracting Officer or designated representative. Typically, reports contain Activity Numbers, Activity Description, Original Duration, Remaining Duration, Early Start Date, Early Finish Date, Late Start Date, Late Finish Date, Total Float, Actual Start Date, Actual Finish Date, and Percent Complete. Provide the reports electronically in .pdf format. The following reports are required for schedule submission reviews unless directed otherwise by the Contracting Officer.

#### 3.5.3.1 Activity Report

List of all activities sorted according to activity number.

#### 3.5.3.2 Logic Report

List of detailed predecessor and successor activities for every activity in ascending order by activity number.

#### 3.5.3.3 Total Float Report

A list of all incomplete activities sorted in ascending order of total float. List activities which have the same amount of total float in ascending order of Early Start Dates. Do not show completed activities on this report.

#### 3.5.3.4 Earnings Report by CLIN

A compilation of the Total Earnings on the project from the NTP to the data date, which reflects the earnings of activities based on the agreements made in the schedule update meeting defined herein. Provided a complete schedule update has been furnished, this report serves as the basis of determining progress payments. Group activities by CLIN number and sort by activity number. Provide a total CLIN percent earned value, CLIN percent complete, and project percent complete. The printed report must contain the following for each activity: the Activity Number,



Activity Description, Original Budgeted Amount, Earnings to Date, Earnings this period, Total Quantity, Quantity to Date, and Percent Complete (based on cost).

#### 3.5.3.5 Schedule Log

Provide a Scheduling/Leveling Report generated from the current project schedule being submitted.

#### 3.5.3.6 Critical Path

Provide an Adobe .pdf report showing the critical path.

#### 3.5.4 Network Diagram

The Network Diagram is required for the Preliminary, Initial and Periodic Updates. Depict and display the order and interdependence of activities and the sequence in which the work is to be accomplished. The Contracting Officer will use, but is not limited to, the following conditions to review compliance with this paragraph:

##### 3.5.4.1 Continuous Flow

Show a continuous flow from left to right with no arrows from right to left. Show the activity number, description, duration, and estimated earned value on the diagram.

##### 3.5.4.2 Project Milestone Dates

Show dates on the diagram for start of project, any contract required interim completion dates, and contract completion dates.

##### 3.5.4.3 Critical Path

Show all activities on the critical path. The critical path is defined as the longest path.

##### 3.5.4.4 Banding

Organize activities using the WBS or as otherwise directed to assist in the understanding of the activity sequence. Typically, this flow will group activities by major elements of work, category of work, work area and/or responsibility.

##### 3.5.4.5 Cash Flow / Schedule Variance Control (SVC) Diagram

With each schedule submission, provide a SVC diagram showing 1) Cash Flow S-Curves indicating planned project cost based on projected early and late activity finish dates, and 2) Earned Value to-date.

#### 3.6 PERIODIC SCHEDULE UPDATE

##### 3.6.1 Periodic Schedule Update Meetings

Conduct periodic schedule update meetings for the purpose of reviewing the proposed percent complete, Periodic Schedule Update, Narrative Report, Schedule Reports, and progress payment. Conduct meetings at least monthly and within five days of the proposed schedule data date. The Contractor may be requested to provide a computer with the scheduling software loaded

and a projector which allows all meeting participants to view the proposed schedule during the meeting. The Contractor's authorized scheduler must organize, group, sort, filter, perform schedule revisions as needed and review functions as requested by the Contractor and/or Government. The meeting is a working interactive exchange which allows the Government and Contractor the opportunity to review the updated schedule on a real time and interactive basis. The meeting will last no longer than 8 hours. The Contractor's Project Manager and scheduler must attend the meeting with the authorized representative of the Contracting Officer. Superintendents, foremen and major subcontractors must attend the meeting as required to discuss the project schedule and work. Following the periodic schedule update meeting, make updates to the draft submission. Include only those items approved by the Government in the submission. Upon Government approval of the schedule submission, submit an invoice for payment.

### 3.6.2 Update Submission Following Progress Meeting

Submit the complete Periodic Schedule Update of the Project Schedule containing all approved progress, revisions, and adjustments, pursuant to paragraph SUBMISSION REQUIREMENTS not later than 4 work days after the periodic schedule update meeting.

### 3.7 WEEKLY PROGRESS MEETINGS

Conduct a weekly meeting with the Government (or as otherwise mutually agreed to) between the meetings described in paragraph entitled PERIODIC SCHEDULE UPDATE MEETINGS for the purpose of jointly reviewing the actual progress of the project as compared to the as planned progress and to review planned activities for the upcoming two weeks. Use the current approved schedule update for the purposes of this meeting and for the production and review of reports. At the weekly progress meeting, address the status of RFIs, RFPs and Submittals.

### 3.8 REQUESTS FOR TIME EXTENSIONS

Provide a justification of delay to the Contracting Officer in accordance with the contract provisions and clauses for approval within 10 days of a delay occurring. Also prepare a time impact analysis for each Government request for proposal (RFP)/ All time impact analysis must be resource loaded and to the same level of detail as the schedule.

#### 3.8.1 Justification of Delay

Provide a description of the event(s) that caused the delay and/or impact to the work. As part of the description, identify all schedule activities impacted. Show that the event that caused the delay/impact was the responsibility of the Government. Provide a time impact analysis that demonstrates the effects of the delay or impact on the project completion date or interim completion date(s). Evaluate multiple impacts chronologically; each with its own justification of delay. With multiple impacts consider any concurrency of delay. A time extension and the schedule fragment becomes part of the project schedule and all future schedule updates upon approval by the Contracting Officer.

#### 3.8.2 Time Impact Analysis (Prospective Analysis)

Prepare a time impact analysis for approval by the Contracting Officer based on industry standard AACE 52R-06. Utilize a copy of the last

approved schedule prior to the first day of the impact or delay for the time impact analysis. If Contracting Officer determines the time frame between the last approved schedule and the first day of impact is too great, prepare an interim updated schedule to perform the time impact analysis. Unless approved by the Contracting Officer, no other changes may be incorporated into the schedule being used to justify the time impact.

### 3.8.3 Forensic Schedule Analysis (Retrospective Analysis)

Prepare an analysis for approval by the Contracting Officer based on industry standard AACE 29R-03.

### 3.8.4 Fragmentary Network (Fragnet)

Prepare a proposed fragnet for time impact analysis consisting of a sequence of new activities that are proposed to be added to the project schedule to demonstrate the influence of the delay or impact to the project's contractual dates. Clearly show how the proposed fragnet is to be tied into the project schedule including all predecessors and successors to the fragnet activities. The proposed fragnet must be approved by the Contracting Officer prior to incorporation into the project schedule.

### 3.8.5 Time Extension

The Contracting Officer must approve the Justification of Delay including the time impact analysis before a time extension will be granted. No time extension will be granted unless the delay consumes all available Project Float and extends the projected finish date ("End Project" milestone) beyond the Contract Completion Date. The time extension will be in calendar days.

Actual delays that are found to be caused by the Contractor's own actions, which result in a calculated schedule delay will not be a cause for an extension to the performance period, completion date, or any interim milestone date.

### 3.8.6 Impact to Early Completion Schedule

No extended overhead will be paid for delay prior to the original Contract Completion Date for an Early Completion IPS unless the Contractor actually performed work in accordance with that Early Completion Schedule. The Contractor must show that an early completion was achievable had it not been for the impact.

## 3.9 FAILURE TO ACHIEVE PROGRESS

Should the progress fall behind the approved project schedule for reasons other than those that are excusable within the terms of the contract, the Contracting Officer may require provision of a written recovery plan for approval. The plan must detail how progress will be made-up to include which activities will be accelerated by adding additional crews, longer work hours, extra work days, etc.

### 3.9.1 Artificially Improving Progress

Artificially improving progress by means such as, but not limited to, revising the schedule logic, modifying or adding constraints, shortening

activity durations, or changing calendars in the project schedule is prohibited. Indicate assumptions made and the basis for any logic, constraint, duration and calendar changes used in the creation of the recovery plan. Any additional resources, manpower, or daily and weekly work hour changes proposed in the recovery plan must be evident at the work site and documented in the daily report along with the Schedule Narrative Report.

### 3.9.2 Failure to Perform

Failure to perform work and maintain progress in accordance with the supplemental recovery plan may result in an interim and final unsatisfactory performance rating and may result in corrective action directed by the Contracting Officer pursuant to FAR 52.236-15 Schedules for Construction Contracts, FAR 52.249-10 Default (Fixed-Price Construction), and other contract provisions.

### 3.9.3 Recovery Schedule

Should the Contracting Officer find it necessary, submit a recovery schedule pursuant to FAR 52.236-15 Schedules for Construction Contracts.

### 3.10 OWNERSHIP OF FLOAT

Except for the provision given in the paragraph IMPACT TO EARLY COMPLETION SCHEDULE, float available in the schedule, at any time, may not be considered for the exclusive use of either the Government or the Contractor including activity and/or project float. Activity float is the number of work days that an activity can be delayed without causing a delay to the "End Project" finish milestone. Project float (if applicable) is the number of work days between the projected early finish and the contract completion date milestone.

### 3.11 TRANSFER OF SCHEDULE DATA INTO RMS

Once the schedule is approved by the Government via submittal or serialized letter, upload the schedule data (SDEF) into the Resident Management System - Contractor Module (RMS CM) unless directed otherwise by the Contracting Officer. The contractor will then create the invoice and complete the Prompt Payment certificate and submit to the Government. After this is complete, create the invoice, complete the Prompt Payment certificate and submit to the Government. This data is considered to be additional supporting data in a form and detail required by the Contracting Officer pursuant to FAR 52.232-5 Payments under Fixed-Price Construction Contracts and FAR 52.232-27 Prompt Payment for Construction Contracts.

### 3.12 PRIMAVERA P6 MANDATORY REQUIREMENTS

The following settings are mandatory and required in all schedule submissions to the Government, if Primavera P6 is used:

- a. Activity Codes must be Project Level, not Global or EPS level.
- b. Calendars must be Project Level, not Global or Resource level.
- c. Activity Duration Types must be set to "Fixed Duration & Units".
- d. Percent Complete Types must be set to "Physical".

- e. Time Period Admin Preferences must remain the default "8.0 hr/day, 40 hr/week, 172 hr/month, 2000 hr/year". Set Calendar Work Hours/Day to 8.0 Hour days.
- f. Set Schedule Option for defining Critical Activities to "Longest Path".
- g. Set Schedule Option for defining progressed activities to "Retained Logic".
- h. Set up cost loading using a single lump sum labor resource. The Price/Unit must be \$1/hr, Default Units/Time must be "8h/d", and settings "Auto Compute Actuals" and "Calculate costs from units" selected.
- i. Activity ID's must not exceed 10 characters.
- j. Activity Names must have the most defining and detailed description within the first 30 characters.

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## SECTION 01 33 00

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**08/18, OMH 02/2021**

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## SECTION 01 33 00

SUBMITTAL PROCEDURES  
08/18, OMH 02/2021

## PART 1 GENERAL

## 1.1 SUMMARY

## 1.1.1 Submittal Information

The Contractor is responsible for total management of their work including, but not limited to, approval, scheduling, control, certification of all submittals and compliance with all applicable Buy-American and Trade Agreement clauses. The submittal management system provided in these specifications is intended to be a complete system for the Contractor to use to control the quality of materials, equipment and workmanship provided by manufacturers, fabricators, suppliers and subcontractors. Review each submittal for contract compliance.

**Compliance with all applicable Buy American and Trade Agreement Clauses is to be included in this review. The Contractor must provide the country of origin on ENG Form 4025 for each item submitted.** The Submittal Register (ENG Form 4288) will be utilized to log and monitor all submittal activities.

The Contracting Officer may request submittals, in addition to those specified, when deemed necessary to adequately describe the work covered in the respective sections. Each submittal is to be complete and in sufficient detail to allow ready determination of compliance with contract requirements.

Units of weights and measures used on all submittals are to be the same as those used in the contract drawings.

## 1.1.2 Project Type

The Contractor and the Designer of Record (DOR), if applicable, are to check and approve all items before submittal and stamp, sign, and date indicating action taken. Clearly identify proposed deviations from the contract requirements. Include within submittals items such as: Contractor's, manufacturer's, or fabricator's drawings; descriptive literature including (but not limited to) catalog cuts, diagrams, operating charts or curves; test reports; test cylinders; samples; O&M manuals (including parts list); certifications; warranties; and other such required items.

## 1.1.3 Submission of Submittals

Schedule and provide submittals requiring Government approval, after notice to proceed (NTP). Provide ample lead time to ensure the submittal's processing by the Government and any lead time needed by the manufacturer upon ordering after approval. Dispose of samples not incorporated into the work in accordance with manufacturer's Safety Data Sheets (SDS) and in compliance with existing laws and regulations.

## 1.2 DEFINITIONS

### 1.2.1 Submittal Descriptions (SD)

Submittal requirements are specified in the technical sections. Examples and descriptions of submittals identified by the Submittal Description (SD) numbers and titles follow:

#### SD-01 Preconstruction Submittals

Submittals that are required prior to or at the start of construction (work) or the next major phase of the construction on a multiphase contract.

Preconstruction Submittals include schedules and a tabular list of locations, features, and other pertinent information regarding products, materials, equipment, or components to be used in the work.

The Government reserves the right to handle pre-construction submittals (listed below) as administrative submittals via a Serial Letter, as directed by the Project, Area or Resident Office. When directed by the Project, Area or Resident Office (as directed), submit administrative submittals for acceptance by the Government. Format for the Serial Letter will be as directed by the Project, Area or Resident Office.

Certificates Of Insurance

Surety Bonds

List Of Proposed Subcontractors

List Of Proposed Products

Baseline Network Analysis Schedule (NAS)

Submittal Register

Schedule Of Prices Or Earned Value Report

Accident Prevention Plan

Work Plan

Quality Control (QC) plan

Permits

Environmental Protection Plan

#### SD-02 Shop Drawings

Drawings, diagrams and schedules specifically prepared to illustrate some portion of the work.

Diagrams and instructions from a manufacturer or fabricator for use in producing the product and as aids to the Contractor for integrating the product or system into the project.

Drawings prepared by or for the Contractor to show how multiple systems and interdisciplinary work will be coordinated.

#### SD-03 Product Data

Catalog cuts, illustrations, schedules, diagrams, performance charts, instructions and brochures illustrating size, physical appearance and other characteristics of materials, systems or equipment for some portion of the work.

Samples of warranty language when the contract requires extended product warranties.

#### SD-04 Samples

Fabricated or unfabricated physical examples of materials, equipment or workmanship that illustrate functional and aesthetic characteristics of a material or product and establish standards by which the work can be judged.

Color samples from the manufacturer's standard line (or custom color samples if specified) to be used in selecting or approving colors for the project.

Field samples and mock-ups constructed on the project site establish standards ensuring work can be judged. Includes assemblies or portions of assemblies that are to be incorporated into the project and those that will be removed at conclusion of the work.

#### SD-05 Design Data

Design calculations, mix designs, analyses or other data pertaining to a part of work.

Design submittals, design substantiation submittals and extensions of design submittals.

#### SD-06 Test Reports

Report signed by authorized official of testing laboratory that a material, product or system identical to the material, product or system to be provided has been tested in accord with specified requirements. Unless specified in another section, testing must have been within three years of date of contract award for the project.

Report that includes findings of a test required to be performed on an actual portion of the work or prototype prepared for the project before shipment to job site.

Report that includes finding of a test made at the job site or on sample taken from the job site, on portion of work during or after installation.

Investigation reports

Daily logs and checklists

Final acceptance test and operational test procedure

## SD-07 Certificates

Statements printed on the manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that the product, system, or material meets specification requirements. Must be dated after award of project contract and clearly name the project.

Document required of Contractor, or of a manufacturer, supplier, installer or Subcontractor through Contractor. The document purpose is to further promote the orderly progression of a portion of the work by documenting procedures, acceptability of methods, or personnel qualifications.

Confined space entry permits

Text of posted operating instructions

## SD-08 Manufacturer's Instructions

Preprinted material describing installation of a product, system or material, including special notices and (SDS) concerning impedances, hazards and safety precautions.

## SD-09 Manufacturer's Field Reports

Documentation of the testing and verification actions taken by manufacturer's representative at the job site, in the vicinity of the job site, or on a sample taken from the job site, on a portion of the work, during or after installation, to confirm compliance with manufacturer's standards or instructions. The documentation must be signed by an authorized official of a testing laboratory or agency and state the test results; and indicate whether the material, product, or system has passed or failed the test.

Factory test reports.

## SD-10 Operation and Maintenance Data

Data provided by the manufacturer, or the system provider, including manufacturer's help and product line documentation, necessary to maintain and install equipment, for operating and maintenance use by facility personnel.

Data required by operating and maintenance personnel for the safe and efficient operation, maintenance and repair of the item.

Data incorporated in an operations and maintenance manual or control system.

## SD-11 Closeout Submittals

Documentation to record compliance with technical or administrative requirements or to establish an administrative mechanism.

Submittals required for Guiding Principle Validation (GPV) or Third Party Certification (TPC).

Special requirements necessary to properly close out a construction

contract. For example, Record Drawings and as-built drawings. Also, submittal requirements necessary to properly close out a major phase of construction on a multi-phase contract.

#### 1.2.2 Approving Authority

Office or designated person authorized to approve the submittal.

#### 1.2.3 Work

As used in this section, on-site and off-site construction required by contract documents, including labor necessary to produce submittals, construction, materials, products, equipment, and systems incorporated or to be incorporated in such construction. In exception, excludes work to produce SD-01 submittals.

### 1.3 SUBMITTALS

Unless directed otherwise or Government approval is required, all design submittals require Government Conformance Review "CR" after Designer of Record and Contractor review and approval. All submittals including "For Information Only" (FIO) submittals require approval by the Contractors Quality Control System Manager (CQCSM). The Government reserves the right during design review to provide comments to remove or add submittals which require Government review.

See paragraph Contractor Action Codes below.

The Designer of Record is to revise "G" designated submittals to "D" designated submittals in edited Unified Facilities Guide Specifications (UFGS), unless directed by COR to leave as "G" or use "A" for DOR approval and Government Approval (DA/GA) or "R" for DOR Approval and Government Conformance Review (DA/CR) designations.

Government approval is required for submittals with a "G" designation; Designer of Record Approval is required for submittals with a "D", "A" or "R" designations; submittals not having any designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with this section. When directed by the Government, the submittal register may be submitted via Section of 01 45 00.15 10 RESIDENTIAL MANAGMENT SYSTEM CONTRACTOR MODE (RMS-CM) in lieu of the copy attached to this section. SpecsIntact is the software system used by Government to generate the Submittal Register that is loaded into RMS-CM.

#### SD-01 Preconstruction Submittals

Submittal Register; G-R0

## 1.3.1 Action Codes

## 1.3.1.1 Contractor Action Codes

DESIGN BUILD SUBMITTALS			
Submittal Classifications to be shown in UFGS Sections	Submittal Classification	Corresponding SpecsIntact Submittal Register Code which is populated in the SI Submittal Register. Software Limitations: (The software shows one character delineation in the SpecsIntact Submittal Register)	RMS - The following Submittal Classifications are populated in RMS when the SpecsIntact Submittal Data File is pulled into RMS)
G	Submittal requires Government Approval	G	GA
BLANK	Submittal is For Information Only(FIO)	BLANK	FIO
D	Submittal requires Designer of Record Approval	D	DA
C	Submittal requires Government Conformance Review	C	CR
R	Submittal requires Designer of Record Approval and Government Conformance Review	R	DA/CR
A	Submittal requires Designer of Record Approval and Government Approval	A	DA/GA

Use Submittal Register Code "R" or "A" only when directed by the Contracting Officer.

#### 1.4 DESIGN SUBMITTAL PACKAGES

Design submittal documents include construction drawings, specifications, design analysis, and other design deliverables. Provide specifications in sufficient detail to fully describe and demonstrate the quality of materials, the installation and performance of equipment, and the quality of workmanship. Comply with manufacturer's recommendations, unless indicated otherwise in RFP Technical Requirements for detailing and installation of all equipment and materials. Provide a design analysis for each design discipline of work and include all features with the necessary calculations, tables, methods, and sources used in determining equipment and material sizes and capacities, and provide sufficient information to support the design. Provide design submittal requirements in accordance with Sections 01 33 00.32 DESIGN AND CONSTRUCTION DELIVERABLES/PROCEDURES and 01 30 00.24 OTHER ADMINISTRATIVE AND SPECIAL REQUIREMENTS.

Submit electronic design deliverables (i.e. drawings, specification, submittal register, design analysis) in Adobe Acrobat latest version.pdf file format, and include bookmarks for each design deliverable. Enable text to be searchable in all submitted files. Generally, list design submittals under SD-05 Design Data.

#### 1.5 CLOSEOUT FINAL REPORT AND AS-BUILT/RECORD DRAWINGS

This includes both a draft and corrected final report. The report will contain a chronological outline of construction activities and required site documentation (i.e. All Issued for Construction Design Documents, Construction Submittals, Administrative Plans & QC Documents, Davis-Bacon, Final/Signed DD 1354's, O&M Manuals, Warranty Manuals, As-Built Drawings, Training/Demonstration Videos, Pre-final/Final Test/Inspection Reports to include punch-list and sign-in sheet, SF-30 signed modifications, RFI's, payments, Beneficial Occupancy letter & Memorandum, photos, KO Acceptance letter, and other items as directed by the Contracting Officer). Provide Closeout Final Report in electronic Adobe Acrobat format with bookmarks or as directed by Contracting Officer. See Section 01 33 39.00 10 ADVANCED MODELING (BIM/CIM/GIS/CAD) REQUIREMENTS for additional requirements.

#### 1.6 SUBMITTAL CLASSIFICATION

##### 1.6.1 Government Approved (G)

Government approval is required for any variations from the Solicitation or the Accepted Proposal and for other items as designated by the Government.

Within the terms of the Contract Clause SPECIFICATIONS AND DRAWINGS FOR CONSTRUCTION, submittals are considered to be "shop drawings."

##### 1.6.2 Design-Build Submittal Classifications

###### 1.6.2.1 Designer of Record Approved (DA)

Designer of Record (DOR) approval is required for extensions of design; critical materials; any variations from the Solicitation, the Accepted Proposal, or the completed design requires either DA/CR or DA/GA approvals/reviews; equipment whose compatibility with the entire system must be checked; and other items as designated by the Contracting Officer. Provide the Government electronic copies designated hereinafter of all DOR approved submittals, unless directed otherwise. The Government

may review any or all Designer of Record approved submittals for conformance with the Solicitation, the Accepted Proposal, and the completed design. The Government will review all submittals designated as varying from the Solicitation or Accepted Proposal, as described below.

#### 1.6.2.2 Government Conformance Review of Design (CR)

The Government will review all intermediate and final design submittals for conformance with the technical requirements of the Solicitation. Section 01 33 00.32 DESIGN AND CONSTRUCTION DELIVERABLES/PROCEDURES covers the design submittal and review process in detail. Review will be only for conformance with the applicable codes, standards, and contract requirements. Design data includes the design documents described in Section 01 33 00.32 DESIGN AND CONSTRUCTION DELIVERABLES/PROCEDURES.

#### 1.6.2.3 Designer of Record Approved/Government Conformance Review (DA/CR)

##### 1.6.2.3.1 Variations from the Accepted Design

DOR approval and the Government's conformance review are required for any proposed variation from the accepted design to ensure compliance with the contract. The Contractor and the DOR may discuss with the Contracting Officer's Representative a potential submittal that would propose a variation. However, the Government reserves the right to review the official submittal before providing an opinion. In any case, the Government will not formally agree to or provide a preliminary opinion on any variation without the DOR's approval or recommended approval. The Government reserves the right to reject any design, variation that may affect furniture, furnishings, equipment selections, or operational decisions that were made, based on the reviewed and accepted design.

##### 1.6.2.3.2 Substitutions

In order to make a substitution for a "named" product, submit the details of the requested substitution for Government acceptance. The "named" product for the the accepted proposal could be identified by system, material, manufacturer, brand name, model number, or other specific identifier. Based on the submittal, the DOR must confirm and document that the substitution meets the contract requirements and is equal in function, performance, quality, and salient features to the "named" product. If the contract otherwise prohibits substitutions of equal named products, systems, materials or equipment by manufacturer, brand name, model number or other specific identification, the request is considered a "variation" to the contract. Variations are discussed below in paragraphs: "DESIGNER OF RECORD APPROVED/GOVERNMENT APPROVED" and VARIATIONS.

#### 1.6.2.4 Designer of Record Approved/Government Approved (DA/GA)

Both DOR and Government Approval and, where applicable, a contract modification are required before the Contractor is authorized to proceed with any proposed variation to the contract (the Solicitation or the Accepted Proposal), that constitutes a change to the contract terms. The Government reserves the right to accept or reject any such proposed variation.

#### 1.6.3 For Information Only

Submittals not requiring Government approval will be for information



only. For Design-build construction all submittals not requiring DOR or Government approval will be for information only. Within the terms of the Contract Clause SPECIFICATIONS AND DRAWINGS FOR CONSTRUCTION, they are not considered to be "shop drawings."

#### 1.6.4 Sustainability Reporting Submittals

Sustainability reporting submittals are as specified in Section 01 33 29 SUSTAINABILITY REQUIREMENTS AND REPORTING.

Schedule submittals for these items throughout the course of construction as provided; do not wait until closeout.

### 1.7 PREPARATION

#### 1.7.1 Transmittal Form

Use the ENG Form 4025 transmittal form for submitting both Government-approved and information-only submittals. Submit in accordance with the instructions on the reverse side of the form. These forms are included in the RMS CM software that the Contractor is required to use for this contract. Properly complete this form by filling out all the heading blank spaces and identifying each item submitted. If there are multiple Item numbers listed on a particular ENG Form 4025 submittal, combine all submitted items for review into a single Adobe file with bookmarks (for ease of review). Exercise special care to ensure proper listing of the specification paragraph and sheet number of the contract drawings pertinent to the data submitted for each item.

#### 1.7.2 Submittal Format

##### 1.7.2.1 Format of SD-01 Preconstruction Submittals

When the submittal includes a document that is to be used in the project, or is to become part of the project record, other than as a submittal, do not apply the Contractor's approval stamp to the document itself, but to a separate sheet accompanying the document.

Provide data in the unit of measure used in the contract documents.

##### 1.7.2.2 Format for SD-02 Shop Drawings

Provide shop drawings not less than 8 1/2 by 11 inches nor more than 30 by 42 inches, except for full-size patterns or templates. Prepare drawings to accurate size, with scale indicated, unless another form is required. Ensure drawings are suitable for reproduction and of a quality to produce clear, distinct lines and letters, with dark lines on a white background.

- a. Include the nameplate data, size, and capacity on drawings. Also include applicable federal, military, industry, and technical society publication references.
- b. Dimension drawings, except diagrams and schematic drawings. Prepare drawings demonstrating interface with other trades to scale. Use the same unit of measure for shop drawings as indicated on the contract drawings. Identify materials and products for work shown.

Submit an electronic copy of drawings in PDF format.

#### 1.7.2.2.1 Drawing Identification

Include on each drawing the drawing title, number, date, and revision numbers and dates, in addition to information required in paragraph IDENTIFYING SUBMITTALS.

Number drawings in a logical sequence. Each drawing is to bear the number of the submittal in a uniform location next to the title block. Place the Government contract number in the margin, immediately below the title block, for each drawing.

#### 1.7.2.3 Format of SD-03 Product Data

Present product data submittals for each section. Include a table of contents, listing the page and catalog item numbers for product data.

Indicate, by prominent notation, each product that is being submitted; indicate the specification section number and paragraph number to which it pertains.

##### 1.7.2.3.1 Product Information

Supplement product data with material prepared for the project to satisfy the submittal requirements where product data does not exist. Identify this material as developed specifically for the project, with information and format as required for submission of SD-07 Certificates.

Provide product data in units used in the Contract documents. Where product data are included in preprinted catalogs with another unit, submit the dimensions in contract document units, on a separate sheet.

##### 1.7.2.3.2 Standards

Where equipment or materials are specified to conform to industry or technical-society reference standards of such organizations as the American National Standards Institute (ANSI), ASTM International (ASTM), National Electrical Manufacturer's Association (NEMA), Underwriters Laboratories (UL), or Association of Edison Illuminating Companies (AEIC), submit proof of such compliance. The label or listing by the specified organization will be acceptable evidence of compliance. In lieu of the label or listing, submit a certificate from an independent testing organization, competent to perform testing, and approved by the Contracting Officer. State on the certificate that the item has been tested in accordance with the specified organization's test methods and that the item complies with the specified organization's reference standard.

##### 1.7.2.3.3 Data Submission

Collect required data submittals for each specific material, product, unit of work, or system into a single submittal that is marked for choices, options, and portions applicable to the submittal. Mark each copy of the product data identically. Partial submittals will not be accepted for expedition of the construction effort.

Submit the manufacturer's instructions before installation.

#### 1.7.2.4 Format of SD-04 Samples

##### 1.7.2.4.1 Sample Characteristics

Furnish samples in the following sizes, unless otherwise specified or unless the manufacturer has prepackaged samples of approximately the same size as specified:

- a. Sample of Equipment or Device: Full size.
- b. Sample of Materials Less Than 2 by 3 inches: Built up to 8 1/2 by 11 inches.
- c. Sample of Materials Exceeding 8 1/2 by 11 inches: Cut down to 8 1/2 by 11 inches and adequate to indicate color, texture, and material variations.
- d. Sample of Linear Devices or Materials: 10 inch length or length to be supplied, if less than 10 inches. Examples of linear devices or materials are conduit and handrails.
- e. Sample Volume of Nonsolid Materials: Pint. Examples of nonsolid materials are sand and paint.
- f. Color Selection Samples: 2 by 4 inches. Where samples are specified for selection of color, finish, pattern, or texture, submit the full set of available choices for the material or product specified. Sizes and quantities of samples are to represent their respective standard unit.
- g. Sample Panel: 4 by 4 feet.
- h. Sample Installation: 100 square feet.

##### 1.7.2.4.2 Sample Incorporation

Reusable Samples: Incorporate returned samples into work only if so specified or indicated. Incorporated samples are to be in undamaged condition at the time of use.

Recording of Sample Installation: Note and preserve the notation of any area constituting a sample installation, but remove the notation at the final clean-up of the project.

##### 1.7.2.4.3 Comparison Sample

Samples Showing Range of Variation: Where variations in color, finish, pattern, or texture are unavoidable due to nature of the materials, submit sets of samples of not less than three units showing extremes and middle of range. Mark each unit to describe its relation to the range of the variation.

When color, texture, or pattern is specified by naming a particular manufacturer and style, include one sample of that manufacturer and style, for comparison.

#### 1.7.2.5 Format of SD-05 Design Data

Provide design data and certificates on 8 1/2 by 11 inch page size.

#### 1.7.2.6 Format of SD-06 Test Reports

By prominent notation, indicate each report in the submittal. Indicate the specification number and paragraph number to which each report pertains.

#### 1.7.2.7 Format of SD-07 Certificates

Provide design data and certificates on 8 1/2 by 11 inch page size.

#### 1.7.2.8 Format of SD-08 Manufacturer's Instructions

Present manufacturer's instructions submittals for each section. Include the manufacturer's name, trade name, place of manufacture, and catalog model or number on product data. Also include applicable federal, military, industry, and technical-society publication references. If supplemental information is needed to clarify the manufacturer's data, submit it as specified for SD-07 Certificates.

Submit the manufacturer's instructions before installation.

##### 1.7.2.8.1 Standards

Where equipment or materials are specified to conform to industry or technical-society reference standards of such organizations as the American National Standards Institute (ANSI), ASTM International (ASTM), National Electrical Manufacturer's Association (NEMA), Underwriters Laboratories (UL), or Association of Edison Illuminating Companies (AEIC), submit proof of such compliance. The label or listing by the specified organization will be acceptable evidence of compliance. In lieu of the label or listing, submit a certificate from an independent testing organization, competent to perform testing, and approved by the Contracting Officer. State on the certificate that the item has been tested in accordance with the specified organization's test methods and that the item complies with the specified organization's reference standard.

#### 1.7.2.9 Format of SD-09 Manufacturer's Field Reports

By prominent notation, indicate each report in the submittal. Indicate the specification number and paragraph number to which each report pertains.

#### 1.7.2.10 Format of SD-10 Operation and Maintenance Data (O&M)

Comply with the requirements specified in Section 01 78 23 OPERATION AND MAINTENANCE DATA for O&M Data format.

#### 1.7.2.11 Format of SD-11 Closeout Submittals

When the submittal includes a document that is to be used in the project or is to become part of the project record, other than as a submittal, do not apply the Contractor's approval stamp to the document itself, but to a separate sheet accompanying the document.

Provide data in the unit of measure used in the contract documents.

### 1.7.3 Source Drawings for Shop Drawings

#### 1.7.3.1 Source Drawings

The entire set of source drawing files (DWG or DGN) will not be provided to the Contractor. Request the specific Drawing Number for the preparation of shop drawings. Only those drawings requested to prepare shop drawings will be provided. These drawings are provided only after award.

#### 1.7.3.2 Terms and Conditions

Data contained on these electronic files must not be used for any purpose other than as a convenience in the preparation of construction data for the referenced project. Any other use or reuse is at the sole risk of the Contractor and without liability or legal exposure to the Government. The Contractor must make no claim, and waives to the fullest extent permitted by law any claim or cause of action of any nature against the Government, its agents, or its subconsultants that may arise out of or in connection with the use of these electronic files. The Contractor must, to the fullest extent permitted by law, indemnify and hold the Government harmless against all damages, liabilities, or costs, including reasonable attorney's fees and defense costs, arising out of or resulting from the use of these electronic files.

These electronic source drawing files are not construction documents. Differences may exist between the source drawing files and the corresponding construction documents. The Government makes no representation regarding the accuracy or completeness of the electronic source drawing files, nor does it make representation to the compatibility of these files with the Contractor hardware or software. The Contractor is responsible for determining if any conflict exists. In the event that a conflict arises between the signed and sealed construction documents prepared by the Government and the furnished source drawing files, the signed and sealed construction documents govern. Use of these source drawing files does not relieve the Contractor of the duty to fully comply with the contract documents, including and without limitation the need to check, confirm and coordinate the work of all contractors for the project. If the Contractor uses, duplicates or modifies these electronic source drawing files for use in producing construction data related to this contract, remove all previous indication of ownership (seals, logos, signatures, initials and dates).

#### 1.7.4 Electronic File Format

Provide submittals in electronic format, with the exception of material samples required for SD-04 Samples items. Compile the submittal file as a single, complete document, to include the Transmittal Form described within. Name the electronic submittal file specifically according to its contents, and coordinate the file naming convention with the Contracting Officer. Electronic files must be of sufficient quality that all information is legible. Use PDF as the electronic format, unless otherwise specified or directed by the Contracting Officer. All documents must make use of optical character recognition (OCR) routines to make text searchable and selectable, so that the text can be copied. Index and bookmark files exceeding 30 pages to allow efficient navigation of the file. When required, the electronic file must include a valid electronic signature.

E-mail electronic submittal documents smaller than 10MB to an e-mail address as directed by the Contracting Officer, unless directed otherwise by COR. Provide electronic documents over 10 MB on an optical disc or through an electronic file sharing system, such as secure ftp site or DoD SAFE located at the following website: <https://safe.apps.mil/>. Use of the Government web application must be initiated by the Government, unless Contractor has a Government CAC card. This Government web application restricts the number of days files are available to download.

#### 1.8 QUANTITY OF SUBMITTALS

Submittals are to be transmitted electronically, unless directed otherwise.

##### 1.8.1 Number of SD-04 Samples

- a. Submit two samples, or two sets of samples showing the range of variation, of each required item. One approved sample or set of samples will be retained by the approving authority and one will be returned to the Contractor.
- b. Submit one sample panel or provide one sample installation where directed. Include components listed in the technical section or as directed.
- c. Submit one sample installation, where directed.
- d. Submit one sample of nonsolid materials.

#### 1.9 INFORMATION ONLY SUBMITTALS

Submittals without an action code must be certified by the QC manager and submitted to the Contracting Officer for information-only. Approval of the Contracting Officer is not required on information only submittals. The Contracting Officer will mark "receipt acknowledged" on submittals for information and will return only the transmittal cover sheet to the Contractor. Normally, submittals for information only will not be returned. However, the Government reserves the right to return unsatisfactory submittals and require the Contractor to resubmit any item found not to comply with the contract. This does not relieve the Contractor from the obligation to furnish material conforming to the plans and specifications; will not prevent the Contracting Officer from requiring removal and replacement of nonconforming material incorporated in the work; and does not relieve the Contractor of the requirement to furnish samples for testing by the Government laboratory or for check testing by the Government in those instances where the technical specifications so prescribe. For Design-Build construction, the Government will retain electronic copies of information-only submittals.

#### 1.10 PROJECT SUBMITTAL REGISTER

A sample Project Submittal Register showing submittals required by the specifications is attached to this section as "Project Submittal Register."

##### 1.10.1 Submittal Management

Prepare and maintain a submittal register, as the work progresses. Do not change data that is output in columns (c), (d), (e), and (f) as delivered by Government; retain data that is output in columns (a), (g), (h), and (i) as approved. As an attachment, provide a submittal register showing

items of equipment and materials for which submittals are required by the specifications. This list may not be all-inclusive and additional submittals may be required. Maintain a submittal register for the project in accordance with Section 01 45 00.15 10 RESIDENT MANAGEMENT SYSTEM CONTRACTOR MODE(RMS CM). The Government will provide the initial submittal register in electronic format with the following fields completed, to the extent that will be required by the Government during subsequent usage.

Column (c): Lists specification section in which submittal is required.

Column (d): Lists each submittal description (SD Number. and type, e.g., SD-02 Shop Drawings) required in each specification section.

Column (e): Lists one principal paragraph in each specification section where a material or product is specified. This listing is only to facilitate locating submitted requirements. Do not consider entries in column (e) as limiting the project requirements.

Thereafter, the Contractor is to track all submittals by maintaining a complete list, including completion of all data columns and all dates on which submittals are received by and returned by the Government.

#### 1.10.2 Design-Build Submittal Register

The Designer of Record develops a complete list of submittals during design and identify required submittals in the specifications, and use the list to prepare the Submittal Register. The list may not be all inclusive and additional submittals may be required by other parts of the contract. Complete the submittal register and submit it to the Contracting Officer for approval within 30 calendar days after Notice to Proceed. The approved submittal register will serve as a scheduling document for submittals and will be used to control submittal actions throughout the contract period. Coordinate the submit dates and need dates with dates in the Contractor prepared progress schedule. Submit monthly or until all submittals have been satisfactorily completed, updates to the submittal register showing the Contractor action codes and actual dates with Government action codes. Revise the submittal register when the progress schedule is revised and submit both for approval.

#### 1.10.3 Preconstruction Use of Submittal Register

Submit the submittal register as an electronic database, using the submittal management program furnished to Contractor, unless directed otherwise by COR. Include the QC plan and the project schedule. Verify that all submittals required for the project are listed and add missing submittals. Coordinate and complete the following fields on the register database submitted with the QC plan and the project schedule:

Column (a) Activity Number: Activity number from the project schedule.

Column (g) Contractor Submit Date: Scheduled date for the approving authority to receive submittals.

Column (h) Contractor Approval Date: Date that Contractor needs approval of submittal.

Column (i) Contractor Material: Date that Contractor needs material delivered to Contractor control.

#### 1.10.4 Contractor Use of Submittal Register

Update the following fields in the Government-furnished submittal register program or equivalent fields in the program used by the Contractor with each submittal throughout the contract.

Column (b) Transmittal Number: List of consecutive, Contractor-assigned numbers.

Column (j) Action Code (k): Date of action used to record Contractor's review when forwarding submittals to QC.

Column (l) Date submittal transmitted.

Column (q) Date approval was received.

#### 1.10.5 Approving Authority Use of Submittal Register

Update the following fields:

Column (b) Transmittal Number: List of consecutive, Contractor-assigned numbers.

Column (l) Date submittal was received.

Column (m) through (p) Dates of review actions.

Column (q) Date of return to Contractor.

#### 1.10.6 Action Codes

See paragraph Action Codes above.

#### 1.10.7 Delivery of Copies

Submit an updated electronic copy of the submittal register to the Contracting Officer with each invoice request, unless a paper copy is requested by the Contracting Officer. Provide an updated Submittal Register monthly regardless of whether an invoice is submitted.

#### 1.11 VARIATIONS

Variations from contract requirements require Contracting Officer approval pursuant to contract Clause FAR 52.236-21 Specifications and Drawings for Construction, and will be considered where advantageous to the Government.

##### 1.11.1 Considering Variations

Discussion of variations with the Contracting Officer before submission will help ensure that functional and quality requirements are met and minimize rejections and resubmittals. For variations that include design changes or some material or product substitutions, the Government may require an evaluation and analysis by a licensed professional engineer



hired by the contractor. When contemplating a variation that results in lower cost, consider submission of the variation as a Value Engineering Change Proposal (VECP).

Specifically point out variations from contract requirements in transmittal letters. Failure to point out variations may cause the Government to require rejection and removal of such work at no additional cost to the Government.

#### 1.11.2 Proposing Variations

When proposing variations, deliver a written request to the Contracting Officer, with documentation of the nature and features of the variation and why the variation is desirable and beneficial to Government. If lower cost is a benefit, also include an estimate of the cost savings. In addition to documentation required for variation, include the submittals required for the item. Clearly mark the proposed variation in all documentation.

Check the column "variation" of ENG Form 4025 for submittals that include variations proposed by the Contractor. Set forth in writing the reason for any variations and note such variations on the submittal. The Government reserves the right to rescind inadvertent approval of submittals containing unnoted variations.

#### 1.11.3 Warranting that Variations are Compatible

When delivering a variation for approval, the Contractor warrants that this contract has been reviewed to establish that the variation, if incorporated, will be compatible with other elements of work.

#### 1.11.4 Review Schedule Extension

In addition to the normal submittal review period, a period of 14 calendar days will be allowed for the Government to consider submittals with variations.

### 1.12 SCHEDULING

Schedule and submit concurrently product data and shop drawings covering component items forming a system or items that are interrelated. Submit pertinent certifications at the same time. No delay damages or time extensions will be allowed for time lost in late submittals. .

- a. Coordinate scheduling, sequencing, preparing, and processing of submittals with performance of work so that work will not be delayed by submittal processing. The Contractor is responsible for additional time required for Government reviews resulting from required resubmittals. The review period for each resubmittal is the same as for the initial submittal.
- b. Submittals required by the contract documents are listed on the submittal register. If a submittal is listed in the submittal register but does not pertain to the contract work, the Contractor is to include the submittal in the register and annotate it "N/A" with a brief explanation. Approval by the Contracting Officer does not relieve the Contractor of supplying submittals required by the contract documents but that have been omitted from the register or marked "N/A."

- c. Resubmit the submittal register and annotate it monthly with actual submission and approval dates. When all items on the register have been fully approved, no further resubmittal is required.

Contracting Officer review will be completed within 20 calendar days after the date of submission.

The Government review period for each construction submittal does not begin until the submittal is delivered via RMS CM. Contract compliance for all submittals are the Contractor's responsibility. Government acceptance or receipt acknowledged does not remove this responsibility for contract compliance on any construction submittal.

#### 1.12.1 Government Reviewed Design

The Government will review design submittals for conformance with the technical requirements of the Solicitation. Section 01 33 00.32 DESIGN AND CONSTRUCTION DELIVERABLE/PROCEDURES covers the design submittal and review process in detail. Government review is required for variations from the completed design. Review will be only for conformance with the contract requirements. Included are only those construction submittals for which the DOR's design documents do not include enough detail to ascertain contract compliance. The Government may, but is not required to, review extensions of design such as structural steel or reinforcement shop drawings.

#### 1.13 GOVERNMENT APPROVING AUTHORITY

When the approving authority is the Contracting Officer, the Government will:

- a. Note the date on which the submittal was received.
- b. Review submittals for approval within the scheduling period specified and only for conformance with project design concepts and compliance with contract documents.
- c. Identify returned submittals with one of the actions defined in paragraph REVIEW NOTATIONS and with comments and markings appropriate for the action indicated.

Upon completion of review of submittals requiring Government approval, stamp and date submittals. An electronic copy of the submittal will be retained by the Contracting Officer and an electronic copy of the submittal will be returned to the Contractor. If the Government performs a conformance review of other Designer of Record approved submittals, the submittals will be identified and returned, as described above. The Government may process submittals in the RMS CM System.

##### 1.13.1 Review Notations

Submittals will be returned to the Contractor with the following notations:

- a. Submittals marked "approved" or "accepted" authorize proceeding with the work covered.
- b. Submittals marked "approved as noted" or "approved, except as noted, resubmittal not required," authorize proceeding with the work covered

provided that the Contractor takes no exception to the corrections.

- c. Submittals marked "not approved," "disapproved," or "revise and resubmit" indicate incomplete submittal or noncompliance with the contract requirements or design concept. Resubmit with appropriate changes. Do not proceed with work for this item until the resubmittal is approved.
- d. Submittals marked "not reviewed" indicate that the submittal has been previously reviewed and approved, is not required, does not have evidence of being reviewed and approved by Contractor, or is not complete. A submittal marked "not reviewed" will be returned with an explanation of the reason it is not reviewed. Resubmit submittals returned for lack of review by Contractor or for being incomplete, with appropriate action, coordination, or change.
- e. Submittals marked "receipt acknowledged" indicate that submittals have been received by the Government. This applies only to "information-only submittals" as previously defined.

#### 1.14 DISAPPROVED SUBMITTALS

Make corrections required by the Contracting Officer. If the Contractor considers any correction or notation on the returned submittals to constitute a change to the contract drawings or specifications, give notice to the Contracting Officer as required under the FAR clause titled CHANGES. The Contractor is responsible for the dimensions and design of connection details and the construction of work. Failure to point out variations may cause the Government to require rejection and removal of such work at the Contractor's expense.

If changes are necessary to submittals, make such revisions and resubmit in accordance with the procedures above. No item of work requiring a submittal change is to be accomplished until the changed submittals are approved.

#### 1.15 APPROVED SUBMITTALS

The Contracting Officer's approval of submittals is not to be construed as a complete check, and indicates only that the general method of construction, materials, detailing, and other information are satisfactory. The design, general method of construction, materials, detailing, and other information appear to meet the Solicitation and Accepted Proposal.

Approval or acceptance by the Government for a submittal does not relieve the Contractor of the responsibility for meeting the contract requirements or for any error that may exist, because under the Quality Control (QC) requirements of this contract, the Contractor is responsible for ensuring information contained within each submittal accurately conforms with the requirements of the contract documents.

After submittals have been approved or accepted by the Contracting Officer, no resubmittal for the purpose of substituting materials or equipment will be considered unless accompanied by an explanation of why a substitution is necessary.

#### 1.16 APPROVED SAMPLES

Approval of a sample is only for the characteristics or use named in such

approval and is not be construed to change or modify any contract requirements. Before submitting samples, provide assurance that the materials or equipment will be available in quantities required in the project. No change or substitution will be permitted after a sample has been approved.

Match the approved samples for materials and equipment incorporated in the work. If requested, approved samples, including those that may be damaged in testing, will be returned to the Contractor, at its expense, upon completion of the contract. Unapproved samples will also be returned to the Contractor at its expense, if so requested.

Failure of any materials to pass the specified tests will be sufficient cause for refusal to consider, under this contract, any further samples of the same brand or make as that material. The Government reserves the right to disapprove any material or equipment that has previously proved unsatisfactory in service.

Samples of various materials or equipment delivered on the site or in place may be taken by the Contracting Officer for testing. Samples failing to meet contract requirements will automatically void previous approvals. Replace such materials or equipment to meet contract requirements.

#### 1.17 WITHHOLDING OF PAYMENT

No payment for materials incorporated in the work will be made unless all required DOR approvals or required Government approvals have been obtained. No payment will be made for any materials incorporated into the work for any conformance review submittals or information-only submittals found to contain errors or deviations from the Solicitation or Accepted Proposal.

#### 1.18 CERTIFICATION OF SUBMITTAL DATA

Certify the submittal data as follows on Form ENG 4025: "I certify that the above submitted items had been reviewed in detail and are correct and in strict conformance with the contract drawings and specifications except as otherwise stated.

\_\_\_\_NAME OF CONTRACTOR \_\_\_\_\_ SIGNATURE OF CONTRACTOR

For Design-Build construction, both the Contractor QC manager and the DOR are to certify that the submittal meets contract requirements.

#### PART 2 PRODUCTS

Not Used

#### PART 3 EXECUTION

Not Used

-- End of Section --

# SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION

Consolidated Preparatory School Dormitories - USAFA, CO

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH	GOVT CLASSIFICATION	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION		DATE FWD TO APPR AUTH/	APPROVING AUTHORITY				MAILED TO CONTR/	REMARKS
						SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE	DATE OF ACTION	DATE RCD FRM APPR AUTH	
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		01 30 00.24	SD-02 Shop Drawings														
			Equipment Room Drawings	1.24	G RO												
		01 32 01.00 10	SD-01 Preconstruction Submittals														
			Project Scheduler Qualifications	1.3	G RO												
			Preliminary Project Schedule	3.4.1	G RO												
			Initial Project Schedule	3.4.2	G RO												
			Periodic Schedule Update	3.6.2	G RO												
		01 33 00	SD-01 Preconstruction Submittals														
			Submittal Register	1.10	G RO												
		01 33 29	SD-01 Preconstruction Submittals														
			Sustainability Coordinator	1.4	G DO												
			Preliminary High Performance	1.6.3.2	G RO												
			and Sustainable Building Checklist														
			Sustainability Action Plan	1.5.1	G RO												
			Preliminary Sustainability	1.6.3.2	G RO												
			eNotebook														
			SD-06 Test Reports														
			Third Party Certification Design	1.6.3.2	G RO												
			Compliance Report														
			SD-11 Closeout Submittals														
			Final High Performance and	1.6.3.2	G RO												
			Sustainable Building Checklist														
			Final Sustainability eNotebook	1.6.3.2	G RO												
			Bio-Based Products	1.7.12													
			Recycled Content	1.7.11													

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		01 33 29	Certification of EPA Designated Items	1.7.11.1													
			Certification of USDA Designated Items														
			Amended Final Sustainability eNotebook	1.6.3.2	G RO												
			Amended Final High Performance and Sustainable Building Checklist	1.6.3.2	G RO												
			Third Party Certification Certificate, Assessment, or Validation and Compliance Report		G RO												
		01 33 39.00 10	SD-01 Preconstruction Submittals														
			Advanced Modeling Project Execution Plan (PxP)	1.4.1	G AO												
			PxP Demonstration	1.4.2	G AO												
		01 35 26	SD-01 Preconstruction Submittals														
			Accident Prevention Plan (APP)	1.7	G RO												
			Accident Prevention Plan (APP)	1.7.1	G RO												
			SD-06 Test Reports														
			Monthly Exposure Reports	1.4													
			Notifications and Reports	1.12													
			Accident Reports	1.12.2	G RO												
			LHE Inspection Reports	1.12.3													
			SD-07 Certificates														
			Crane Operators/Riggers	1.6.1.4													

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		01 35 26	Standard Lift Plan	1.7.3.2	G RO												
			Critical Lift Plan	1.7.3.3	G RO												
			Activity Hazard Analysis (AHA)	1.8													
			Confined Space Entry Permit	1.9.1													
			Hot Work Permit	1.9.1													
			Certificate of Compliance	1.12.4													
			License Certificates	1.14													
		01 41 26.05 24	SD-01 Preconstruction Submittals														
			Inspector Qualifications	3.2.4.1													
		01 45 00.00 10	SD-01 Preconstruction Submittals														
			Contractor Quality Control (CQC)	3.2	G RO												
			Plan														
			Additional Requirements for	3.2.2	G DO												
			Design Quality Control (DQC) Plan														
			SD-05 Design Data														
			Discipline-Specific Checklists	3.2.2													
			Design Quality Control	3.9													
			SD-06 Test Reports														
			Verification Statement	3.9													
		01 57 20.00 10	SD-01 Preconstruction Submittals														
			Environmental Protection Plan	1.9													
		01 57 23	SD-07 Certificates														
			Mill Certificate or Affidavit	2.1.3													
		01 74 19	SD-01 Preconstruction Submittals														
			Construction Waste Management	1.8	G RO												
			Plan														

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		01 74 19	SD-06 Test Reports														
			Quarterly Reports	1.10.2													
			Annual Report	1.10.3													
			SD-11 Closeout Submittals														
			Final Construction Waste	1.11	G RO												
			Diversion Report														
		01 78 23	SD-10 Operation and Maintenance														
			Data														
			O&M Database	1.4.5	G RO												
			Training Plan	3.1.1	G RO												
			Training Outline	3.1.3	G RO												
			Training Content	3.1.2	G RO												
			SD-11 Closeout Submittals														
			Training Video Recording	3.1.4	G RO												
			Validation of Training Completion	3.1.6	G RO												
		01 78 24.00 10	SD-01 Preconstruction Submittals														
			Facility Data Project Execution	1.5.1	G RO												
			Plan														
			FDPxP Coordination Meeting	1.5.2.2	G RO												
			Submittal Demonstration Meeting	1.5.2.3	G RO												
			SD-11 Closeout Submittals														
			Preliminary BRED Template and	2.1.5	G RO												
			Report														
			Preliminary BRED Template and	3.1	G RO												
			Report														



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		01 78 24.00 10	Preliminary BRED Template and Report	3.1	G RO												
			Final BRED Template and Report	2.1.6	G RO												
			Final BRED Template and Report	2.1.7	G RO												
			Final BRED Template and Report	3.1	G RO												
			Final BRED Template and Report	3.2	G RO												
			Final BUILDER Data Upload	2.1.7	G RO												
			Final BUILDER Data Upload	3.2	G RO												
		01 78 36.00 24	SD-11 Closeout Submittals														
			Equipment Warranty Booklet	1.2.5													
		01 78 39.00 24	SD-03 Product Data														
			50 Percent Preliminary As-Built Drawings	1.8.2	G DO												
			100 Percent Preliminary As-Built Drawings	1.8.3	G DO												
			SD-11 Closeout Submittals														
			Final As-Built Drawings	1.8.4	G DO												
			Sustainability Documentation	1.5.4	G RO												
		01 86 26	SD-01 Preconstruction Submittals														
			Cybersecurity Subject Matter Expert (Qualifications)	2.22.1													
		01 91 00.15 10	SD-01 Preconstruction Submittals														
			Commissioning Firm	1.8	G RO												
			Lead Commissioning Specialist	1.8.1	G RO												
			Technical Commissioning Specialists	1.8.2	G RO												

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		01 91 00.15 10	Commissioning Firm's Contract	1.8	G RO												
			SD-05 Design Data														
			Design Phase Commissioning Plan	3.1.2	G RO												
			SD-06 Test Reports														
			Design Review Report	3.1.3	G RO												
			Interim Construction Phase Commissioning Plan	3.2.2.1	G RO												
			Final Construction Phase Commissioning Plan	3.2.2.2	G RO												
			Template Building Envelope Inspection Checklists	3.2.2.1.2	G RO												
			Building Envelope Inspection Checklists	3.2.4.2	G RO												
			Pre-Functional Checklists	3.2.4.3	G RO												
			Issues Log	1.10													
			Commissioning Report	3.3	G RO												
			Post-Construction Trend Log Report		G RO												
			SD-07 Certificates														
			Certificate of Readiness	1.11	G RO												
			SD-10 Operation and Maintenance Data														
			Training Plan	3.2.5	G RO												
			Training Attendance Rosters	3.2.5	G RO												
			Systems Manual	3.2.6	G RO												

CONTRACT NO.

### TITLE AND LOCATION

Consolidated Preparatory School Dormitories - USAFA, CO

CONTRACTOR

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U.S. Army Corps of Engineers (USACE) <b>TRANSMITTAL OF SHOP DRAWINGS, EQUIPMENT DATA, MATERIAL SAMPLES, OR MANUFACTURER'S CERTIFICATES OF COMPLIANCE</b> For use of this form, see ER 415-1-10; the proponent agency is CECW-CE.					DATE		TRANSMITTAL NO.	
SECTION I - REQUEST FOR APPROVAL OF THE FOLLOWING ITEMS <i>(This section will be initiated by the contractor)</i>								
TO:			FROM:		CONTRACT NO.		CHECK ONE: <input type="checkbox"/> THIS IS A NEW TRANSMITTAL <input type="checkbox"/> THIS IS A RESUBMITTAL OF TRANSMITTAL _____	
SPECIFICATION SEC. NO. <i>(Cover only one section with each transmittal)</i>			PROJECT TITLE AND LOCATION			THIS TRANSMITTAL IS FOR: <i>(Check one)</i> <input type="checkbox"/> FIO <input type="checkbox"/> GA <input type="checkbox"/> DA <input type="checkbox"/> CR <input type="checkbox"/> DA/CR <input type="checkbox"/> DA/GA		
ITEM NO. <i>(See Note 3)</i>  a.	DESCRIPTION OF SUBMITTAL ITEM <i>(Type size, model number/etc.)</i>  b.	SUBMITTAL TYPE CODE <i>(See Note 8)</i>  c.	NO. OF COPIES  d.	CONTRACT DOCUMENT REFERENCE		CONTRACTOR REVIEW CODE  g.	VARIATION Enter "Y" if requesting a variation <i>(See Note 6)</i>  h.	USACE ACTION CODE <i>(Note 9)</i>  i.
				SPEC. PARA. NO.  e.	DRAWING SHEET NO.  f.			
REMARKS				I certify that the above submitted items had been reviewed in detail and are correct and in strict conformance with the contract drawings and specifications except as otherwise stated.				
				NAME OF CONTRACTOR			SIGNATURE OF CONTRACTOR	
SECTION II - APPROVAL ACTION								
ENCLOSURES RETURNED <i>(List by item No.)</i>			NAME AND TITLE OF APPROVING AUTHORITY			SIGNATURE OF APPROVING AUTHORITY		DATE

## INSTRUCTIONS

1. Section I will be initiated by the Contractor in the required number of copies.
2. Each Transmittal shall be numbered consecutively. The Transmittal Number typically includes two parts separated by a dash (-). The first part is the specification section number. The second part is a sequential number for the submittals under that spec section. If the Transmittal is a resubmittal, then add a decimal point to the end of the original Transmittal Number and begin numbering the resubmittal packages sequentially after the decimal.
3. The "Item No." for each entry on this form will be the same "Item No." as indicated on ENG FORM 4288-R.
4. Submittals requiring expeditious handling will be submitted on a separate ENG Form 4025-R.
5. Items transmitted on each transmittal form will be from the same specification section. Do not combine submittal information from different specification sections in a single transmittal.
6. If the data submitted are intentionally in variance with the contract requirements, indicate a variation in column h, and enter a statement in the Remarks block describing the detailed reason for the variation.
7. ENG Form 4025-R is self-transmitting - a letter of transmittal is not required.
8. When submittal items are transmitted, indicate the "Submittal Type" (*SD-01 through SD-11*) in column c of Section I.  
Submittal types are the following:

SD-01 - Preconstruction	SD-02 - Shop Drawings	SD-03 - Product Data	SD-04 - Samples	SD-05 - Design Data	SD-06 - Test Reports
SD-07 - Certificates	SD-08 - Manufacturer's Instructions	SD-09 - Manufacturer's Field Reports	SD-10 - O&M Data	SD-11 - Closeout	
9. For each submittal item, the Contractor will assign Submittal Action Codes in column g of Section I. The U.S. Army Corps of Engineers approving authority will assign Submittal Action Codes in column i of Section I. The Submittal Action Codes are:

A — Approved as submitted. B — Approved, except as noted on drawings. Resubmission not required. C — Approved, except as noted on drawings. Refer to attached comments. Resubmission required. D — Will be returned by separate correspondence. E — Disapproved. Refer to attached comments.	F — Receipt acknowledged. X — Receipt acknowledged, does not comply with contract requirements, as noted. G — Other action required ( <i>Specify</i> ) K — Government concurs with intermediate design. ( <i>For D-B contracts</i> ) R — Design submittal is acceptable for release for construction. ( <i>For D-B contracts</i> )
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10. Approval of items does not relieve the contractor from complying with all the requirements of the contract.

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## DIVISION 01 - GENERAL REQUIREMENTS

## SECTION 01 33 00.32

## DESIGN AND CONSTRUCTION DELIVERABLES/PROCEDURES

**10/06; Rev 03/22**

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- 1.3 APPLICABLE REFERENCES
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  - 1.3.2 NATIONAL CAD STANDARDS
  - 1.3.3 WEB SITES
- 1.4 DEFINITIONS
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## ATTACHMENTS:

Example Drawing Title Block Information Key

-- End of Section Table of Contents --



## SECTION 01 33 00.32

DESIGN AND CONSTRUCTION DELIVERABLES/PROCEDURES  
10/06; Rev 03/22

## PART 1 GENERAL

Attachments: Attachment A, Design Certification and Transmittal Letter  
Attachment B, Supplemental Design Certification And  
Transmittal Form  
Example Drawing Title Block Information Key

## 1.1 SUMMARY

## a. Design

Develop and submit a design including drawings, specifications, design analysis and any other required design deliverables and distribute design deliverables per the requirements in this section. See Section 01 33 00.36 60 PERCENT DESIGN REQUIREMENTS and Section 01 33 00.38 100 PERCENT DESIGN REQUIREMENTS for specific requirements related to each design discipline.

Use a collaborative, integrated design process for all stages of project delivery with comprehensive performance goals for site development, energy, water, material selection, indoor environmental quality, and waste diversion. Ensure incorporation of these goals in project delivery. Consider all stages of the project lifecycle, including deconstruction, rehabilitation, re-purposing, or demolition.

## b. Construction

Distribute the construction set of design deliverables, DD Form 1354 and as-built drawings as described herein. Edit the technical guide specifications using the construction submittal classifications defined below. As necessary, revise accepted design during construction per the instructions in this section.

## 1.2 CRITERIA VERSIONS FOR DESIGN

The design publications listed below and in this RFP, such as UFCs, shall be used as sources of criteria for the design. Where a date is not specified, the most current edition of the code or standard in effect, including errata and addenda available at the RFP advertisement shall be used as criteria for the design. The criteria from these sources may be supplemented but not supplanted, by applicable criteria contained in nationally recognized codes and standards.

## 1.3 APPLICABLE REFERENCES

The references listed below form a part of this specification to the extent referenced.

## 1.3.1 THE CONSTRUCTION SPECIFICATIONS INSTITUTE (CSI)

CSI Masterformat 2016      Master List of Section Titles and Numbers

### 1.3.2 NATIONAL CAD STANDARDS

The National CAD Standards can be found at:

<https://www.nationalcadstandard.org/ncs6/>. See Section 01 78 39.00 24 AS-BUILT DRAWINGS and Section 01 33 39.00 10 ADVANCED MODELING (BIM/CIM/GIS/CAD) REQUIREMENT for a summary of CAD and general guidelines concerning file format and font requirements. Furnish the CAD software for contractor use meeting the requirements of the RFP.

### 1.3.3 WEB SITES

In addition to the web sites listed in this section, other RFP Sections may list web sites containing design criteria references used in this solicitation package.

NOTE: FOR ITEMS BELOW, REFERENCES TO RECEIVING APPROVAL FROM OTHER GOVERNMENT AGENCIES FOR ALTERNATIVE DESIGNS ARE NOT APPLICABLE TO THIS PROJECT. THE CONTRACTOR IS THE DESIGNER WHEN READING THESE DOCUMENTS.

CONSIDER ALL ITEMS LISTED BELOW A PART OF THE RFP SOLICITATION DOCUMENT (AS APPLICABLE) AND THE RESULTANT CONTRACT.

(a) OBTAIN UNIFIED FACILITIES CRITERIA (UFC), TECHNICAL MANUALS (TM), TECHNICAL INSTRUCTIONS (TI), AIR FORCE MANUALS (AFM), ENGINEERING TECHNICAL LETTERS (ETL), ARMY ARCHITECTURAL AND ENGINEERING DESIGN CRITERIA (AEI), SUSTAINABLE DESIGN DOCUMENTS, AND MILITARY HANDBOOKS (MIL HANDBK) from the following internet addresses:

<http://www.publications.usace.army.mil/>.

<http://www.wbdg.org/>

Additional web sites are as follows:

AIR FORCE DESIGN CRITERIA:

<http://www.e-publishing.af.mil/>

(b) UNIFIED FACILITIES GUIDE SPECIFICATIONS (UFGS)

This includes UFGS sections referenced, but not provided in the solicitation and other UFGS sections required in developing the project specifications. Unless noted otherwise, download these Guide sections in SpecsIntact SGML (zipped) file format at the following internet address:

[http://www.wbdg.org/ccb/browse\\_org.php?o=70](http://www.wbdg.org/ccb/browse_org.php?o=70)

Guide specification numbers and titles referenced in the solicitation may vary from the actual specification numbers and titles available at the website listed above.

Download SpecsIntact software at the following internet address:

<http://specsintact.ksc.nasa.gov/Software/software.shtml>

Use SI Version 5.0 or later. Select the new unified submittal format for file format.

## U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 1110-1-2909

(2012) Engineering and Design --  
Geospatial Data and Systems

## U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 1-300-02

Unified Facilities Guide Specifications  
(UFGS) Format Standard

UFC 1-300-08

Criteria for Transfer and Acceptance of  
DoD Real Property

## 1.4 DEFINITIONS

## 1.4.1 Contractor

Firm or company awarded the design and construction of Consolidate Prep. School Dormitories, located at US Air Force Academy, Colorado.

## 1.4.2 Design

Documents or deliverables, as defined in this section, prepared by or under the direct supervision of registered professional architects and engineers and proposed to meet the requirements of this solicitation.

## 1.4.3 Design Drawings

Documentation showing in graphic and quantitative form the extent, design, location, relationships, and dimensions of the construction to be provided by the Contractor. (Note: Do not provide Shop Drawings, as defined in Section 01 33 00, "Submittals Procedures" until after the Government determines that the design drawings are satisfactory for construction.)

## 1.4.4 Designer of Record (DOR)

Professional Registered members of the Contractor's Design-Build team that check, approve, sign, date, and certify, prior to submitting the deliverables to the Government, that the D-B design submittals comply with the contract requirements.

The DOR's stamp, sign, and date each design drawing and other design deliverables under their responsible discipline at each design submittal stage. The DOR(s) are responsible for maintaining the integrity of the design and for compliance with the contract requirements through construction and documentation of the as-built condition by coordination, review and approval of extensions of design, material, equipment and other construction submittals, review and approval or disapproval of requested deviations to the accepted design or to the contract, coordination with the Government of the above activities, and by performing other typical professional design responsibilities.

## 1.4.5 Request for Proposal (RFP)

Documents furnished to prospective offerors containing proposal information and specifying criteria and project requirements for design and construction of a Consolidate Prep. School Dormitories located at US Air Force Academy, Colorado. The documents include this specification, attachments, appendices, and the RFP drawings.

#### 1.4.6 Advanced Modeling

A subset of geospatial technologies as defined in EM 1110-1-2909 to include BIM, CIM, GIS, and CAD. Advanced Modeling is comprised of models and drawings that form a digital representation of the project, or part thereof, that are comprised of model elements with facility data. See Section 01 33 39.00 10 ADVANCED MODELING (BIM/CIM/GIS/CAD) REQUIREMENTS.

#### 1.5 ORDER OF PRECEDENCE

See Section 01 30 00.24 OTHER ADMINISTRATIVE AND SPECIAL REQUIREMENTS, paragraph "DESIGN-BUILD CONSTRUCTION CONTRACTS".

#### 1.6 QUALITY ASSURANCE

If, because of reasons beyond the control of the construction or design firm, the named individuals submitted for approval are unable to fulfill this obligation, present replacement personnel with similar skills and experience for acceptance by the Contracting Officer. Ensure replacement individuals have qualifications and experience meeting or exceeding those identified in the proposal. Obtain the Contracting Officer's written consent before making any substitution for these designated personnel.

##### 1.6.1 Construction Personnel Experience

See Section 01 45 00.00 10 QUALITY CONTROL and Section 00 22 00.

##### 1.6.2 Designer Qualifications and Experience

See below for required experience of Design Personnel. Submit resumes and credentials demonstrating compliance with these requirements as part of the Design Quality Control Plan required in Section 01 45 00.00 10 QUALITY CONTROL.

Project Managers and Lead Designers must be registered/licensed professional architects or engineers with at least ten (10) years experience as a registered/licensed professional in the proposed position/role in the design of similar projects. Required Design personnel are listed below. Ensure designers will be immediately available for design services at the time of Notice to Proceed:

- a. Project Design Manager (Registered/licensed Architect or Engineer)(10 years of design experience/5 years of Design Manager experience)
- b. Registered/licensed Architect
- c. Registered Structural Engineer
- d. Registered Mechanical Engineer
- e. Registered Fire Protection Engineer
- f. Registered Electrical Engineer
- g. Registered Communications Engineer (RCDD)
- h. Interior Designer (NCIDQ)
- i. BIM Manager (certification not required, but submit proof of experience)
- j. Registered Civil Engineer

## 1.7 SUBMISSION OF DESIGN DRAWINGS, SPECIFICATIONS AND DESIGN ANALYSES

### 1.7.1 Design Certification

Within each design submittal, certify that all design documents (after construction award) comply with this RFP, the Division 1 specifications, and mandatory requirements of the UFGS and designated CEGS (Omaha District Specifications). The criteria specified in this RFP are binding contract criteria and in case of any conflict, after award, between the RFP criteria and Contractor's submittals, the RFP criteria will govern unless there is a written and signed agreement between the Contracting Officer and the Contractor waiving a specific requirement. See paragraph "ORDER OF PRECEDENCE" above. Include certification similar to Attachment A of this section with the letter of transmittal for each design submittal (including the 100% corrected design (backcheck) submittal) stating that the submittal (plans, specifications, design analysis, etc.) complies with the requirements above.

### 1.7.2 Deviations

Identify deviations from the RFP technical requirements in the letter of transmittal and design certification letter. The Contracting Office will consider and may approve deviations from the RFP technical requirements if the changes result in a significant improvement to the project or exceed the minimum RFP technical requirements.

### 1.7.3 Field Inspection

Field verify conditions which are significant to design. Research and obtain all necessary existing facility as-built drawings and reproduce as necessary, and discuss status with knowledgeable personnel. Include this information in the design documents.

### 1.7.4 Drawings

#### 1.7.4.1 Software Requirements

Develop and maintain Design and As-Built requirements in accordance with Section 01 33 39.00 10 ADVANCED MODELING (BIM/CIM/GIS/CAD) REQUIREMENTS and Section 01 78 39.00 24 AS-BUILT DRAWINGS, respectively. The Government will provide files developed for the RFP for the designer's optional use. The files developed for the RFP may not comply with the design requirements listed herein. Use of the concept model does not limit compliance with BIM or As-Built requirements in this contract.

#### 1.7.4.2 RFP Drawings

The Government will furnish files as described in Section 01 33 39.00 10 ADVANCED MODELING (BIM/CIM/GIS/CAD) REQUIREMENTS. See that specification for caveats and limitations associated with government-furnished material.

### 1.7.5 Design Documents

Include construction drawings, specifications, design analysis, and other design deliverables as indicated in Sections 01 33 00.34 35% DESIGN REQUIREMENTS, 01 33 00.36 60% DESIGN REQUIREMENTS and 01 33 00.38 100% DESIGN REQUIREMENTS. Include sufficient detail in the specifications to fully describe and demonstrate the quality of materials, the installation and performance of equipment, and the quality of workmanship. Comply with

the manufacturer's recommendations for detailing and installation of all equipment and materials. Include in the Design Analysis each discipline of work and all features with the necessary calculations, tables, methods and sources used in determining equipment and material sizes and capacities. Provide sufficient information to support the design.

#### 1.7.6 Post-Award and Initial Design Kickoff Meeting

After contract award, coordinate an appropriate time for and conduct a design initiation/kickoff meeting with appropriate Government stakeholders at the project site. Discuss and validate the project scope as defined in the RFP. Collect information relative to the initiation of the design, current state of the project facility/site, mission requirements, criteria, and stakeholder and project requirements. Ensure all relevant Design-Build designers and construction personnel participate. Document and submit meeting minutes related to the meeting. Submit any variances, deviations, and/or modifications to scope as defined by this RFP must be processed accordingly. The primary purpose of the meeting is to make sure any needs are assigned and due dates established, as well as points of contact identified.

As a minimum, address the following during the conference:

- a. The Government will introduce the Government project delivery team members, facility users, facility command representatives, and installation representatives.
- b. Introduce key personnel, major subcontractors and other needed staff.
- c. Define expectations and duties of each participant.
- d. Develop a meeting roster with complete contact information including name, office, project role, phone, mailing and physical address, and e-mail address for distribution to all participants. Also, provide minutes of the meeting to all participants.
- e. Discuss basic contract administration requirements.
- f. Discuss expected project progress processes.
- g. Coordinate subsequent meetings required by this contract.

#### 1.7.7 Design Reviews

During the design, conduct a minimum of three design reviews at the US Air Force Academy, CO for the 35 percent, 60 percent and the 100 percent completion stages, unless directed otherwise. A backcheck review will follow the Corrected 100 percent design. Once the Government reviews the Corrected 100 percent design and determines it to be satisfactory for the purpose of beginning construction, prepare and distribute sets of documents for construction. Attend the design reviews, visit the site, and make other trips as necessary during the design to accomplish the work.

#### 1.7.8 Document Packaging

The 35 percent design submittal includes the 35 percent complete site and utility design and building design (See 01 30 00.24 OTHER ADMINISTRATIVE AND SPECIAL REQUIREMENTS, paragraph: Sequence of Design-Construction for

optional packaging and submission of design documents). These documents shall be packaged and stamped "For Review Only - 35% Design - Not For Construction"; and each sheet of the drawings shall also be stamped.

See Section 01 33 00.36 60 PERCENT DESIGN REQUIREMENTS for the 60 percent design submittal requirements. Stamp these documents "For Review Only - 60% Design - Not For Construction"; also include this stamp on each sheet of the drawings.

See Section 01 33 00.38 100 PERCENT DESIGN REQUIREMENTS for the 100 percent design submittal requirements. Stamp these documents "For Review Only - 100% Design - Not For Construction", also include this stamp on each sheet of the drawings.

Stamp the backcheck design submittal(s) after the Government review of the 100 percent complete design "100% Corrected Design - Not For Construction"; also include this stamp on each sheet of the drawings. The 100% Corrected Design submittal is for making corrections resulting from review comments and for preparing the final project documents. The Government will grant no additional time for completion of the contract due to insufficient design submittals. See paragraph "Government Design Review and Acceptance" below for additional requirements.

## PART 2 PRODUCTS (NOT APPLICABLE)

## PART 3 EXECUTION

### 3.1 DRAWINGS

Prepare, organize, and present drawings in the format specified herein. Provide drawings complete, accurate and explicit enough to show compliance with the RFP requirements and to permit construction. Properly detail systems on drawings proposed to meet RFP performance specifications to ensure appropriate use, proper fit, compatibility of components and coordination with the design analysis and specifications. Coordinate drawings to ensure no conflicts exist between design disciplines and between drawings and specifications.

#### 3.1.1 Drawings Format

Full size drawings are 22 inches x 33.1 inches. Half-size drawings are 11 inches x 17 inches. Ensure title block complies with the . Sections 01 33 00.36 60 PERCENT DESIGN REQUIREMENTS and 01 33 00.38 100 PERCENT DESIGN REQUIREMENTS specify recommended drawing scales. Ensure the Cover Sheet of the drawings bears the stamp or seal and signature of the registered architect or appropriate engineer responsible for the work and proposed to meet the RFP requirements. Use the following drawing project code numbers on all border sheets for the design and construction drawings: AA70. FILE NUMBER on all border sheets for the design and construction drawings is to be the contract number determined at award and will be verified at the design kickoff meeting.

See attached Example Drawing Title Block Information Key.

#### 3.1.2 Drawings Sequence

Arrange drawings by design discipline in accordance with National CAD Standards.

### 3.1.3 Drawings Required

As a minimum, prepare and submit the following design drawings:

- a. Title Sheet, Index of Drawings, Legend and Abbreviations and Soil Borings.
- b. Civil Drawings
- c. Utility Drawings (Water Supply, Wastewater, Gas, and Electrical)
- d. Architectural Drawings
- e. Interior Design Drawings
- f. Structural Drawings
- g. Mechanical Drawings
- h. Plumbing drawings
- i. Electrical Drawings
- j. Communications Drawings
- k. Fire Protection Drawings

## 3.2 SPECIFICATIONS

### 3.2.1 Project Specifications

#### 3.2.1.1 General Requirements

Develop project specifications incorporating the Division 1 Specifications furnished with this RFP; unedited Unified Facilities Guide Specifications (UFGS) current at the time of award; designated specification sections furnished with this RFP; and additional project specifications as needed not covered by UFGS. Organize project sections not based on UFGS in accordance with CSI MasterFormat and UFC 1-300-02.

Edit and process the specification using SpecsIntact software.

#### 3.2.1.2 Technical Specifications

Use unedited UFGS and designated unedited CEGS sections for developing project specifications. Do not rewrite specification paragraphs and subparagraphs to lessen the quality of the original technical specification sections, unless directed otherwise. The technical guide specifications describe the type and quality of material and installation normally acceptable for Corps of Engineers Construction, and often represent specific agreement between the Government and the applicable industry. Do not change the provisions of the technical guide specifications without justification. Identify in the design analysis under the appropriate design discipline justifications for additional materials. Do not include designer notes in any design submittals. Only delete bracketed choices and inapplicable items. Do not show revisions in the corrected 100 percent specifications submittal. Complete the editing of all options. Where designer notes are provided, edit the choice in accordance with the recommendations and guidance of the Notes, except



where the RFP provides specific guidance.

Edit and expand the appropriate specifications to meet all project design requirements, current code requirements, and regulatory requirements. Provide non-proprietary, descriptive project specifications in compliance with the requirements in UFC 1-300-02. Do not provide proprietary information in the project specifications unless approved by the Contracting Officer.

### 3.2.1.3 Editing Technical Specifications (Designated CEGS or UFGS)

#### (1) Incorporating Established RFP Requirements into Guide Specifications

Where the edited RFP Division 01 and Section 02 41 00 DEMOLITION provide specific requirements in regards to materials, methods and end function requirements, edit the UFGS and designated CEGS (Omaha) to reflect these requirements. The Government will not permit variations to these requirements, unless authorized as a design deviation by the Contracting Officer.

#### (2) Requirements of Guide Specifications Not Established By RFP Requirements

Where the RFP does not provide specific direction in regards to materials, methods and end function requirements, the final requirements will be a result of the completed design by the Contractor.

(3) ADDITIONS: If the specifications of the UFGS or designated CEGS does not cover a feature that is in the project, insert new sentences and/or paragraphs in the proper locations to adequately cover the feature of work. Do not use additions to lessen the quality of materials indicated by the specifications. If adding a new material, properly reference it in "Applicable Publications", "MATERIALS", "SUBMITTAL", "TESTS", and "INSTALLATION" paragraphs, as applicable.

(4) DELETION OF INAPPLICABLE TEXT MATERIAL, AS NECESSARY, TO TAILOR THE SPECIFICATIONS TO FIT THE PROJECT: After deleting all inapplicable paragraphs, subparagraphs, choices, and schedules from the body of the specifications (including but not limited to the correction of lists in "Submittals", "Tests", and "Installation" paragraphs), delete all nonapplicable references listed in the preceding "APPLICABLE PUBLICATIONS" and "MATERIALS" paragraphs. Do not use deletions to lessen the quality of materials indicated by the specifications.

(5) Do not remove any special code markings for submittals, references, tests or section references, unless the text is not required.

(6) REFERENCES TO SPECIFICATION SECTIONS. Coordinate section references, along with the technical requirements, to specific specification sections (number and title) within the project specifications. Revise section references (title and number) to reflect the titles and numbers of specification sections used.

(7) REFERENCES. Coordinate references or publications in the text of each specifications with the references listed at the beginning of

each section. See paragraph "Error Report Submission and Resolution" below. The SpecsIntact Software removes references or publications not referenced in the text from the Reference Article when printing from the Jobs menu.

(8) SUBMITTALS. Each section of the specifications includes a submittal paragraph which lists all applicable Contractor submittals. Properly mark submittals as outlined in the SpecsIntact documentation and in this section. SpecsIntact uses these codings for automatic generation of the Submittal Register. Do NOT delete these codings from the text, unless the submittal is not required. Make the Submittal Item text between the coding identical (word for word, including punctuation and spacing) to the paragraph text in the reference paragraph(s). Text may be either upper or lower case letters.

During the design phase, develop a complete list of required construction submittals in each technical specification. The list will become the Submittal Register for approval by the Contracting Officer Representative (COR). SpecsIntact generated the example Submittal Register in this Solicitation. Replace this example Submittal Register with the actual submittal register developed from the completed design specifications. This list is not all inclusive and additional submittals may be required as directed by the COR. Both the attached sample and the Contractor-generated submittal registers identify only the submittal section, type of submittal, description of item submitted, paragraph number related to submittal item (section submittal paragraph if none listed), submittal classification (G or FIO), and submittal reviewer identifier.

See Section 01 33 00 SUBMITTAL PROCEDURES, for complete instructions related to submittal descriptions, classifications, numbers, and submittal process.

#### (9) USE OF UFGS SECTIONS

Unless directed otherwise, use UFGS sections. UFGS sections are a joint effort of the U.S. Army Corps of Engineers (USACE), the Naval Facilities Engineering Command (NAVFAC), National Aeronautics and Space Administration (NASA) and the Air Force Civil Engineer Support Agency (AFCEA). In instances where more than one UFGS section addresses the same material or system requirement, as a general rule, use the Section developed by the USACE specification proponent. Available UFGS sections with the numbers ending ".00 10", ".00 20" or ".00 40" following the section number are sections that have not yet been unified by the different Government design agencies. The ending numbers designate the specification proponent (".00 10" is for USACE, ".00 40" for NASA and ".00 20" is for NAVFAC). Where UFGS sections include tailoring options for both the various proponents (Army, NASA and Navy), use the Army tailoring option. Where conflicts exist that cannot be resolved, contact the Contracting Officer to resolve the issue.

#### 3.2.1.4 Developing Additional Project Specifications

Organize project sections not based on UFGS in accordance with CSI MasterFormat and UFC 1-300-02. Ensure these specifications conform to the applicable criteria requirements indicated in the solicitation. Write at the Mediumscope level of detail as described in CSI Masterformat. Use Mediumscope level section numbers and titles as identified in CSI

Masterformat. Adjust section numbers which conflict with the specifications used in the Project Specifications. Use the same format as the CSI format specifications included in the UFGS (including the submittal paragraph).

Use of commercially-available guide specifications such as "SpecText" published by CSI and "MasterSpec" published by The American Institute of Architects is permissible, subject to the format, coding and submittal paragraph requirements. Change references to the "Architect/Engineer" and the "Owner" to refer to the "Government" or "Contracting Officer," as appropriate. Coordinate references, along with the technical requirements, to specific specification sections (number and title) within the project specifications. Revise section references (title and number) to reflect the titles and numbers of specification sections used.

### 3.2.1.5 Division 0 and 1 Sections

Include Division 0 and 1 specifications sections contained in the RFP as part of the project specifications without change, unless directed otherwise:

01 30 00.24 OTHER ADMINISTRATIVE AND SPECIAL REQUIREMENTS,  
 01 32 01.00 10 PROJECT SCHEDULE,  
 01 33 00 SUBMITTAL PROCEDURES,  
 01 33 29 SUSTAINABILITY REQUIREMENTS AND REPORTING,  
 01 33 39.00 10 ADVANCED MODELING (BIM/CIM/GIS/CAD) REQUIREMENTS,  
 01 35 26 GOVERNMENTAL SAFETY STANDARDS,  
 01 41 26.05 24 (FEDERAL FACILITIES COLORADO) NPDES PERMIT REQUIREMENTS FOR  
 STORM WATER DISCHARGES  
 01 45 00.00 10 QUALITY CONTROL,  
 01 45 00.15 10 RESIDENT MANAGEMENT SYSTEM CONTRACTOR MODE (RMS CM),  
 01 57 20.00 10 ENVIRONMENTAL PROTECTION,  
 01 57 23 TEMPORARY STORM WATER POLLUTION CONTROL,  
 01 62 35 RECYCLED / RECOVERED MATERIALS,  
 01 74 19 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL,  
 01 78 23 OPERATION AND MAINTENANCE DATA,  
 01 78 24.00 10 FACILITY DATA REQUIREMENTS,  
 01 78 36.00 24 WARRANTY OF CONSTRUCTION AND DESIGN,  
 01 78 39.00 24 AS-BUILT DRAWINGS, and  
 01 91 00.15 10 TOTAL BUILDING COMMISSIONING

The Government will furnish copies of these sections and other specifications included with the RFP upon request to the successful offeror in SpecsIntact. Include any amendment revisions issued into these sections. Provide any other Division 1 Specifications required by the Contract, including 01 42 00 SOURCES FOR REFERENCE PUBLICATIONS and 01 45 35 SPECIAL INSPECTIONS. Include additional specifications indicated elsewhere in the solicitation or required by the Contractor.

### 3.2.2 Format for Project Specifications

Submit a bundled specification package, including a cover page and table of contents, in PDF format for each design package. As a minimum, bookmark each specification section in the bundled package. Also, submit the source files, in the processing system format, used to create the PDF.

For the 60 percent and 100 percent design submittals, show specification revisions including text deletions and text insertions (i.e. print the 60% and 100% review specifications showing all insertions and deletions). Do

not show revisions for the corrected 100 percent specifications (remove markings for insertion and deletion).

Include a Section Table of Contents within each specification section matching the page numbering of the specification section.

Make the Specifications Cover Page similar to the RFP Cover page and include:

- a. Project title, Project Number, activity and location
- b. Construction contract number
- c. Construction Contractor's name and address
- d. Design firm's name and address
- e. Names of design team members (Designers of Record) responsible for each Contractor prepared technical discipline of the project specification
- f. Name and signature of a Principal of the design firm

Include the appropriate Divisions using CSI format and the specification section numbers and titles contained in the project specifications in the Table of Contents.

### 3.2.3 Error Report Submission and Resolution

Submit the following SpecsIntact reports with the 100 percent and Corrected 100 percent design submittals: Address Verification, Reference Verification, Section Verification, Bracket Verification, Submittal Verification, Submittal Register and any other reports requested by the Contracting Officer. Reconcile references when printing reports. Submit the reports for review after correcting any errors initially displayed in these reports. In the reference verification reports, only fix errors consisting of a discrepancy with the issue date of a publication (i.e., NFPA 70, revise to the latest code requirement). Complete Address, Reference and Submittal Reconciliation prior to submittal of the 100 percent design.

### 3.2.4 Construction Submittals

See Section 01 33 00 SUBMITTAL PROCEDURES.

Include construction submittal types and products, including the submittal description numbers and data package numbers. When appropriate, use specific product terms instead of the generic product terms contained in the specifications sections (e.g., asphalt shingles, built-up roofing, EPDM single ply, etc. vs roof covering; concrete masonry units, brick, metal siding, etc. vs exterior skin; mineral fiber board, block, batt or blanket, polystyrene, polyurethane, polyisocyanurate board vs insulation).

#### 3.2.4.1 Submittals Register (Form)

Prepare and maintain a Submittal Register. Prepare the Submittal Register (ENG Form 4025) using SpecsIntact Software.

Fill in columns "c" through "f" and submit with the 100 percent design

submittal. The Government will return the Submittal Register to the Contractor along with the reviewed and accepted design.

Resubmit the Submittal Register as a construction submittal as required in Section 01 33 00 SUBMITTAL PROCEDURES. Provide an electronic copy of the accepted submittal register (NAVY4288.txt file), generated by the SpecsIntact software, three (3) working days prior to the pre-construction conference. Appropriate authorities will fill in remaining columns during construction.

### 3.3 DESIGN ANALYSES

Prepare design analyses (basis of design and calculations) for each design discipline. This section and Sections 01 33 00.34 35% DESIGN SUBMITTALS, 01 33 00.36 60 PERCENT DESIGN SUBMITTALS and 01 33 00.38 100 PERCENT DESIGN SUBMITTALS contain specific requirements for technical content. Include a basis of design and calculations, as applicable, for each discipline. Present facts to demonstrate that the concept of the project is fully understood and that the design is based on sound engineering. For each discipline include:

a. A basis of design consisting of:

(1) An introductory description of the project concept which addresses the salient points of the design;

(2) An orderly and comprehensive documentation of criteria, rationale, assumptions and reasoning for system selection.

b. Calculations required to support the design.

c. Project Engineering Considerations and Instructions (ECI) for Final Design Analysis.

Do not make reference to the RFP solicitation to avoid stating the requirements for the basis for design.

#### 3.3.1 Format

Include a cover page indicating the stage of design "PRELIMINARY DESIGN ANALYSIS" for 60 percent design submittal and "FINAL DESIGN ANALYSIS" for 100 percent design submittal, the project title "CONSOLIDATE PREP. SCHOOL DORMITORIES PNXQPZ104002", fiscal year and program funding "FY20 MCAF", location "US AIR FORCE ACADEMY, COLORADO", who prepared the design analysis "Prepared By:" followed by Name of AE and Construction Contractor, location of AE and Construction Contractor Office involved with the design, and construction contract number; table of contents; and bookmarks for each part of design analysis for quick reference. Indicate the volume number and total number of volumes for the project on the cover sheet. Provide a cover sheet for each volume. Submit design analyses prepared on 8 1/2 by 11-inch page size. Include all disciplines in one volume when possible, excluding calculations. Provide multiple volumes for individual disciplines, appropriately numbered, when required.

Use a decimal paragraph numbering system (i.e. 1, 1.1, 1.1.1, 1.1.1.1, etc.) for narratives. Do not copy the text from the RFP document sections, unless directed otherwise. Write in the same tense (Past or Present) for the entire design analysis. Include the part number and page numbering (consecutive page numbering for each part). Organize design analysis

narrative into the following parts, as follows:

3.3.1.1 Part 1 - General Description.

Provide statements of purpose, authority and applicable criteria. Provide a description of the project and a summary of the economic factors influencing the choice of the civil, architectural, structural, mechanical, electrical, communications, fire safety, water supply, and wastewater disposal systems used in the project along with an indication of how initial and life costs were considered.

**a. Purpose.** Include a statement under the heading of "PURPOSE" that applies to the project

**b. Authority.** Confirm authorization statement with the USACE project manager after award.

**c. Applicable Criteria.** Provide a list of the general criteria that pertains to all disciplines used in the design. List specific criteria used in a particular engineering/architectural discipline in the text of the appropriate discipline in Part 2 of the design analysis. Reference such criteria accordingly.

**d. Project Description.** Provide a description of the project and summary of economic factors influencing the choice of materials and systems used in the project.

3.3.1.2 Part 2 - Design Requirements and Provisions.

Provide statements of factors considered in the design along with supporting justification of design decisions and design calculations. Include narratives for each of the following areas or disciplines. See Sections 01 33 00.34 35 PERCENT DESIGN REQUIREMENTS, 01 33 00.36 60 PERCENT DESIGN REQUIREMENTS, and 01 33 00.38 100 PERCENT DESIGN REQUIREMENTS for specific requirements.

- a. Civil
- b. Water Supply and Wastewater
- c. Architectural
- d. Interior Design
- e. Structural
- f. Mechanical
- g. Electrical
- h. Communications
- i. Fire Protection
- j. Environmental Protection, Compliance and Permits
- k. Health and Safety
- l. Sustainable Design

### 3.3.2 Calculations

Place all calculations in separate appendices and volume(s) as needed. Include a cover page for calculations similar to the design analysis narrative cover page, a table of contents, index page and a summary of criteria for each appendix on the first pages and the project title. Identify the project and location on every page of the calculations. Ensure all calculation pages are legible and photo-ready. Consecutively number each discipline (Example: A-1, A-2, A-3 etc. for Water Supply and Wastewater Calculations and B-1, B-2, B-3, etc. for Structural Calculations) and include the date. Cite criteria for calculations, rationale, and formulae by publication number, title, edition and page number. Include the names of the persons originating and checking the calculations on the cover page and each page of the calculations. Ensure a registered professional engineer other than the originator checks the calculations. In addition, include the signature and seal of the appropriate registered professional engineer responsible for the work appears on the cover page of the calculations for each discipline. List subtopics (e.g. for Structural - Loads, Materials, References, Wind Analysis, Footing Design, Wall Design, Column Design, etc.) on an index page for each appendix with page numbers corresponding to the calculations.

Use consecutive page numbers and identify computer printouts similar to the calculations. Identify the computer program name, source, and version. Provide all schematic models used for computer input.

### 3.3.3 Engineering Considerations and Instructions (ECI) for Field Personnel

#### 3.3.3.1 Separate Appendix

Under a separate appendix in the Final Design Analysis, include the following items:

- a. Features critical to the quality of the final construction product requiring special attention.
- b. Submittals requiring special attention during construction.
- c. Special user requirements or instructions.
- d. Assumed field conditions, pertinent significant aspects, or critical phases of the project used as a basis of project design.

#### 3.3.3.2 Format

Include the following information in a format similar to the below for Engineering Considerations and Instructions (ECI's):

**"ENGINEERING CONSIDERATIONS AND INSTRUCTIONS**

Project Name: \_\_\_\_\_

Location: \_\_\_\_\_

Designer Name: \_\_\_\_\_ Phone: \_\_\_\_\_

Discipline: \_\_\_\_\_

Follow these Engineering Considerations and Instructions (ECI's) during the construction of the above project. If you have any questions, contact the appropriate Design-Build designer."

#### 3.3.3.3 Distribution of ECI's

After acceptance of the 100 percent corrected design and prior to the start of construction, e-mail a copy of the ECI's to the appropriate U.S. Army Corps of Engineer's Field representative with a copy furnished to the appropriate individuals identified at either the pre-design or pre-construction conference.

#### 3.3.4 Requests for Information, Meeting Minutes and Comments

Include copies of Requests for Information (RFI) as an appendix to the design analysis. Include an index of each RFI documenting the RFI number, the date given to Government, the date answered, and the Action Response provided by the Government.

Include a copy of all meeting minutes and design review comments (if any) with action responses as an appendix to the design analysis.

Include page numbering and formatting in all appendices for RFI's, Meeting Minutes, and design review comments similar to Calculations listed above.

### 3.4 DESIGN CERTIFICATION

Provide certification signed by an officer of the Contractor's company attesting that the drawings, specifications, and design analyses prepared for the construction of the facility meet the requirements of the RFP. Include the certification in the submission of the design documents along with names and disciplines for the designers of record. Include a list of deviations (variations) from the solicitation or accepted final design as part of this design certification. Prepare the design certification and transmittal letter in the format shown in Attachment A or Attachment B included at the end of this section.

### 3.5 REVIEW BY GOVERNMENT AGENCIES

#### 3.5.1 Distribution of Design Documents for Conformance Review

(a) Send review documents to ensure Government receipt days prior to review conferences. The documents will be in their then-present "on-board" design status (except for the 100% design submittal). See below for review agencies and required quantities. Include an index of contents in all documents. Continue work during the review period between the 60% design submission and the 60% design review conference.

Ensure work is 100% complete when the 100% design is submitted. Do not continue design work during the review period between the 100% design submission and the 100% design review conference. Indicate distribution by use of the "ATTN" code shown in the address in the transmittal letter. Submit a complete package (i.e. drawings, specifications, DA, etc.) including the items listed below.

(b) If the Government requires more time than the thirty (30) days given, prior to either of the 60% or 100% review conferences, the Government will grant an extension of time equal to the number of calendar days of delay.



(c) The Government requires fourteen (14) days to review 100 Percent Corrected Design submittals **after receipt** of these documents. If the Government requires additional review time, it will grant an extension of time equal to the number of calendar days of delay.

#### 3.5.1.1 Design Submittal Items

Submit electronic copies of the following items as applicable for each design submittal: design analysis, design analysis calculations and appendices, specifications, specification error reports, submittal register, color boards, DD Form 1354, environmental protection plan, backcheck review comments, sustainability tracking report, design certification letter with deviations, and engineering considerations and instructions (ECI) in an Adobe Acrobat XI .pdf format in the quantity indicated by the '**EMedia**' designation. Use bookmarks with titles and ensure the text is searchable. Make each design submittal item and submittal item component easy to find (i.e. each specification section, chapters and appendices of design analysis, and each submittal item). Ensure submittals are legible and permit ease of design review. Poor quality scans of as-built drawings or other materials are unacceptable. Failure to meet this requirement on one design submittal may result in requiring all future submittals and resubmittals to be hard copy, at no additional cost to the Government.

The submittal items listed below identify the different design submittals required throughout the design process and select submittals required during and at the completion of construction. Each submittal item has an abbreviation as shown below used in conjunction with the number of required copies.

Submit hardcopies of any items identified separately below from the required "EMedia" submittal.

#### SUBMITTAL ITEM - **ABBREVIATION**

Drawings (1/2 size) - **Dwg-1/2**

Electronic Media - **EMedia**

Color Board - **ColBd**

Framed and Matted Renderings - **Rend**

#### 3.5.1.2 Activity Distribution Addresses

U.S. Army Corps of Engineers

CENWO-CDS-C (Trish Lambert)  
USACE - Omaha District Office  
1616 Capitol Avenue  
Omaha, NE 68102-4901

Attn: CENWO-PMM (J. Wiegmann)  
U.S Army Corps of Engineers  
5475 Tech Center Drive, Suite 205  
Colorado Springs, CO 80919  
Phone: (402) 996-3719

Air Force Academy Resident Office  
Attn: CENWO-CDR-Y (B. Felker)  
U.S. Army Corps of Engineers

8110 Security Drive, Door #7  
 US Air Force Academy, CO 80840  
 Phone: (719) 333-2975

Air Force

10 CES/CENMP

ATTN: John Conner  
 8120 Edgerton Drive, Suite 40  
 USAFA Academy, CO 80840  
 Phone: (719) 333-3465

AFCEC/CFMC

Attn: AFCEC (Maria Ramsey) - send to USACE RO

USAFA/A4

Attn: USAFA (Duane Boyle)  
 41 Orville Wright Ave., Bldg 4351  
 Barksdale AFB, LA 71110

### 3.5.1.3 35 Percent Design Distribution

See paragraphs above explaining Submittal Abbreviation Codes and Activity Distribution Addresses.

Activity / Submittal Item	CENWO-CDS-C	CENWO-PMM	CENWO-CDR-Y	10 CES/CENMP	AFCEC / CFMC	USAFA / A4
Dwg-1/2	0	1	1	6	1	1
EMedia	1	1	1	6	1	1
SID ColBds	1	1	0	0	0	1

#### 35 PERCENT SUBMITTAL NOTES:

(1) Electronic Media Drawings:

Submit drawings electronically in CAD and PDF format as well as on paper.

(2) Include electronic color boards in each submittal that show colors of all proposed exterior and interior finishes. In addition, provide actual color boards in the quantity indicated in the submittal distribution list; these color boards shall show actual color samples of all proposed exterior and interior finishes.

### 3.5.1.4 60 Percent Design Distribution

See paragraphs above explaining Submittal Abbreviation Codes and Activity Distribution Addresses.

Activity / Submittal Item	CENWO-CDS-C	CENWO-PMM	CENWO-CDR-Y	10 CES/CENMP	AFCEC / CFMC	USAFA / A4
Dwg-1/2	0	1	1	6	1	1
EMedia	1	1	1	6	1	1

Activity / Submittal Item	CENWO-CDS-C	CENWO-PMM	CENWO-CDR-Y	10 CES/CENMP	AFCEC / CFMC	USAFA / A4
SID ColBds	1	1	0	0	0	1
FF&E Package	1	1	0	0	0	1

## 60 PERCENT SUBMITTAL NOTES:

(1) Show deletions and insertions (Revisions On) for all specifications. Include Process and Print Options for each section as follows (check boxes under):

- "Sections" Print/Process Sections and Renumber Paragraphs
- "Reports" a Section Table of Contents (Include Without Scope and Combine sections and section tables of contents)
- "Options" Section Dates shown, Units of Measure as English, Revisions shown, Start Page Numbering with "1", Restart for each section, Use orphan control
- "Header/Footer" (jobtitle) and (jobname) as a Header and Section number and Page number as a footer (similar to format shown on this section of the RFP).

## (2) Electronic Media Drawings:

Submit drawings electronically in CAD and PDF format as well as on paper. Provide the following drawings on the 'EMedia':

- interior design furniture footprint
- architectural composite and area floor plans, and reflected ceiling plans
- electrical lighting, thermostat, power and communication drawings

## (3) Include:

- electronic color boards in each submittal that show colors of all proposed exterior and interior finishes. In addition, provide actual color boards in the quantity indicated in the submittal distribution list; these color boards shall show actual color samples of all proposed exterior and interior finishes.
- electronic FF&E in each submittal that shows colors of all proposed finishes and fabrics. In addition, provide FF&E binders in the quantity indicated in the submittal distribution list; these binders shall have actual color samples of all finishes and fabrics..

## 3.5.1.5 100 Percent Design Distribution

See paragraphs above explaining Submittal Abbreviation Codes and Activity Distribution Addresses.

Activity / Submittal Item	CENWO-CDS-C	CENWO-PMM	CENWO-CDR-Y	10 CES/CENMP	AFCEC / CFMC	USAFA / A4
Dwg-1/2	0	1	1	6	1	1
EMedia	1	1	1	6	1	1
SID ColBds	1	1	0	0	0	1
FF&E Package	1	1	0	0	0	1

## 100 PERCENT SUBMITTAL NOTES:

(1) Show deletions and insertions (Revisions On) for all specifications.

Include Process and Print Options for each section as follows (check boxes under):

- "Sections" Print/Process Sections and Renumber Paragraphs
- "Reports" a Section Table of Contents (Include Without Scope and Combine sections and section tables of contents)
- "Options" Section Dates shown, Units of Measure as English, Revisions shown, Start Page Numbering with "1", Restart for each section, Use orphan control
- "Header/Footer" (jobtitle) and (jobname) as a Header and Section number and Page number as a footer (similar to format shown on this section of the RFP)

(2) Electronic Media Drawings:

Submit drawings electronically in CAD and PDF format as well as on paper. Provide the following drawings on the 'EMedia'

- interior design furniture footprint
- architectural composite and area floor plans, and reflected ceiling plans
- electrical lighting, thermostat, power and communication drawings

(3) Color boards include:

- electronic color boards in each submittal that show colors of all proposed exterior and interior finishes. In addition, provide actual color boards in the quantity indicated in the submittal distribution list; these color boards shall show actual color samples of all proposed exterior and interior finishes. Resubmittal of color board binders is not required if there are no changes from the previous design submittal; provide updated cover and spine for insertion into the previously submitted SID binder. If only minor changes are required, submit updated binder cover and spine, applicable coded samples (tape ready for application) and corrected legends for the color board binders. If major changes to the color board are required, resubmit the color board binders and include color samples of all proposed exterior and interior finishes and an updated legend.
- electronic FF&E in each submittal that shows colors of all proposed finishes and fabrics with actual color samples of all finishes and fabrics in the binders. Resubmittal of FF&E binder is not required if there are no changes from the previous design submittal; provide updated cover and spine for insertion into the previously submitted FF&E binders. If only minor changes are required, submit updated binder cover and spine, corrected FF&E sections, and applicable coded finish and fabric samples (tape ready for application). If major changes to the color board are required, resubmit the FF&E binders, include actual color samples of all proposed finishes and fabrics.

### 3.5.1.6 100 Percent Corrected Design Distribution

See paragraphs above explaining Submittal Abbreviation Codes and Activity Distribution Addresses.

Activity / Submittal Item	CENWO-CDS-C	CENWO-PMM	CENWO-CDR-Y	10 CES/CENMP	AFCEC / CFMC	USAFA / A4
Dwg-1/2	0	1	1	6	1	1
EMedia	1	1	1	6	1	1

Activity / Submittal Item	CENWO-CDS-C	CENWO-PMM	CENWO-CDR-Y	10 CES/CENMP	AFCEC / CFMC	USAFA / A4
SID ColBds	1	1	0	0	0	1
FF&E Package	1	1	0	0	0	1

## 100 PERCENT CORRECTED SUBMITTAL NOTES:

- (1) Show revisions executed (deletions removed and insertions markings removed) for all specification sections submitted. Include Process and Print Options for each section as follows (check boxes under):
- "Sections" Print/Process Sections and Renumber Paragraphs
  - "Reports" a Section Table of Contents (Include Without Scope and Combine sections and section tables of contents)
  - "Options" Section Dates shown, Units of Measure as English, Start Page Numbering with "1", Restart for each section, Use orphan control
  - Header/Footer" (jobtitle) and (jobname) as a Header and Section number and Page number as a footer (similar to format shown on this section of the RFP)
- (2) Submit drawings electronically in CAD and PDF format as well as on paper.
- (3) Do not submit color boards if there are no changes from the previous design submittal. If only minor changes are required, submit applicable coded samples (with tape ready for application) and corrected color legend. If major changes to the color board are required, resubmit the color boards with actual color samples of all proposed exterior and interior finishes and revised corrected color legend.

## 3.5.1.7 Construction Set Distribution

See paragraphs above explaining Submittal Abbreviation Codes and Activity Distribution Addresses.

Activity / Submittal Item	CENWO-CDS-C	CENWO-PMM	CENWO-CDR-Y	10 CES/CENMP	AFCEC / CFMC	USAFA / A4
Dwg-1/2	0	1	1	6	1	1
EMedia	1	1	1	6	1	1
SID ColBds	1	1	0	0	0	1
FF&E Package	1	1	0	0	0	1

## CONSTRUCTION SET SUBMITTAL NOTES:

- (1) Include all items in the 100 percent Corrected submittal and incorporate any additional comments made to 100 percent corrected design submittal.
- (2) Stamp each drawing sheet (P.E.) by the appropriate Designer.
- (3) Include all Electronic Media Drawings in CAD and PDF format on the ' **EMedia** ' in addition to all other Electronic Media documents.
- (4) E-mail a copy of the ECI per requirements stated in this section.
- (5) Include all changes made through accepted 100 Percent Corrected

Design.

#### 3.5.1.8 As-Built Submittals

See Section 01 78 39.00 24 AS-BUILT DRAWINGS for requirements.

#### 3.5.2 Review Comments Disposition

For each design review submittal, the Government will furnish comments from Omaha District and other agencies involved in the review process approximately 21 days **after receipt**, unless indicated otherwise. Conduct the review conference for the 35 Percent, 60 Percent, and 100 Percent Design submittals approximately 30 days after Government receipt of documents. Clearly outline reasons to justify noncompliance with any review comments so that they may be resolved at the design review conference. Furnish annotated comments, including the disposition of all comments in writing within five (5) days of the review conference. Record comments in the Contractor prepared Meeting Minutes described below. Forward the written documentation to the distribution list shown in paragraph: "Distribution of Design Documents for Conformance Review" above.

The Government will review the 100% Backcheck Review Documents for a period of fourteen (14) days **after receipt of the documents**. After this review, the Government will send a formal letter allowing the commencement of construction or rejecting the submittal.

Resolve any backcheck review comments to the 100 percent Corrected Design Submittals prior to distribution of Construction Set documents. Furnish copies of Annotated backcheck review comments indicating disposition of all comments with the Construction document set.

#### 3.5.3 Review Comments Resolution

For the review of submitted design documents, Government Agencies will forward review comments for discussion and resolution to the Contractor. For each review conference, provide adequate copies of annotated comments to all conference participants. Resolve comments and problems by immediate follow-on action at the end of conferences. Incorporate valid comments. The Omaha District will recommend acceptance to proceed with construction after receipt of final corrected design documents upon incorporation of all backcheck comments. Conduct as many backchecks as the Government deems necessary. The Government intends to utilize the Dr. Checks review system, which is available at:

<https://www.projnet.org/projnet/binKornHome/index.cfm>, for processing review comments and responses. The Government will provide access rights to the Design-Build Contractor after contract award. The Government reserves the right to not accept design document submittals and withhold design payments if comments on any design document submission are of too great of a significance. If final submittal(s) are incomplete or deficient, requiring correction and resubmittal for review, the Government will deduct the cost of rehandling and reviewing from payment at the rate of \$2000.00 (for each design discipline requiring resubmittal) per submittal. "Design Disciplines" in this paragraph consist of Architectural, Structural, Interior Design, Mechanical, Electrical, Civil/Site work, and Fire Protection.

#### 3.5.4 Delays

The Government will not consider delays caused by the Contractor in

completion of the 35 percent, 60 percent design, the 100 percent design or the 100 percent corrected design as valid reasons to delay completion of the entire design. The Government may not be held liable for delays caused by re-submittal efforts caused by designs submitted which are rejected by the reviewers.

### 3.5.5 Reproduction (For Construction):

Upon the Government's completion of the review of the 100% Corrected Design submittal, reproduce copies of the design documents (accepted for the purposes of beginning construction), subject to the incorporation of the Corrected 100% design review comments. Include the stamp or seal and signature of the registered architect or appropriate engineer responsible for the work proposed to meet the RFP requirements on the cover sheet of the drawings. Include the month and year that the drawings were cleared for beginning construction on each drawing. Include the date that the design documents were cleared for beginning construction on the Cover Sheet of the drawings, Cover Sheet of the Specifications, and Cover Sheet of the Design Analysis. Distribute as indicated above. Retain the originals for recording of as-built conditions. Upon completion of the project, supply the accepted design documents corrected to reflect as-built conditions to the Government. See Section 01 78 39.00 24 AS-BUILT DRAWINGS for as-built drawing requirements.

### 3.5.6 Government Design Review and Acceptance

#### 3.5.6.1 Design Review Conference and Post-Design Review Conference Minutes:

Hold all design review conferences at US Air Force Academy, unless directed otherwise. Government personnel will forward review comments for discussion and resolution prior to the design review conference. For each review conference, provide copies of annotated comments to all review conference participants. Resolve comments and problems by immediate follow-on action at the end of the conferences. Incorporate valid comments. Upon satisfactory Government review of the 100 percent corrected design documents, the Omaha District will formally provide Government acceptance necessary to initiate construction. The Government reserves the right to not accept design document submittals and to withhold design payments if comments are of too great of a significance. If final design submittal(s) are incomplete or deficient, requiring correction by the Contractor and resubmittal for review, the Government will deduct the cost of rehandling and reviewing from payment due the Contractor at the rate of \$2000.00 (for each design discipline requiring resubmittal) per submittal. For each review conference, submit to the Contracting Officer within five (5) calendar days, an electronic copy of meeting minutes summarizing major decision points and issues which require resolution. Attach annotated comments to these minutes.

#### 3.5.6.2 100% Corrected Design Documents

Submit complete design documents in the same quantity and to the same offices listed above in paragraph "**100% Corrected Design Distribution**", for each corrected 100 percent design submittal (one or more) until the Government is satisfied that all review comments are addressed and resolved.

### 3.5.6.3 Accuracy and Completeness of Design

Do not construe reviews by the Government of the design documents to be an endorsement of the accuracy or completeness of the design. Design deficiencies or omissions in the accepted design are the responsibility of the Contractor.

### 3.5.6.4 Responses to Review Comments

In responding to review comments presented by the Government, state how and where comments were addressed.

### 3.5.7 DD Form 1354, Transfer and Acceptance of Military Real Property

Prepare draft DD Form 1354 "Transfer and Acceptance of Military Real Property" (copy available at: [www.dtic.mil/whs/directives/forms/eforms/dd1354.pdf](http://www.dtic.mil/whs/directives/forms/eforms/dd1354.pdf) with the final design documents. Fill out DD Form 1354 in accordance with DD 1354 Instructions, UFC 1-300-08, and Air Force Manual AFMAN 32-1084 Facility Requirements (2016) and Air Force Instruction AFI 32-1024 Standard Facility Requirements. The deliverable consists of an electronic copy of the DD 1354.

Complete the interim DD Form 1354 after substantial completion of construction in preparation of final acceptance. Complete and store the DD Form 1354 in RMS. When the final costs of construction are accrued, furnish the final DD Form 1354 to the accountable Service, including all additional expenses incurred following the placed-in-service date or the date the interim DD Form 1354 was signed.

## 3.6 REVISIONS TO THE ACCEPTED DESIGN

### 3.6.1 Minimization of Design Revisions

The accepted design will be used by all parties involved in construction and in administration of the contract. Therefore, keep the design documents up to date and implement an effective system of making and distributing changes. Since changes to the design increase risk of construction errors and deplete available administrative resources, make every effort to minimize revisions to the accepted design. The Government will use the goal of minimizing changes to the accepted design to measure the effectiveness of the Contractor's management. Use effective quality control during design, and experienced and capable designers as means to accomplish this goal.

### 3.6.2 Supplemental Design Package and Certification

If revisions to the accepted design (Construction Set) become necessary, submit a Supplemental Design Package using Attachment B "Supplemental Design Certification and Transmittal Form" attached at the end of this specification section. Submit this Supplemental Design Package as a "G-DO" construction submittal in accordance with Section 01 33 00 SUBMITTAL PROCEDURES. The Government will consider the revisions a "Variation". Identify the list of deviations from the accepted design on the Supplemental Design Certification and Transmittal Form and on the construction submittal form ENG Form 4025.

The Contractor's Designer and Contractor's Quality Control Representative as well as the Contracting Officer must approve variations as conforming with the RFP before construction of items affected by these revisions can



commence. Comply with all the requirements of paragraph "VARIATIONS" of Section 01 33 00 SUBMITTAL PROCEDURES in preparation of the Supplemental Design Package.

## Attachment A - DESIGN CERTIFICATION AND TRANSMITTAL LETTER

[Contractor's Letterhead]

[Date:

\_\_\_\_\_]

[Contract No.

\_\_\_\_\_]

[Reviewing Component Address]

Subj: DESIGN CERTIFICATION AND TRANSMITTAL LETTER

[Project Title \_\_\_\_\_]

[Project Location \_\_\_\_\_]

[Contract No. \_\_\_\_\_]

Greetings:

Enclosed are the following documents, which I hereby certify are in compliance with the RFP requirements of the subject construction contract and can be used to commence construction subject to Government Conformance Review:

1. Design Drawings
2. Project Specification
3. Design Analysis
  - a. Civil
  - b. Water Supply and Wastewater Collection
  - c. Architectural
  - d. Interior Design
  - e. Structural
  - f. Mechanical
  - g. Fire Protection
  - h. Electrical
  - i. Communications
  - j. Environmental Protection, Compliance and Permits
  - k. Health and Safety
  - l. Sustainable Design
4. Submittals Register
5. All other Design Deliverables
6. Deviations (List of Deviations with Justification Attached)

[Typed Name, Date and Signature of an  
Officer of the Contractor's Company]

[Typed Name, date, and Signature of the Contractor Quality Control (CQC)  
System Manager along with Stamp of Approval]

[Typed Name, date, and Signature of the Designer of Record (Registered  
Professional Engineer) along with PE Stamp of Approval]

Copy to:  
[As standard with the Contractor]



## Attachment B - SUPPLEMENTAL DESIGN CERTIFICATION AND TRANSMITTAL FORM

[Contractor's Letterhead]

[Date:

\_\_\_\_\_]

[Contract No.

\_\_\_\_\_]

[Reviewing Component Address]

Subj: SUPPLEMENTAL DESIGN CERTIFICATION AND TRANSMITTAL FORM

[Project Title \_\_\_\_\_]

[Project Location \_\_\_\_\_]

[Contract No. \_\_\_\_\_]

## Greetings:

The supplemental design items listed below and the attached documents, unless identified otherwise, I hereby certify are in compliance with the RFP requirements of the subject construction contract and are compatible with other elements of work, subject to Government conformance review:

1. Nature and Features of the Design Variation(s):
2. Why the each Design Variation is desirable and Beneficial to the Government:
3. List of any additional Deviations from the RFP:
4. List of Specific Documents Supporting Design Variation(s):
  - a. Design Drawings
    - (1) Sketches:
    - (2) Reissued Drawings:
    - (3) Descriptive Changes:
  - b. Project Specification
    - (1) Reissued or New Sections:
    - (2) Descriptive Changes:
  - c. Design Analysis
    - (1) Reissued Pages:
    - (2) Reissued or New Calculations:
  - d. Any other Design Deliverable:

[Typed Name, Date and Signature of an  
Officer of the Contractor's Company]

[Typed Name, date, and Signature of the Contractor Quality Control (CQC)  
System Manager along with Stamp of Approval]

[Typed Name, date, and Signature of the Designer of Record (Registered  
Professional Engineer) along with PE Stamp of Approval]

Copy to:

[As standard with the Contractor]

-- End of Section --



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## SECTION 01 33 00.34

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7/19

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## SECTION 01 33 00.34

## 35 PERCENT DESIGN REQUIREMENTS

7/19

## PART 1 35 PERCENT DESIGN SUBMITTALS

For general submittal requirements, See Section 01 33 00.32 DESIGN AND CONSTRUCTION DELIVERABLES/PROCEDURES.

## 1.1 REFERENCES

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 4-010-06 (2016; with Change 1, 2017) Cybersecurity  
of Facility-Related Control Systems

See individual discipline requirements specification sections for other reference criteria to be used during the design process and for the creation of design analyses.

## 1.2 CIVIL/SITE

## 1.2.1 DRAWINGS

## 1.2.1.1 Location Plan and Vicinity Map

A Vicinity Map consists of a small scale drawing of the project location, similar to a road map. A Location Plan consists of a small scale drawing showing the Government property or reservation limit with the construction project site shown. The drawing shall show the facility approved Contractor Access and Haul Routes. A reproducible base sheet, if available, may be provided by the Omaha District for the Contractor's use in preparing the Location Plan.

## 1.2.1.2 Survey Plan

The information depicting existing conditions used to generate site drawings shall be shown on this drawing. An engineering survey of the site will be presented to the Contractor selected as a result of this RFP process. Any additional survey information required by the Contractor for design above that shown in the prepared engineering survey shall be procured and paid for by the Contractor.

## 1.2.1.3 Removal Plan

The removal plan will show the existing physical features and condition of the site before construction. This information should include the field survey to show all above and below ground utilities; buildings, drives, roads and parking areas, walks, and vegetation; and such facilities as retaining walls, underground storage tanks, foundations, etc. Each physical feature to be removed shall be as indicated on the standard legend sheet, a legend on the removal plan, and properly noted: to be removed, to remain, or to be relocated.

#### 1.2.1.4 Site Plan

The Site Plan shall show all the site layout information necessary to field locate the building, walks, parking lots, bicycle parking areas, and all other appurtenances to be constructed on the project. All site related work to be constructed will be located by dimensions. The Site Plan will identify all site related items such as: curbs, pavements, walks, plazas, seating areas, bollards, trash enclosures, retaining walls, chiller units, electrical transformers locations, etc. in accordance with a standard legend sheet or with additional legends or notes. Site Plans shall be at a scale of 1 Inch = 20 Feet or 1 Inch = 40 Feet. Other drawing scales must be approved by the Omaha District. North arrows shall be oriented the same direction on all plan sheets and by all disciplines. No existing or proposed contours shall be shown on this Plan. The Site Plan, prior to adding the dimensions, should serve as the base sheet to the other Plans, such as: Utilities Plan, Grading and Drainage Plans and Landscape Plan. The Site Plan shall show all existing physical features and utilities within and adjacent to the work site that will remain after the proposed construction has been completed. This plan will also show any free zones, construction limits, and storage areas etc. Whenever the Site Plan occupies more than one sheet of drawings, a Key Plan shall be included. Additional plans showing specific areas of the site in smaller scales can be included if more detail is necessary.

#### 1.2.1.5 Grading and Drainage Plan

A preliminary grading and drainage plan shall be provided at the same scale as the site plan (1 Inch = 20 Feet or 1 Inch = 30 Feet). Other drawing scales must be approved by the Omaha District. Tentative new and existing grading contours shall be indicated at 1-foot contour intervals. Indicate finished floor elevation of the new buildings. Plans shall show layout of the new and existing storm drainage systems. Uniform grades shall be labeled using slope arrows. Provide spot elevations at building corners, parking area corners, changes in grade, etc. Provide location and description of benchmarks and indicate vertical and horizontal datums.

#### 1.2.1.6 Grading Sections

Provide grading sections through the site showing finished and existing grades, pavement sections in detail, slope percentage, ditches, etc.

#### 1.2.1.7 Typical Pavement Sections

Provide typical pavement and road sections and details showing interface between new and existing pavements and new pavements of different sections.

#### 1.2.1.8 Site Furnishing Details

The Contractor shall provide designs and details as necessary for site furnishings and accessories.

#### 1.2.1.9 Landscape Plan

A Landscape Plan is included in the drawing set to serve as a guide in preparing the final contract drawings. A detailed Landscape Plan showing trees, shrubs, ground covers, seeded and sodded areas, shall be prepared by the Contractor. The Landscape Plan shall be prepared by a fully qualified, experienced professional Landscape Architect. The Contractor shall specify types of plant materials that are locally grown,

commercially available and acclimated to the project environment. The Landscape Plan shall include a plant material schedule. This schedule shall include botanical names, common names, size, the method of planting and remarks. The Landscape Plan shall also show all unsurfaced ground areas disturbed by construction within the project limits with these areas shown to be seeded, sodded, and/or mulched as required.

#### 1.2.1.10 Landscape Details

The Contractor shall verify the methods of planting to meet the project site/installation requirements and provide the necessary Landscape Details to perform the contract design work. Details shall reflect local practices and conditions for installation. The Contractor shall provide designs and details as necessary for other required site furnishings and accessories.

#### 1.2.2 SPECIFICATIONS

Specifications are not a required submittal item for this design phase.

#### 1.2.3 DESIGN ANALYSIS NARRATIVE

Design analysis shall include the following:

##### 1.2.3.1 References

Design references used in preparing the civil/site design.

##### 1.2.3.2 Grading

A narrative of the grading design and criteria used.

##### 1.2.3.3 Pavements

A narrative of the pavement design and criteria used.

##### 1.2.3.4 Drainage

A narrative of the drainage design and criteria used. Include information on the storm drain pipe materials selected and their ability to withstand earth dead loads and live loads that will be imposed.

##### 1.2.3.5 Basis, Specific Goals, Objectives and Priorities For Civil/Site Design

The Design Analysis should give the basis for the civil/site design and should establish specific goals, objectives and priorities for civil/site design of the project. Identify, explain and document use of design criteria and how the design meets goals, objectives and priorities. Identify the preferred site development concept. Document pollution prevention measures and other environmental considerations made during design. The 35 percent Design Analysis must be approved and accepted before 60% design submission.

#### 1.2.4 DESIGN ANALYSIS CALCULATIONS

##### 1.2.4.1 Storm Drainage System Calculations

Storm Drainage System Calculations shall include the following:

- a. Drainage area map showing boundaries of each drainage area and respective drain inlet or culvert.
- b. Storm run-off calculations for each drainage area.
- c. Preliminary storm drain pipe sizing calculations.

#### 1.2.4.2 Pavement Calculations

Pavement thickness calculations for each pavement.

### 1.3 GEOTECHNICAL

See Structural Design Requirements.

### 1.4 WATER SUPPLY AND WASTEWATER

#### 1.4.1 DRAWINGS

##### 1.4.1.1 Water Distribution and Sewage Collection Systems Plan (including building services)

Provide all existing utilities and above ground features which may pose as an obstacle (i.e., water, sewer, gas, electrical, etc.) on the basic site plan layout. Exclude site notes and dimensions from the plan. Provide all proposed new water and sewer lines with preliminary sizes. This shall include all new service lines up to the 5-foot building line. Show the proposed locations of all new manholes, fire hydrants, valves (including PIV's), connection points and etc.

#### 1.4.2 SPECIFICATIONS

Specifications are not a required submittal item for this design phase.

#### 1.4.3 DESIGN ANALYSIS NARRATIVE

Design analysis shall include the following:

##### 1.4.3.1 References

Provide design references used in preparing the water and wastewater design.

##### 1.4.3.2 Water Supply and Distribution Systems

A narrative of the water supply and distribution systems design and applicable criteria used shall be provided. Include the peak and average domestic demands, the fire flow required and the available flow and residual pressures. A description of the water distribution system, a listing of allowable piping materials, hydrant flow test data and preliminary calculations necessary to support equipment, piping sizes, fire and domestic demands, etc., shall be provided.

##### 1.4.3.3 Wastewater and Sewers

A narrative of the wastewater supply design and applicable criteria used shall be provided. Include the preliminary calculations used to design the average, diurnal peak, and extreme peak flows. Full flow capacity (70% of the total depth) of the existing system to ensure that it will be adequate

for the flows generated by the new facility. Include the available capacity and full flow capacity in the design analysis. Preliminary calculations necessary to support equipment and piping sizes and a listing of allowable piping materials shall be provided. The design shall be in accordance with the velocity requirements of Section 01 89 00 SITE WORK REQUIREMENTS.

## 1.5 ARCHITECTURAL

### 1.5.1 DRAWINGS

Thirty-five percent architectural drawing submittal shall be a complete set of architectural drawings without large scale details. All other drawings shall be complete except referencing of the large scale details.

#### 1.5.1.1 Floor Plans

Provide scaled double-line drawings showing the complete functional arrangement of spaces, required adjacencies, circulation, required exiting, and required number of plumbing fixtures. Indicate door swing and window type; however, door and window schedules are not required.

For large buildings that require the floor plans to be divided into several areas, provide a Composite Floor Plan of the entire building, drawn at the largest scale practicable to include the entire building or floor level on a single sheet. Subsequent floor plan sheets drawn at a larger scale will show the individual floor plan areas, with a Key Plan indicating the individual area location. Include a gross area tabulation comparing the actual square footage with the authorized square footage of the facility in the first composite floor plan sheet. Include the following for each plan:

- North Arrow
- Overall and Control dimensions
- Match Lines for delineating individual areas of floor plans
- Room Names and Numbers
- Structural Column Grid
- Wall and Building Section Cuts
- Door Swings
- Square Footage
- General Notes

The key plan located on each floor plan sheet should clearly show the inter-relationships between the individual building areas. Locate key plans in consistent locations throughout the sheet set for easy navigability. Include major elements of mechanical and electrical equipment affecting space allocation on the architectural plan. Ensure that equipment does not overcrowd the sheet, making it difficult to read.

#### 1.5.1.2 Life Safety Plan

Provide a separate (composite type) floor plan for each floor of the building showing all of the various Life Safety features and functions, such as building Occupancies, Hazardous areas, travel distances, exit capacities, fire and smoke partitions, and similar features clearly indicated. This plan can be a separate plan in the Architectural drawing set, or can be combined with the Fire Protection drawings, as long as all of the necessary information is shown. See FIRE PROTECTION section of this specification for more information on required fire protection criteria.

## 1.5.1.3 Roof Plan

Provide a composite Roof Plan showing the general roof configuration and major roof features contemplated.

## 1.5.1.4 Building Elevations

Provide all four building elevations to show the overall appearance, wall and roofing materials, windows, doors, and other architectural treatments. Dimension elevations to show story height, total height, and relation to grade.

## 1.5.1.5 Building Cross Sections

Provide building cross sections to show general interior volumes, framing methods, and floor-to-floor and ceiling heights. Identify materials used and necessary dimensions.

## 1.5.1.6 Room Finish Schedules

Provide a Room Finish Schedule showing preliminary room finishes. Room Finish Schedule shall be complete in accordance with Corps of Engineers (COE) standard format.

## 1.5.1.7 Drawing Scales

Architectural work must be legible and drawn at the scales listed below. In addition, larger scale drawings may be required to supplement the standard drawing scale drawings for clarity. Smaller scale drawings may be used only by written authorization through the USACE Project Manager. All disciplines (Interior Design, Structural, Mechanical, Electrical, and Fire Protection) should use the same scale for plan sheets, with exceptions (as needed) for detailed plans.

	<u>ENGLISH</u>
Composite Plans (Note 1)	Varies
Floor Plans	1/8-Inch = 1'-0" min.
Roof Plans	Legible
Composite Exterior Elevations Plans)	Varies (same scale as Composite
Building Cross Sections	Legible
Life Safety Plans (Note 1)	Varies

## Notes:

1. Scale composite plan(s) as required so that the entire facility is drawn on one sheet without break lines.
2. All areas of the facility floor plan must be drawn at this scale and areas of the facility should be the same for other design disciplines. The goal of this requirement is that the area plans used as base sheets for other disciplines be at a scale that are large enough to read, review, and bid when reproduced. Provide key plans for facility designs with multiple areas, which cannot be drawn on a single sheet. By authorized written permission, a smaller scale may be used on large open facilities such as hangars or warehouses, which do not contain administrative areas. On concept/early preliminary designs, smaller scale



drawings may be used when approved to allow for the entire floor plan to be shown on a single sheet.

#### 1.5.1.8 Legends

Standard architectural material symbols used on the drawings shall be provided as a separate architectural legend drawing located just in front of the architectural drawings in the set. Additional material symbols should be added to the Legend Sheet as needed for the project.

#### 1.5.1.9 North Arrows

Orient North arrows in the same direction on all plan sheets and by all disciplines, including site and civil drawings. Orient plan-north "up" or to the left on the drawings. Indicate true north on composite and area plan drawings. North arrows shall be located approximately at the same location on all sheets.

#### 1.5.1.10 Modular Design

Follow modular masonry design practices in the design of all masonry buildings. Figure dimensions to whole or half-unit lengths, in increments of 4-inches (for standard brick) or 8-inches (for standard concrete masonry units) in order to reduce on-site cutting of masonry. Avoid units less than 4-inches long to the greatest extent practical.

#### 1.5.1.11 Symbols

Utilize a consistent room and door number system for all facilities designed under any one contract. Where plans are site-adapted, the symbols need not be changed to the District standards, except those related to the identification of amendments and modifications to a contract. Do not use the standard symbols for Amendments (a triangular box) or Modifications (a type of circular box) for any other purpose, and care take care to avoid using similar-appearing symbols. When possible, start room numbering at the main entrance and proceed clockwise around functional areas. Obtain approval from this strategy from the Government.

#### 1.5.1.12 Schedules

Provide clear and complete schedules for room finish, doors, windows, louvers, etc. Provide as many columns as necessary in order to present the essential information. The "Remarks" column should not be used as a substitute for an information column. Normally a single item should be presented on each schedule line. Category group scheduling will be permitted only for facilities with a large percentage of repetitive rooms. Other scheduling methods as standard with the AE may be used if approved by written authorization from the USACE Project Architect. Color information will be specified in UFGS 09 06 00, SCHEDULES FOR FINISHES, or noted on the drawings in schedule format. The sheen of a particular paint system will be coordinated with UFGS 09 90 00, PAINTS AND COATINGS.

#### 1.5.1.13 Notes

Notes may be placed on drawings to reduce the amount of repetitive drafting, provided that clarity is not lost. General notes should be placed at the right-hand edge of the sheet.

#### 1.5.1.14 Dimensions

Provide complete, accurate and fully coordinated dimensioning. Dimensions should be to points easily measurable in the construction, and should be laid out to eliminate re-figuring in the field. Dimensions should be tied to column lines, etc., to facilitate checking. Plan dimensions for frame construction should be to face of stud for exterior walls, to one face of stud for interior partitions, and to centerline of openings. For masonry construction, dimensions should be to one or both nominal faces of masonry and to jambs of openings. When dimensioning, use arrowheads, not dots or slashes.

#### 1.5.1.15 Facility Elevation

Indicate the elevation of the first floor as 100'-0" (100 000 for metric projects). Ensure that top of slab of ground-level floors is a minimum of 6 inches above finish grade. Relate elevations for other floors, footings, etc., to this figure. Do not show sea level elevations on the architectural drawings. Coordinate finished floor elevation with the civil drawings. Indicate elevations of the first floor above sea level on the Civil grading plans.

#### 1.5.2 SPECIFICATIONS

Specifications are not a required submittal item for this design phase.

#### 1.5.3 DESIGN ANALYSIS NARRATIVE

The Design Analysis shall be essentially complete with emphasis on the following:

##### 1.5.3.1 Additional Criteria/Clarification

A list of items on which additional criteria, clarification, or guidance is required.

##### 1.5.3.2 Site Adaptation of Standard Drawings (as applicable)

Include the following when site adapting a design.

a. An outline of the selections made where the standards permit the designer a choice of design or material.

b. An outline of items on the standard that do not conform to current criteria or to the design instructions, and suggested methods for changing the standards.

c. An outline of errors found in the standards and suggested methods for correction and improvement.

##### 1.5.3.3 General Parameters

The design analysis shall follow the format described herein.

a. The purposes, overall functions, and total capacities of the facility.

b. The design theme or visual appearance of the exterior and interiors of

the building, and how this facility coordinates with the image criteria of the installation on which it will be constructed.

- c. The number of personnel to use facility; military, civilian, and visiting personnel.
- d. The type of activities, equipment, and vehicles involved.
- e. The anticipated life of the functions to be accommodated.
- f. The category of construction; permanent, temporary, or relocatable.

#### 1.5.3.4 Functional and Technical Requirements

- a. Functional areas, occupant capacities, and allocation, including a functional relationship matrix.
- b. All items of required equipment.
- c. Occupational safety and health.
- d. Accessibility for people with disabilities.
- e. Energy conservation including solar energy applications and energy budget goals.
- f. Sound and vibration control.
- g. Physical security; lock and keying, intrusion-detection, alarms, restricted access areas, interior guard support, and ties to local authorities.
- h. Justification for selection of exterior and interior finishes and materials.
- i. Moisture Vapor Control.
- j. Lessons learned incorporated into the design.

#### 1.5.3.5 Design Objectives and Provisions

- a. Adaptation of the building to the size, shape, and orientation of the site to include benefit from natural warming and cooling effects afforded by the site.
- b. Organization of functional spaces to establish workable adjacency relationships.
- c. Building layout to establish convenient circulation flows during normal operation and emergency evacuation activities, for materials, equipment, services, and people.
- d. Grouping spaces into sound-compatible zones and protective construction zones, e.g., for fire and storm.
- e. Space layout compatible with modular (structural and environmental) support systems.
- f. Type of construction materials, architectural systems, and finishes,

including windows, doors, roofing systems and other major building components, to include basis for selection.

g. Building expandability/changeability.

h. Physical security and Anti-Terrorism/Force Protection.

i. Barrier-free design/ABA.

j. Energy conservation. (passive, insulation, orientation)

k. Acoustical design.

l. Sustainability. Include a narrative of the architectural portion of the design that addresses applicable UFC 1-200-02 and third-party certification requirements.

m. Composition of masses and spaces architectural compatibility and architectural details to reflect the design theme and desired image, and the scale and nature of the activities involved.

n. Perception of the building details and volumes. (Specific provisions made, e.g., an identifiable sequence of viewing positions for experiencing the interior and exterior architectural design.)

o. Enhancement of materials and systems maintenance and operation.

p. Economy of building construction, operation, and maintenance: life cycle cost effectiveness.

#### 1.5.3.6 Coordination with Installation or Outside Agencies

a. Physical security support.

b. Blind vending operations.

c. Government furnished equipment.

d. Operations and maintenance support.

#### 1.5.3.7 Checklists

Include the Fire Protection and Building Code Analysis, Lessons Learned Checklist, LEED (or other third-party certification), and ABA Checklist in the Design Analysis.

#### 1.5.3.8 Sketches

All sketches presented during the design phase shall be reduced to 8-1/2" by 11" and included in this design analysis to document the design options and decisions evaluated during the design process.

#### 1.5.4 DESIGN ANALYSIS CALCULATIONS

a. Net room areas, occupant capacity and gross building areas. (Categorize areas and capacities under the titles of "Operational Space Requirements", "Administrative Space Requirements", "Storage Space Requirements", and "Support Space Requirements".)

- b. DD Form 1391 scope validation calculations.
- c. U-values for each wall, window, door, or roof type studied or selected.
- d. Ratio of exterior window and room area, if applicable.
- e. Acoustics, if applicable.
- f. Gutter roof drain and downspout calculations.
- g. Condensation calculations.

## 1.6 INTERIORS

### 1.6.1 DESIGN ANALYSIS NARRATIVE

The design analysis shall contain an explanation of the desired image or visual appearance of the interior of the facility and the design intent.

### 1.6.2 DRAWINGS

Include a scaled furniture floorplan indicating proposed furniture layout in the drawings. Label furniture on the plans and provide a furniture legend on the drawings. Identify on drawings if furniture is not in contract.

### 1.6.3 SPECIFICATIONS

Specifications are not a required submittal item for this design phase.

### 1.6.4 FURNITURE, FIXTURES & EQUIPMENT (FF&E) PACKAGE

FF&E Package is not a required submittal item for this design phase.

### 1.6.5 COLOR BOARDS AND LEGENDS

At this design phase, submit SID color boards showing major interior and exterior finishes. Major interior finishes include but are not limited to major flooring finishes, tile, and wall paint (including accent wall paint colors). Color boards must show actual color samples of all proposed exterior and interior finishes. A color board legend shall accompany the boards and shall clearly identify all finishes. Clarification of finish placement shall be required when more than one color of a single finish is proposed. Color boards shall be 8 1/2" x 11" in size and provided in a three ring binder. Include project name and location, design stage and date on the front cover and spine of the binder.

### 1.6.6 DESIGN ANALYSIS NARRATIVE

The design analysis shall contain an explanation of the desired image or visual appearance of the interior of the facility and the design intent.

## 1.7 STRUCTURAL

### 1.7.1 DRAWINGS

Drawings shall include preliminary roof and floor framing plans, floor slab plans and foundation plans. Roof and floor framing plans shall show sufficient details to clearly indicate the type of framing system used,

size and spacing of members and their elevations. The preliminary location of all columns or pilasters shall be shown, and all building structural members shall be at least outlined. The preliminary sizes, locations and elevations of footings shall be shown. Slab plans shall be coordinated with the Architectural sheets and shall indicate the locations of structural walls and masonry partitions, recessed slabs and contraction or construction joints. . Elevation views, sections and details necessary to illustrate the design at a 35% level of completion shall be provided. Drawings shall also include overall building plan dimensions, north arrows, and design notes. Drawings shall be at done at a scale appropriate for the design, in no case however, shall plan type drawings be done at a scale smaller than 1/8" = 1'-0" or detail type drawings at a scale smaller than 1/2" = 1'-0".

#### 1.7.2 SPECIFICATIONS

Specifications are not a required submittal item for this design phase.

#### 1.7.3 DESIGN ANALYSIS NARRATIVE

Design analysis shall follow the format described in Section 01 33 00.32 DESIGN AND CONSTRUCTION DELIVERABLES/PROCEDURES, Paragraph 3.3, "Design Analyses" and the specific content shall be essentially as outlined below.

##### 1.7.3.1 Design Criteria and References

A list of design criteria references, such as DOD Unified Facilities Criteria, Department of the Army Technical Manuals, ACI Standards, AISC Specifications, etc., and any other references which were used in the design of the project shall be included in the narrative.

##### 1.7.3.2 Design Loads and Conditions

A list of structural design loads and conditions shall be provided, including:

- Snow load parameters;
- Wind load parameters
- Seismic design parameters;
- Roof live loads;
- Floor live loads, identifying each loading with usage and the room or space where used;
- Progressive Collapse load parameters
- Foundation design criteria, including the design depth for footings, allowable soil bearing pressure, equivalent fluid densities (or lateral earth pressure coefficients) for the design of earth retaining structures and building components, modulus of subgrade reaction, and any other pertinent data derived from the recommendations of the Final Geotechnical Investigation Report, a copy of which shall be included as an Appendix to the design analysis.

##### 1.7.3.3 Structural Materials

A list of structural materials shall be provided, together with the stress grades and/or ASTM designations, as applicable, for structural steel, concrete, and reinforcing steel; the series for steel joists; and identification of the proposed use of each material in the structure.

#### 1.7.3.4 Description of the Structural System

A concise description of the proposed structural system for the building, together with the reasons for its selection, shall be provided. All principal elements of the structural system selected shall be described. Typically, these shall include:

- Primary supporting members for the roof;
- Masonry walls, type of material, and whether load bearing or non-load bearing, with location of load-bearing walls defined, and measures taken to compensate for expansion/contraction and crack control in masonry walls;
- The proposed system for resisting lateral forces (wind and earthquake) and transferring them to the ground, whether diaphragms, chord bracing, shear walls, braced or moment resisting frame, etc;
- Foundations, description of special designs to accommodate existing site conditions;
- Concrete slab-on-grade floors, description of floor surface finish treatment, accommodation of live loads, and the use, location and types of crack control joints;
- The proposed treatment of any unusual structural loadings, features or unique solutions to structural problems.
- Identification of any major vibrating elements and measures taken to isolate them.

#### 1.7.4 Design Analysis Calculations

The extent of the structural calculations shall be indicative of a design which has reached a 35% level of completion. Computations shall include snow, wind, seismic, dead and live loads. Computations shall show sizing and spacing of structural members for roof and floor framing, sidewalls and foundation sizes, as appropriate to the systems to be used for these elements.

#### 1.7.5 Final Geotechnical Investigation Report

The Contractor's geotechnical engineer shall accomplish additional site investigation, soil borings, and laboratory testing as deemed necessary to support the design of the project. A final geotechnical investigation report shall be prepared and submitted to the Contracting Officer.

The work will be coordinated with the Contracting Officer and shall not interfere with normal base operations. The cost of any additional geotechnical work shall be included in the contract amount.

#### 1.8 MECHANICAL

Compliance with the design requirements for the building mechanical systems will be determined by a review of the submitted 35 percent drawings and design analysis. Any conflicts in the design requirements or lack of thorough understanding of the nature and scope of work shall be identified and resolved prior to submittal of the 35 percent design.

### 1.8.1 DESIGN DRAWINGS

The 35 percent design drawings shall be fully coordinated with the design analysis. Sufficient plans including but not limited to major equipment layouts, ductwork and piping layouts, and sections at a minimum shall be provided as necessary to define the required design intent. Floor plans shall use the architectural floor plans as a basis, with the building outline half-toned. Unless otherwise indicated, all floor plans shall be drawn at  $1/8" = 1'-0"$  scale and show all room names and numbers. An exception to this are administrative areas being air-conditioned shall be  $1/4" = 1'-0"$  scale and mechanical room plans shall be  $1/2" = 1'-0"$  scale. Sheet reference number sequencing shall be in accordance with the National CADD Standards with Omaha District CADD requirements. Submittal drawings shall include, but not limited to, the following:

#### 1.8.1.1 Mechanical Index Sheet

An index sheet identifying all mechanical drawings shall be provided, including those drawings anticipated to be provided in the 100 percent design submittal. Index shall include drawing file numbers, drawing numbers, sheet numbers, and drawing descriptions.

#### 1.8.1.2 Mechanical Abbreviation, Legend, and General Notes Sheet

This sheet shall include all mechanical abbreviations and symbols that will be used on the drawings. Symbols shall be grouped into sections; as a minimum, provide sections for Plumbing, Heating, Miscellaneous Piping, Valves and Fittings, and ventilation.

#### 1.8.1.3 Exterior Utility Drawings

The following exterior utility drawings shall be provided:

##### a. Removal Plan

All existing exterior mechanical utilities and utilities which are to be removed shall be indicated on the Site Removal Plan located in the civil section of the drawing package.

##### b. Utility Plan:

All existing and new mechanical utilities shall be indicated on the Site Composite Utilities Plan located in the civil section of the drawing package. The location of existing exterior utilities shall be thoroughly checked and indicated on plans and profiles, thus preventing interference with new services. The utility drawing shall indicate all new utilities, including tie-in points, and existing utilities which are to be abandoned.

### Plumbing Drawings

The following plumbing drawings shall be provided:

##### a. Plumbing Plans

Plumbing plans showing the design and tentative layout of the domestic hot and cold water distribution systems; make-up water piping; soil, waste and vent piping; and storm water drainage system shall be provided. Plans



shall show all anticipated routing of piping systems from the connections within the structure to a point 5 feet outside the structure. The grade of all drain lines shall be calculated and invert elevations established. All electrical panels/equipment and pertinent HVAC equipment (expansion tanks, boilers, AHU's, pumps, lawn sprinkler system, etc.) shall be outlined in half-tone on the plumbing plans. Plans may combine building areas and be drawn at 1/8" = 1'-0" scale as long as legibility is not compromised. Plumbing fixtures and drains shown on the drawings shall be designated by the same identification system used in the Technical Specification and Plumbing Fixture Schedule.

b. Enlarged Mechanical Room Plumbing Plan

An enlarged mechanical room plumbing plan drawn at a minimum 1/4" = 1'-0" scale shall be provided. Plan shall show layout of all plumbing equipment and piping within the rooms. In addition to all the plumbing systems required, the plan shall show half-toned outlines of all HVAC equipment located in the room, gas service, lawn sprinkler apparatus, the fire protection entrance and risers, and the outline of any electrical panels or equipment located in the room.

1.8.1.4 Mechanical HVAC Drawings

Show on mechanical HVAC drawings, all items of mechanical equipment, including mechanical room equipment, HVAC equipment layout, air handling units, air distribution and exhaust systems, etc., to determine proper space allocation within the intent of the architectural layout requirements. Plans, elevations, and sections shall be developed sufficiently to insure that major equipment items, piping, and ductwork cause no interference with structural members, electrical equipment, etc. The following HVAC drawings shall be provided:

a. Mechanical HVAC Plans

Mechanical HVAC plans showing the design and tentative layout of the hot water piping distribution system and equipment, the air supply and distribution systems, and the ventilation and exhaust systems shall be provided. Air supply and distribution systems shall show all ductwork, including supply and return ductwork, ductwork to diffusers, and all diffusers. For the 35 percent submittal, all ductwork may be shown as single-lined. The final design submittal shall show all ductwork as double-lined. All electrical panels/equipment and pertinent plumbing equipment shall be outlined in half-tone on the HVAC plans.

b. Enlarged Mechanical Room HVAC Plans

Enlarged mechanical room HVAC plans showing all mechanical systems and drawn at a minimum 1/2" = 1'-0" scale shall be provided. Plans shall show layout of all equipment, piping, and ducts located within the rooms. Equipment shall include (but not limited to) air handling units with associated outside air intakes, relief air, and supply/return ducts; exhaust/supply fans, mechanical room ventilation intake/relief openings, gas service entrance, combustion air opening, unit heaters, HW pumps, boilers, expansion tanks, and temperature control panels. Plans shall show dedicated access space for items requiring maintenance. In addition to all the mechanical HVAC systems required, the plan shall show half-toned outlines of all major plumbing equipment, the water service entrance, fire protection entrance and riser, lawn sprinkler apparatus, and any

electrical equipment or panels located in the room.

c. Mechanical Room Sections:

For each air handling unit within the mechanical room, a mechanical room section view shall be provided showing, but not limited to, all AHU components, ductwork connections/routing, and relationship to adjacent structural features.

d. Chilled and Heating Water System Flow Diagrams:

Provide flow diagrams showing the facility piping system including the pumps and connected chilled / heating water equipment. Each pump and equipment item shall show associated cfm flowrate. All thermometers, pressure gauges, isolation and control valves, bypass piping, freeze protection piping, etc. shall be shown on the flow diagram.

e. Mechanical Detail Sheets:

Installation details showing all specification requirements such as isolation and balancing valves, thermometers, pressure gauges, equipment pads, strainers, vents, hangers, vibration isolation, etc. shall be provided for each item of mechanical equipment. As a minimum, the following mechanical details shall be provided to the extent they are included in the design:

- Refrigerant Piping Diagram
- Hot Water Boiler and Piping Diagram
- Chilled water piping Diagram
- Chilled water pumps
- Hot Water Pumps
- Expansion Tanks
- Horizontal Unit Heater
- Vertical Unit Heater
- Chemical Shot Feeders
- Gas Service Entrance
- Cabinet Unit Heater
- Air Handling Units
- Wall Propeller Supply/Exhaust Fan
- In-line Supply/Exhaust Fan
- Relief Hood
- Relief Vent
- Exhaust Hoods
- Seismic Requirements for Floor-Mounted and Suspended Equipment

f. Mechanical Schedule Sheets

Schedules, with preliminary capacities, shall be provided for each item of mechanical equipment. Furnished typical equipment schedules shall be used whenever possible and shall be revised and completed as necessary to suit the project requirements. In addition to the furnished schedules, damper and control valve schedules shall also be provided.

#### 1.8.2 TECHNICAL SPECIFICATIONS

Specifications are not a required submittal item for this design phase.

### 1.8.3 DESIGN ANALYSIS NARRATIVE

The narrative portion of the design analysis shall contain a narrative description and analysis for each of the mechanical portions of the design.

The basis and reasons for specific engineering decisions, special features, unusual requirements, etc., shall be explained or summarized as applicable. If it is necessary to deviate from criteria or standard practice, reasons shall also be included. Design statements shall be provided in sufficient detail to enable the reviewer to get a clear picture and understanding of all included work so that approval will be granted. Narrative shall be complete relative to scope and intended design approaches. The total scope projected to final design shall be outlined in a form that will be conveniently adapted, expanded, and detailed at the final design stage. If alternatives were to be evaluated and selected by the designer, findings (pros and cons) and conclusions shall be included. The design analysis shall carry a complete narrative for every item and system covered in the design, and shall include, but not be limited to, the following:

#### 1.8.3.1 Index

Provide a design analysis index identifying all main and sub-paragraph headings.

#### 1.8.3.2 Project Summary

Provide a brief description of the mechanical design objectives.

#### 1.8.3.3 Applicable Criteria

A list of all applicable criteria used for basis of design.

#### 1.8.3.4 Design Conditions

A list of Mechanical HVAC design conditions including elevation, latitude, heating/cooling degree days, winter and summer outside design temperatures, inside design temperatures for all spaces, ventilation rates, etc. shall be provided.

#### 1.8.3.5 System Descriptions

Provide a complete description of all building systems; include the designer's reasons for selecting specific materials, systems, etc. in which the reason for selection is not obvious. System descriptions shall be include, but not limited to, the following:

- Plumbing System
- Exterior Gas Distribution System
- Interior Gas Piping System
- Hot Water Heating System
- Exhaust Hoods
- Air Supply and Distribution Systems
- Ventilation and Exhaust Systems
- Temperature Control System
- Seismic Protection
- Chilled Water System
- Refrigeration System

#### 1.8.4 DESIGN ANALYSIS CALCULATIONS

The Design Analysis calculations shall provide an estimate of the heating, cooling, and ventilation loads to determine a preliminary selection of the type and size of mechanical equipment to be used. Design calculations shall be provided in sufficient detail to enable the reviewer to get a clear understanding of all work to allow approval. Backup data shall be furnished to support basic design decisions related to sizing of major equipment and materials, performance of specific systems or equipment. Manufacturer's catalog data sheets shall be provided for each item of equipment selected. Calculations may be performed by manual or computerized procedures. Use of standardized charts, curves, tables, graphs will generally be acceptable for portions of required calculations lieu of specific calculation procedures. Such data must be from a recognized source which is identified in the design analysis and shall be included with the calculations. Design calculations and computations shall be provided for all systems and shall include, but not limited to, the following:

##### 1.8.4.1 Index

Provide a design analysis index identifying all calculation items.

##### 1.8.4.2 Design Conditions

A list of Mechanical HVAC design conditions including elevation, latitude, heating/cooling degree days, winter and summer outside design temperatures, inside design temperatures for all spaces, ventilation rates, etc. shall be provided.

##### 1.8.4.3 Zone Air-Conditioning Loads

Preliminary cooling calculations shall be prepared using the Cooling Load Temperature Differential/Cooling Load Factors (CLTD/CLF).

##### 1.8.4.4 Block Air-Conditioning Loads

Preliminary block cooling load calculations, encompassing the air-conditioned areas, shall be prepared using the CLTD/DLF Method.

##### 1.8.4.5 Chilled Water Pump Selections

Include pump flow calculations and catalog selection data indicating dimensions, connection sizes, rpm, horsepower, and efficiency.

##### 1.8.4.6 Heating Loads

For each area or room requiring heat; provide calculations.

##### 1.8.4.7 Heating Load Summary

A tabular summary of all heating load calculations for each area or room, including combustion air heating, shall be provided.

##### 1.8.4.8 Boiler Selection

Include boiler capacity adjustments for altitude, inefficiency, and net rating. Provide catalog data indicating input capacity, net output capacity, dimensions, and water and flue size connections.

#### 1.8.4.9 Hot Water Pump Selection

Include pump flow calculations and catalog selection data indicating dimensions, connection sizes, rpm, horsepower, and efficiency.

#### 1.8.4.10 Combustion-Air Requirements

Include combustion air quantity and free area calculations, louver selection, combustion air heating requirements, and selection of heating equipment.

#### 1.8.4.11 Unit Heater Selections

For each area requiring a unit heater, provide data on capacity, weight, and horsepower.

#### 1.8.4.12 Mechanical Ventilation

For each area or room requiring mechanical ventilation for cooling; provide calculations similar to zone air-conditioning, louver selection, and catalog fan data.

#### 1.8.4.13 Toilets/Janitor Room Ventilation

Provide calculations, catalog fan data, and louver selections, for each toilet area.

#### 1.8.4.14 Air Handling Units

A tabular summary of all airflow calculations for each area or room shall be provided on each air distribution system for fan sizing.

#### 1.8.4.15 Domestic Water Demand

Calculations for determining the size of the domestic cold water supply line to the building shall be provided.

#### 1.8.4.16 Domestic Hot Water Demand

Provide calculations determining the domestic hot water demand for the facility. Provide catalog data for the domestic water heaters.

#### 1.8.4.17 Electrical Load Summary

A summary of all mechanical equipment and the associated electrical load requirements shall be provided.

#### 1.8.5 ENERGY CONSERVATION

Mechanical designs shall be economical, maintainable and energy conservative with full consideration given to the functional requirements and planned life of the facility. Emphasis shall be given to heat reclamation, outside air usage and other energy conservation measures for mechanical systems. Each major item of proposed mechanical equipment shall have a net efficiency rating that is equal to or exceeds the net efficiency ratings of similar or equal equipment of the four manufacturers each having one of the four highest ratings.

#### 1.8.6 AIR POLLUTION CONTROL

Air pollution control shall be incorporated in all designs. The Architect-Engineer shall investigate the latest Using Service, Local, State, and Federal regulations and standards, analyze and report on requirements in the design analysis, and include in the design as applicable. The most stringent of all regulations and standards shall be implemented into the design. If in doubt as to requirements, contact this office for assistance.

#### 1.9 ELECTRICAL

##### 1.9.1 DRAWINGS

Drawing scale shall match architectural drawing requirements. Drawings shall show the following:

###### 1.9.1.1 Exterior Electrical

Properly identify existing and new electrical primary lines both overhead and underground. Show removals and relocations in separate drawings. Indicate electrical characteristics of all items shown; including voltage, phase, conductor size and kVA. Show new routing of line and new transformers.

###### 1.9.1.2 Lighting Layout and List of Fixtures

Provide typical lighting layout of each different type of interior illumination. An office, dorm room, corridor, stairwell, and utility rooms are considered typical examples of different types of illumination and one or more layouts should be provided for each condition. Indicate the type of fixture on the drawing.

###### 1.9.1.3 Power Equipment and Layout

Show location of electrical service connection and main electrical service equipment. Show the location of all major pieces of electrical equipment such as panelboards and switchgear.

###### 1.9.1.4 Power One Line Diagram

Power one line diagram shall be shown to indicate arrangement of the system. Sizes of all conduit, wires, cables, panels, etc., need not be included.

###### 1.9.1.5 Electronic Systems

Show location of all electronic system panels for Fire Detection and Security on floor plans.

###### 1.9.1.6 Miscellaneous Details of Special Equipment

Miscellaneous details of special equipment to indicate understanding of  
01 86 26 ELECTRICAL REQUIREMENTS.

##### 1.9.2 SPECIFICATIONS

Specifications are not a required submittal item for this design phase.

### 1.9.3 DESIGN ANALYSIS NARRATIVE

The design analysis shall contain a description and analysis of the electrical portions of the design. Special features, unusual requirements, demolition and removal, etc., should be noted. Narrative must address all technical requirements identified in Section 01 86 26 ELECTRICAL REQUIREMENTS. Calculations are generally unnecessary other than rough calculations to determine tentative sizes of major cost items.

### 1.10 CYBERSECURITY

Refer to Specification Sections 01 81 00 SUMMARY OF THE WORK, 01 86 10 MECHANICAL REQUIREMENTS, 01 86 13 FIRE PROTECTION REQUIREMENTS, 01 86 26 ELECTRICAL REQUIREMENTS, 01 91 00.15 10 TOTAL BUILDING COMMISSIONING, and related facility control system specification sections. Comply with all requirements for the 35% design level of completion as specified in the related facility control system specification sections.

#### 1.10.1 DESIGN ANALYSIS

The design analysis shall contain a description and analysis of the proposed facility related control systems (frcs) included in the design. Special features, unusual requirements, etc., should be noted. The Narrative must address all technical requirements identified in referenced specification sections and UFC 4-010-06. At a minimum the Narrative shall identify the ISSM/ISSO (Information System Security Manager/Officer) for cybersecurity, include a preliminary inventory of all frcs with associated C-I-A (Confidentiality-Integrity-Availability) Impact Level Ratings, and the mission category (support, essential, critical). The Narrative shall provide a discussion which describes the background for, and purpose of cybersecurity controls implementation for frcs.

#### 1.10.2 SPECIFICATIONS

Submit a preliminary table of contents of specification section 25 05 11 variants which provide the applicable cybersecurity controls implementation for each frcs based upon coordinated project reviews and coordination across all disciplines which includes Commissioning Agent(s).

Specifications shall be provided (to approximately 35 percent completion). See Section 01 33 00.32 DESIGN AND CONSTRUCTION DELIVERABLES/PROCEDURES, paragraph 3.2, SPECIFICATIONS for additional requirements.

#### 1.10.3 DRAWINGS

Identify proposed Mission Space(s) as applicable on plan sheets.1.11 COMMUNICATIONS

##### 1.11.1 Drawings

Drawing scale shall match architectural drawing requirements. Drawings shall be organized and demonstrate that the work complies with all requirements of the RFP as follows:

###### 1.11.1.1 Outside Plant Distribution

Show manhole, handhole and ductbank system layout.

#### 1.11.1.2 Voice and Data Plans

Provide a typical layout of office, dorm room and group study rooms. The type of outlets shall be indicated. Racks, cabinets, and other equipment shall be shown and identified.

#### 1.11.1.3 Riser Diagrams

Provide riser diagrams that indicate the telecommunication rooms, number of racks, and service entrance configuration

#### 1.11.1.4 Miscellaneous Communications Systems

#### 1.11.1.5 Plans

Show location of panels for Public Address and CATV.

#### 1.11.1.6 Riser Diagrams

Provide a separate riser diagram for each system, showing general connection between all major components.

#### 1.11.2 Specifications

Specifications are not a required submittal item for this design phase.

#### 1.11.3 Design Analysis Narrative

The design analysis shall contain a description and analysis of the communications portions of the design. Special features, removal and relocations, and unusual requirements should be noted. Narrative must address all technical requirements identified in section 01 86 29 COMMUNICATIONS REQUIREMENTS.

### 1.12 FIRE PROTECTION

#### 1.12.1 DRAWINGS

Features of Fire Protection, their ratings, and the hazards requiring them, shall be clearly indicated. Sprinkler and fire alarm/detection areas shall also be clearly indicated. Fire detection mass notification and sprinkler systems shall be laid out and detailed sufficiently to indicate the designers understanding of the Section 01 86 13 FIRE PROTECTION REQUIREMENTS. When other functions co-exist with the fire protection functions, their integration shall be clearly indicated, with an analysis that describes how both functions will be served. Provide a separate, composite type floor plan which makes an accurate presentation of these various features and functions. As part of the submittal, provide a set of plans that shows emergency egress for the facility.

#### 1.12.2 SPECIFICATIONS

Specifications are not a required submittal item for this design phase.

#### 1.12.3 DESIGN ANALYSIS

The design analysis shall include a separate fire protection report containing, but not limited to, review statements and/or comments on the following items, where applicable.



- a. Location and rating of fire walls and fire partitions.
- b. Column, floor, and roof protection.
- c. Path of travel for emergency egress and operation of panic exits.
- d. Access to building for fire fighting.
- e. Design and placement of fire and smoke stop doors.
- f. Labeled windows, where required.
- g. Venting of smoke.
- h. Placement of hand fire extinguisher cabinets.
- i. Type and adequacy of sprinkler system.
- j. Building exterior fire protection facilities and building clearances.
- k. Type of occupancy.
- l. Zoning of fixed fire protection systems.
- m. Type and adequacy of fire alarm and detection systems.
- n. Zoning of fire alarm and detection systems.
- o. Number of zones of alarm and detection systems that are separately transmitted to the base or installation fire department.

#### 1.13 ENVIRONMENTAL PROTECTION COMPLIANCE

##### 1.13.1 SPECIFICATIONS

Specifications are not a required submittal item for this design phase.

##### 1.13.2 DESIGN ANALYSIS NARRATIVE

The Contractor shall prepare a chapter in the Design Analysis entitled: "Environmental Protection Compliance". This chapter shall summarize how the project complies with environmental laws and regulations with regard to environmental permits, notices, reviews and/or approvals by the governing authorities. As a minimum, the chapter shall include the following:

- a. The list of Permitting and/or Approving Authority(ies).
- b. The list Construction/Operating Permits, Notices, Reviews and/or Approvals required for the project. If, when checking with the environmental agencies, a permit, notice, or approval is not required, include a copy of the telephone conversation memorandum or letter from the agency stating nothing required.
- c. Time required by the permitting agency(ies) to process the application(s) and issue the permits.

- d. Fee schedule including filing/application fees, review fees, emissions fees, certification testing, etc.
- e. Monitoring and/or compliance testing requirements.
- f. Copies of the completed application forms and associated documents.

#### 1.13.3 Submittal of Environmental Approvals, Permits Applications and Associated Documents

Approvals and/or Permits, for which the facility is required to be permittee or the facility is required to submit for approval to the Federal, State, or local governing agency, may be required to be submitted with 35 percent design documents because of time restraints for obtaining the permit. The Contractor shall complete the technical portions of the approvals, permit applications and complete the required associated supporting material. This package shall be submitted to the Corps of Engineers with sufficient time for the Federal Facility to receive the approval and/or permit prior to construction commencing.

#### 1.14 SAFETY AND HEALTH

##### 1.14.1 SPECIFICATIONS

Specifications are not a required submittal item for this design phase.

##### 1.14.2 DESIGN ANALYSIS

###### 1.14.2.1 Narrative

The Design Analysis Narrative shall list all conditions impacting safe work on the project for each of the sections listed above. Potentially hazardous conditions such as and materials shall be identified. The basis and reasons for specific decisions, special features, unusual requirements, etc., shall be explained or summarized as applicable. If it is necessary to deviate from criteria or standard practice, reasons shall also be included. Design statements shall be provided in sufficient detail to enable the reviewer to get a clear picture and understanding of all included work. Narrative shall be complete relative to scope and intended design approaches. The total scope projected to final design shall be outlined in a form that will be conveniently adapted, expanded and detailed at the final design stage. The design analysis shall carry a complete narrative for every item covered in the design.

###### 1.14.2.2 Design Analysis Calculations

Amount and location of hazardous material (asbestos, lead paint, PCBs, etc) that will be removed shall be addressed.

###### 1.14.2.3 Basis, Specific goals, Objectives and Priorities for Hazardous Material

The Design Analysis should establish specific goals, objectives and priorities for safety (including the removal, handling and disposal of hazardous materials) of the project. Identify, explain and document use of design criteria and how the design meets goals, objectives and priorities. Identify the preferred site development concept. Show how systematic planning has been used in the design, and to meet the objectives. Systematic planning ensures high decision confidence and stakeholder

satisfaction. It should list various regulatory, scientific and engineering decisions that must be made in order to achieve the desired outcome, list unknowns that stand in the way of making those decisions, and strategies to eliminate or manage the unknowns.

#### 1.14.3 DRAWINGS

The drawings shall clearly identify the amount and location of hazardous material.

#### 1.15 SUSTAINABLE DESIGN

See SECTION 01 33 29 SUSTAINABILITY REPORTING for sustainability documentation submittal requirements for each phase of design.

PART 2 NOT USED

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## SECTION 01 33 00.36

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## SECTION 01 33 00.36

## 60 PERCENT DESIGN REQUIREMENTS

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## PART 1 60 PERCENT DESIGN SUBMITTALS

For general submittal requirements, See Section 01 33 00.32 DESIGN AND CONSTRUCTION DELIVERABLES/PROCEDURES.

## 1.1 REFERENCES

## U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 4-010-06 (2016; with Change 1, 2017) Cybersecurity  
of Facility-Related Control Systems

This reference list is not comprehensive. See individual discipline requirements specification sections for specific reference criteria to be used during the design process and for the creation of design analyses.

## 1.2 CIVIL/SITE

## 1.2.1 DRAWINGS

## 1.2.1.1 Location Plan and Vicinity Map

A Vicinity Map consists of a small scale drawing of the project location, similar to a road map. A Location Plan consists of a small scale drawing showing the Government property or reservation limit with the construction project site shown. The drawing shall show the facility approved Contractor Access and Haul Routes. A reproducible base sheet, if available, may be provided by the Omaha District for the Contractor's use in preparing the Location Plan.

## 1.2.1.2 Survey Plan

The information depicting existing conditions used to generate site drawings shall be shown on this drawing. An engineering survey of the site will be presented to the Contractor selected as a result of this RFP process. Any additional survey information required by the Contractor for design above that shown in the prepared engineering survey shall be procured and paid for by the Contractor.

## 1.2.1.3 Removal Plan

The removal plan will show the existing physical features and condition of the site before construction. This information should include the field survey to show all above and below ground utilities; buildings, drives, roads and parking areas, walks, and vegetation; and such facilities as retaining walls, underground storage tanks, foundations, etc. Each physical feature to be removed shall be as indicated on the standard legend sheet, a legend on the removal plan, and properly noted: to be removed, to remain, or to be relocated.

#### 1.2.1.4 Site Plan

The Site Plan shall show all the site layout information necessary to field locate the building, walks, parking lots, bicycle parking areas, and all other appurtenances to be constructed on the project. All site related work to be constructed will be located by dimensions. The Site Plan will identify all site related items such as: curbs, pavements, walks, plazas, seating areas, bollards, trash enclosures, retaining walls, chiller units, electrical transformers locations, etc. in accordance with a standard legend sheet or with additional legends or notes. Material types shall be indicated on the Site Plan for all pavement, fencing and structures. New work will be clearly identified from existing features. The Site Plan shall incorporate comments from the previous submittal, applicable regulations and restrictions for clearances and setbacks; i.e. anti-terrorism, airfield and explosive clearance zones, etc., as well as any specific orientation requests made by design reviewers. Site Plans shall be at a scale of 1 Inch = 20 Feet or 1 Inch = 40 Feet. Other drawing scales must be approved by the Omaha District. North arrows shall be oriented the same direction on all plan sheets and by all disciplines. No existing or proposed contours shall be shown on this Plan. The Site Plan, prior to adding the dimensions, should serve as the base sheet to the other Plans, such as: Utilities Plan, Grading and Drainage Plans and Landscape Plan. The Site Plan shall show all existing physical features and utilities within and adjacent to the work site that will remain after the proposed construction has been completed. This plan will also show any free zones, construction limits, and storage areas etc. Whenever the Site Plan occupies more than one sheet of drawings, a Key Plan shall be included. Additional plans showing specific areas of the site in smaller scales can be included if more detail is necessary.

#### 1.2.1.5 Grading and Drainage Plan

A preliminary grading and drainage plan shall be provided at the same scale as the site plan (1 Inch = 20 Feet or 1 Inch = 30 Feet). Other drawing scales must be approved by the Omaha District. Tentative new and existing grading contours shall be indicated at 1-foot contour intervals. Indicate finished floor elevation of the new buildings. Plans shall show layout of the new and existing storm drainage systems. Uniform grades shall be labeled using slope arrows. Provide spot elevations at building corners, parking area corners, changes in grade, etc. Provide location and description of benchmarks and indicate vertical and horizontal datums.

#### 1.2.1.6 Grading Sections

Provide grading sections through the site showing finished and existing grades, pavement sections in detail, slope percentage, ditches, etc.

#### 1.2.1.7 Typical Pavement Sections

Provide typical pavement and road sections and details showing interface between new and existing pavements and new pavements of different sections.

#### 1.2.1.8 Site Furnishing Details

The Contractor shall provide designs and sufficient details as necessary for site furnishings and accessories to allow for customer and engineering comments to be performed. Provide details of site furnishings (i.e. dumpster enclosure, handrails, etc.), handicapped parking and provisions, specific construction techniques, applications, and finishes when

graphical clarification is necessary for design interpretation or construction quality.

#### 1.2.1.9 Landscape Plan

A Landscape Plan is included in the drawing set to serve as a guide in preparing the final contract drawings. A detailed Landscape Plan showing trees, shrubs, ground covers, seeded and sodded areas, shall be prepared by the Contractor. The Landscape Plan shall be prepared by a fully qualified, experienced professional Landscape Architect. The Contractor shall specify types of plant materials that are locally grown, commercially available and acclimated to the project environment. The Landscape Plan shall include a plant material schedule. This schedule shall include botanical names, common names, size, the method of planting, and remarks. The Landscape Plan shall also show all unsurfaced ground areas disturbed by construction within the project limits with these areas shown to be seeded, sodded, and/or mulched as required.

#### 1.2.1.10 Landscape Details

The Contractor shall verify the methods of planting to meet the project site/installation requirements and provide the necessary Landscape Details to perform the contract design work. Details shall reflect local practices and conditions for installation. The Contractor shall provide designs and details as necessary for other required site furnishings and accessories.

#### 1.2.2 SPECIFICATIONS

Provide a listing by title and number of all Technical Specifications proposed for use in the final civil/site/landscape design.

#### 1.2.3 DESIGN ANALYSIS NARRATIVE

Design analysis shall include the following:

##### 1.2.3.1 References

Design references used in preparing the civil/site design.

##### 1.2.3.2 Grading

A narrative of the grading design and criteria used and preliminary calculations.

##### 1.2.3.3 Pavements

A narrative of the pavement design and criteria used.

##### 1.2.3.4 Drainage

A narrative of the drainage design and criteria used. Provide a description of the all surface and subsurface direction of flow for both pre and post-construction activities. Include information on the storm drain pipe materials selected and their ability to withstand earth dead loads and live loads that will be imposed.

#### 1.2.3.5 Basis, Specific Goals, Objectives and Priorities For Civil/Site Design

The Design Analysis should give the basis for the civil/site design and should establish specific goals, objectives and priorities for civil/site design of the project. Identify, explain and document use of design criteria and how the design meets goals, objectives and priorities. Identify the preferred site development concept. Document pollution prevention measures and other environmental considerations made during design. The 60 percent Design Analysis must be approved and accepted before Final Design.

#### 1.2.4 DESIGN ANALYSIS CALCULATIONS

##### 1.2.4.1 Storm Drainage System Calculations

Storm Drainage System Calculations shall include the following:

- a. Drainage area map showing boundaries of each drainage area and respective drain inlet or culvert.
- b. Storm run-off calculations for each drainage area.
- c. Preliminary storm drain pipe sizing calculations.

##### 1.2.4.2 Pavement Calculations

Pavement thickness calculations for each pavement.

#### 1.3 GEOTECHNICAL

See Structural Design Requirements.

#### 1.4 WATER SUPPLY AND WASTEWATER

##### 1.4.1 DRAWINGS

###### 1.4.1.1 Water Distribution and Sewage Collection Systems Plan (including building services)

Provide all existing utilities and above ground features which may pose as an obstacle (i.e., water, sewer, gas, electrical, etc.) on the basic site plan layout. This shall include all new service lines up to the 5-foot building line. Show the proposed locations of all new manholes, fire hydrants, valves (including PIV's), connection points and etc.

##### 1.4.2 SPECIFICATIONS

Specifications shall be coordinated with the plans and include all items. Provide a listing of specifications to be provided. Provide a complete copy of special sections to cover those subjects for which no UFGS guide specifications are used or available.

##### 1.4.3 DESIGN ANALYSIS NARRATIVE

Design analysis shall include the following:

#### 1.4.3.1 References

Provide design references used in preparing the water and wastewater design.

#### 1.4.3.2 Water Supply and Distribution Systems

A narrative of the water supply and distribution systems design and applicable criteria used shall be provided. Include the peak and average domestic demands, the fire flow required and the available flow and residual pressures. A description of the water distribution system, a listing of allowable piping materials, hydrant flow test data and preliminary calculations necessary to support equipment, piping sizes, fire and domestic demands, etc., shall be provided.

#### 1.4.3.3 Wastewater and Sewers

A narrative of the wastewater supply design and applicable criteria used shall be provided. Include the preliminary calculations used to design the average, diurnal peak, and extreme peak flows. Full flow capacity (70% of the total depth) of the existing system to ensure that it will be adequate for the flows generated by the new facility. Include the available capacity and full flow capacity in the design analysis. Preliminary calculations necessary to support equipment and piping sizes and a listing of allowable piping materials shall be provided. The design shall be in accordance with the velocity requirements of Section 01 89 00 SITE WORKS REQUIREMENTS.

### 1.5 ARCHITECTURAL

#### 1.5.1 DRAWINGS

Sixty percent architectural drawing submittal shall be a complete set of architectural drawings without large scale details. All other drawings shall be complete except referencing of the large scale details.

##### 1.5.1.1 Floor Plans

Provide scaled double-line drawings showing the complete functional arrangement of spaces, required adjacencies, circulation, required exiting, and required number of plumbing fixtures. Indicate door swing and window type; however, door and window schedules are not required.

For large buildings that require the floor plans to be divided into several areas, provide a Composite Floor Plan of the entire building, drawn at the largest scale practicable to include the entire building or floor level on a single sheet. Subsequent floor plan sheets drawn at a larger scale will show the individual floor plan areas, with a Key Plan indicating the individual area location. Include a gross area tabulation comparing the actual square footage with the authorized square footage of the facility in the first composite floor plan sheet. Include the following for each plan:

- North Arrow
- Overall and Control dimensions
- Match Lines for delineating individual areas of floor plans
- Room Names and Numbers
- Structural Column Grid
- Wall and Building Section Cuts

Door Swings  
Square Footage  
General Notes

The key plan located on each floor plan sheet should clearly show the inter-relationships between the individual building areas. Locate key plans in consistent locations throughout the sheet set for easy navigability. Include major elements of mechanical and electrical equipment affecting space allocation on the architectural plan. Ensure that equipment does not overcrowd the sheet, making it difficult to read.

#### 1.5.1.2 Life Safety Plan

Provide a separate (composite type) floor plan for each floor of the building showing all of the various Life Safety features and functions, such as building Occupancies, Hazardous areas, travel distances, exit capacities, fire and smoke partitions, and similar features clearly indicated. This plan can be a separate plan in the Architectural drawing set, or can be combined with the Fire Protection drawings, as long as all of the necessary information is shown. See FIRE PROTECTION section of this specification for more information on required fire protection criteria.

#### 1.5.1.3 Reflected Ceiling Plans

Provide reflected ceiling plans for all ceiling areas regardless of ceiling material. Show the ceiling tile layout where applicable and all light fixtures, air diffusers, grilles, registers, and other ceiling mounted items. Lay out equipment and fixtures in a regular pattern symmetrical with the ceiling tile grid, or symmetrical with the room centerlines, columns, windows, or other features that dominate. Provide notes, complete legends, and pocheing of all materials to be used.

#### 1.5.1.4 Roof Plan

Composite and larger area roof plans shall be complete including all notes, legends, slope indications, gutter and downspout locations, and roof overflow drains. All elements located on the roof shall be coordinated with all disciplines.

#### 1.5.1.5 Building Elevations

Provide all building elevations complete showing the appearance and architectural treatment. Elevations shall be dimensioned to show total height, and relation to grade. Critical elevations such as top of finish floor, top of steel, etc. shall be indicated. All notes for materials shall be included.

#### 1.5.1.6 Building Cross Sections

Provide building cross sections to show general interior volumes, framing methods, and floor-to-floor and ceiling heights. Identify materials used and necessary dimensions.

#### 1.5.1.7 Wall Sections

Drawings shall include all wall sections and stair section conditions including corridors, showing vertical control elevations and dimensions, with all materials labeled. The sections should normally be cut through doors, windows, and other critical wall section locations. Wall sections

shall not be broken. Additional details shall be included when necessary to illustrate important or unusual features. All horizontal dimensions shall occur on the plans and vertical dimensions on the sections and elevations. See paragraph on Drawing Scales for Wall Section scale requirements.

#### 1.5.1.8 Room Finish Schedules

Room finish schedule shall be complete in accordance with Corps of Engineers (COE) standard format.

#### 1.5.1.9 Door, Window, and Louver Schedules

Door schedule shall be complete in accordance with Corps of Engineers (COE) standard format. Schedule shall include door and frame types, except referencing to door details and hardware sets. Window and louver schedules shall be complete including window and louver types except referencing to details.

#### 1.5.1.10 Drawing Scales

Architectural work shall be drawn at the scales listed below. Other scales may be used only by written authorization through the Project Manager, Omaha District. Units of measurements shown on the drawings shall be done in english units. All disciplines should use the same scale for plan sheets. The following is a comparison guide to establish equivalent scaling of drawings:

	<u>ENGLISH</u>
Composite Plans (Note 1)	Varies
Floor Plans (Note 2)	1/4-Inch = 1'-0"
Reflected Ceiling Plans (Note 5)	1/8-Inch = 1'-0"
Detail Plans (Note 3)	1/2-Inch = 1'-0"
Roof Plans	1/8-Inch = 1'-0"
Composite Exterior Elevations (Note 6)	Same scale as plan
Exterior Elevations	
Interior Elevations and Casework	1/2-Inch = 1'-0"
Building Cross Sections	1/4-Inch = 1'-0"
Wall Sections	3/4-Inch = 1'-0"
Stair Sections	3/4-Inch = 1'-0"
Details (Note 4)	3-Inches = 1'-0"
Wall Types	3/4-Inch = 1'-0"

#### Notes:

1. Scale composite plan(s) as required so that the entire facility is drawn on one sheet without break lines.

2. All areas of the facility floor plan must be drawn at this scale and areas of the facility should be the same for other design disciplines. The goal of this requirement is that the area plans used as base sheets for other disciplines be at a scale that are large enough to read, review, and bid when reproduced. Provide key plans for facility designs with multiple areas, which cannot be drawn on a single sheet. By authorized written permission, a smaller scale may be used on large open facilities such as hangars or warehouses, which do not contain administrative areas. On concept/early preliminary designs, smaller scale drawings may be used when approved to allow for the entire floor plan to be shown

on a single sheet.

3. The goal is that the detail plans be large enough to show all fixtures, accessories, equipment, materials, clearances required for maintenance, and complete dimensions. Toilet rooms, equipment rooms, laboratories, kitchens, and congested roof plan areas, are examples of the kind of spaces to be drawn as a Detail Plan.

4. Details containing sheet metal flashing should be 3"=1'-0".

5. All areas of the facility ceiling plan must be drawn at this scale. Provide key plans for facility designs with multiple areas, which cannot be drawn on a single sheet. By authorized written permission, a smaller scale may be used on large open facilities such as hangars or warehouses, which do not contain administrative areas. On concept/early preliminary designs, smaller scale drawings may be used when approved to allow for the entire floor plan to be shown on a single sheet.

6. Scale composite elevations as required so that the entire facility is drawn on one sheet without break lines.

7. When the project is required to be designed in metric units of measurement, use metric scales which most closely correspond to the English scales indicated above.

#### 1.5.1.11 Legends

Standard architectural material symbols used on the drawings shall be provided as a separate architectural legend drawing located just in front of the architectural drawings in the set. Additional material symbols should be added to the Legend Sheet as needed for the project.

#### 1.5.1.12 North Arrows

Orient North arrows in the same direction on all plan sheets and by all disciplines, including site and civil drawings. Orient plan-north "up" or to the left on the drawings. Indicate true north on composite and area plan drawings. North arrows shall be located approximately at the same location on all sheets.

#### 1.5.1.13 Modular Design

Follow modular masonry design practices in the design of all masonry buildings. Figure dimensions to whole or half-unit lengths, in increments of 4-inches (for standard brick) or 8-inches (for standard concrete masonry units) in order to reduce on-site cutting of masonry. Avoid units less than 4-inches long to the greatest extent practical.

#### 1.5.1.14 Symbols

Utilize a consistent room and door number system for all facilities designed under any one contract. Where plans are site-adapted, the symbols need not be changed to the District standards, except those related to the identification of amendments and modifications to a contract. Do not use the standard symbols for Amendments (a triangular box) or Modifications (a type of circular box) for any other purpose, and care take care to avoid using similar-appearing symbols. When possible, start room numbering at



the main entrance and proceed clockwise around functional areas. Obtain approval from this strategy from the Government.

#### 1.5.1.15 Schedules

Provide clear and complete schedules for room finish, doors, windows, louvers, etc. Provide as many columns as necessary in order to present the essential information. The "Remarks" column should not be used as a substitute for an information column. Normally a single item should be presented on each schedule line. Category group scheduling will be permitted only for facilities with a large percentage of repetitive rooms. Other scheduling methods as standard with the AE may be used if approved by written authorization from the USACE Project Architect. Color information will be specified in UFGS 09 06 00, SCHEDULES FOR FINISHES, or noted on the drawings in schedule format. The sheen of a particular paint system will be coordinated with UFGS 09 90 00, PAINTS AND COATINGS.

#### 1.5.1.16 Notes

Notes may be placed on drawings to reduce the amount of repetitive drafting, provided that clarity is not lost. General notes should be placed at the right-hand edge of the sheet.

#### 1.5.1.17 Dimensions

Provide complete, accurate and fully coordinated dimensioning. Dimensions should be to points easily measurable in the construction, and should be laid out to eliminate re-figuring in the field. Dimensions should be tied to column lines, etc., to facilitate checking. Plan dimensions for frame construction should be to face of stud for exterior walls, to one face of stud for interior partitions, and to centerline of openings. For masonry construction, dimensions should be to one or both nominal faces of masonry and to jambs of openings. When dimensioning, use arrowheads, not dots or slashes.

#### 1.5.1.18 Facility Elevation

Indicate the elevation of the first floor as 100'-0" (100 000 for metric projects). Ensure that top of slab of ground-level floors is a minimum of 6 inches above finish grade. Relate elevations for other floors, footings, etc., to this figure. Do not show sea level elevations on the architectural drawings. Coordinate finished floor elevation with the civil drawings. Indicate elevations of the first floor above sea level on the Civil grading plans.

### 1.5.2 SPECIFICATIONS

#### 1.5.2.1 Use of Technical Guide Specifications

Unified Facilities Guide Specifications (UFGS) are prepared by the Corps of Engineers to achieve the maximum uniformity in contract specifications. The UFGS describe the type and quality of material and installation normally acceptable for Corps construction, and often represent specific agreement between the Corps and the applicable industry. The provisions of the technical guide specifications should not be changed without justification. The 60% submittal shall include a draft edited specifications of all the applicable sections. Items added or

deleted in these specification sections shall be evident. Complete descriptions including specific size, gauge, and configuration are included in the UFGS for a wide variety of items. The designer must be familiar with the UFGS requirements in order to provide details fully coordinated with the technical specification descriptions. Terminology used on the drawings shall be the same as used in the UFGS. Where it is desirable to detail a variance with the standard provisions of the UFGS, the specifications must be revised to coordinate with the details. New guide specifications shall be limited to those specialty type items not covered in the regular sections of UFGS.

#### 1.5.3 DESIGN ANALYSIS NARRATIVE

The Design Analysis shall be essentially complete with emphasis on the following:

##### 1.5.3.1 Additional Criteria/Clarification

A list of items on which additional criteria, clarification, or guidance is required.

##### 1.5.3.2 Site Adaptation of Standard Drawings (as applicable)

Include the following when site adapting a design.

- a. An outline of the selections made where the standards permit the designer a choice of design or material.
- b. An outline of items on the standard that do not conform to current criteria or to the design instructions, and suggested methods for changing the standards.
- c. An outline of errors found in the standards and suggested methods for correction and improvement.

##### 1.5.3.3 General Parameters

The design analysis shall follow the format described herein.

- a. The purposes, overall functions, and total capacities of the facility.
- b. The design theme or visual appearance of the exterior and interiors of the building, and how this facility coordinates with the image criteria of the installation on which it will be constructed.
- c. The number of personnel to use facility; military, civilian, and visiting personnel.
- d. The type of activities, equipment, and vehicles involved.
- e. The anticipated life of the functions to be accommodated.
- f. The category of construction; permanent, temporary, or relocatable.

##### 1.5.3.4 Functional and Technical Requirements

- a. Functional areas, occupant capacities, and allocation, including a functional relationship matrix.

- b. All items of required equipment.
- c. Occupational safety and health.
- d. Accessibility for people with disabilities.
- e. Energy conservation including solar energy applications and energy budget goals.
- f. Sound and vibration control.
- g. Physical security; lock and keying, intrusion-detection, alarms, restricted access areas, interior guard support, and ties to local authorities.
- h. Justification for selection of exterior and interior finishes and materials.
- i. Moisture Vapor Control.
- j. Lessons learned incorporated into the design.

#### 1.5.3.5 Design Objectives and Provisions

- a. Adaptation of the building to the size, shape, and orientation of the site to include benefit from natural warming and cooling effects afforded by the site.
- b. Organization of functional spaces to establish workable adjacency relationships.
- c. Building layout to establish convenient circulation flows during normal operation and emergency evacuation activities, for materials, equipment, services, and people.
- d. Grouping spaces into sound-compatible zones and protective construction zones, e.g., for fire and storm.
- e. Space layout compatible with modular (structural and environmental) support systems.
- f. Type of construction materials, architectural systems, and finishes, including windows, doors, roofing systems and other major building components, to include basis for selectio.
- g. Building expandability/changeability.
- h. Physical security and Anti-Terrorism/Force Protection.
- i. Barrier-free design/ABA.
- j. Energy conservation. (passive, insulation, orientation)
- k. Acoustical design.
- l. Sustainability. Include a narrative of the architectural portion of the design that addresses applicable UFC 1-200-02 and third-party certification requirements.

m. Composition of masses and spaces architectural compatibility and architectural details to reflect the design theme and desired image, and the scale and nature of the activities involved.

n. Perception of the building details and volumes. (Specific provisions made, e.g., an identifiable sequence of viewing positions for experiencing the interior and exterior architectural design.)

o. Enhancement of materials and systems maintenance and operation.

p Economy of building construction, operation, and maintenance: life-cycle cost effectiveness.

#### 1.5.3.6 Coordination with Installation or Outside Agencies

a. Physical security support.

b. Blind vending operations.

c. Government furnished equipment.

d. Operations and maintenance support.

#### 1.5.3.7 Checklists

Include the Fire Protection and Building Code Analysis, Lessons Learned Checklist, LEED (or other third-party certification), and ABA Checklist in the Design Analysis.

#### 1.5.3.8 Sketches

All sketches presented during the design phase shall be reduced to 8-1/2" by 11" and included in this design analysis to document the design options and decisions evaluated during the design process.

#### 1.5.4 DESIGN ANALYSIS CALCULATIONS

a. Net room areas, occupant capacity and gross building areas. (Categorize areas and capacities under the titles of "Operational Space Requirements", "Administrative Space Requirements", "Storage Space Requirements", and "Support Space Requirements".)

b. DD Form 1391 scope validation calculations.

c. U-values for each wall, window, door, or roof type studied or selected.

d. Ratio of exterior window and room area, if applicable.

e. Acoustics, if applicable.

f. Gutter roof drain and downspout calculations.

g. Condensation calculations.

#### 1.6 INTERIORS

##### 1.6.1 DESIGN ANALYSIS NARRATIVE

The design analysis shall contain an explanation of the desired image or

visual appearance of the interior of the facility and the design intent.

#### 1.6.2 DRAWINGS

Include a scaled furniture floorplan indicating proposed furniture and equipment layout in the drawings. Label furniture on the plans and provide a furniture legend on the drawings. Identify on drawings if furniture and/or equipment is in contract or not in contract.

#### 1.6.3 SPECIFICATIONS

Appropriate UFGS guide specifications shall be provided and coordinated with the drawings and design analysis. Specifications shall be edited to identify proposed product and installation requirements. Where materials or installation requirements are not covered in the provided specifications, information shall be prepared to cover these items.

#### 1.6.4 FURNITURE, FIXTURES & EQUIPMENT (FF&E) PACKAGE

Provide FF&E package that includes a narrative, cost estimate, furniture data sheets, furniture finish color boards and applicable floorplans.

Data sheets must include the item code, item name, manufacturer, GSA contractor (contract number, contract expiration date, FSC group and special item number), model name, model number, dimensions, specification (include information such as minimum quality standards, construction materials and methods, configuration, features and required options), finish, upholstery, room location (include room numbers, room names, quantity of item per room, and total quantity), and unit cost and total cost as applicable. Include furniture illustrations on the data sheets. Illustrations must be close to the actual item specified or it must be noted that it is representative or similar. Identify each data sheet with the item code in the upper or lower right hand corner of the page for ease of reference. Arrange the data sheets in a sequential alphanumeric order based on the item codes.

#### 1.6.5 COLOR BOARDS AND LEGENDS

Submit SID color boards showing interior and exterior finishes. Color boards must show actual color samples of all proposed exterior and interior finishes. A color board legend shall accompany the boards and shall clearly identify all finishes. Clarification of finish placement shall be required when more than one color of a single finish is proposed. Color boards shall be 8 1/2" x 11" in size and provided in a three ring binder. Include project name and location, design stage and date on the front cover and spine of the binder.

#### 1.6.6 DESIGN ANALYSIS NARRATIVE

The design analysis shall contain an explanation of the desired image or visual appearance of the interior of the facility and the design intent.

### 1.7 STRUCTURAL

#### 1.7.1 DRAWINGS

Drawings shall include roof and floor framing plans, floor slab plans and foundation plans. Roof and floor framing plans shall show sufficient details to clearly indicate the type of framing system used, size and

spacing of members and their elevations. The location of all columns or pilasters shall be shown, and all building structural members shall be at least outlined. The sizes, locations and elevations of footings shall be shown. Slab plans shall be coordinated with the Architectural sheets and shall indicate the locations of structural walls and masonry partitions, recessed slabs and contraction or construction joints. Concrete slab-on-grade thicknesses and sections shall be shown. Proposed treatment of special footings and unique or complex features and details shall be shown on the drawings. Elevation views, sections and details necessary to illustrate the design at a 60% level of completion shall be provided. Drawings shall also include overall building plan dimensions, north arrows, and design notes. Drawings shall be at done at a scale appropriate for the design, in no case however, shall plan type drawings be done at a scale smaller than  $1/8" = 1'-0"$  or detail type drawings at a scale smaller than  $1/2" = 1'-0"$ .

#### 1.7.2 SPECIFICATIONS

For this 60% design submittal the Contractor shall provide a listing by title and number of all Technical Specifications proposed for use in the final structural design. Identify special sections that are to be developed.

#### 1.7.3 DESIGN ANALYSIS NARRATIVE

Design analysis shall follow the format described in Section 01 33 00.32 DESIGN AND CONSTRUCTION DELIVERABLES/PROCEDURES, Paragraph 3.3, "Design Analyses" and the specific content shall be essentially as outlined below.

##### 1.7.3.1 Design Criteria and References

A list of design criteria references, such as DOD Unified Facilities Criteria, Department of the Army Technical Manuals, ACI Standards, AISC Specifications, etc., and any other references which were used in the design of the project shall be included in the narrative.

##### 1.7.3.2 Design Loads and Conditions

A list of structural design loads and conditions shall be provided, including:

- Snow load parameters;
- Wind load parameters
- Seismic design parameters;
- Roof live loads;
- Floor live loads, identifying each loading with usage and the room or space where used;
- Progressive Collapse parameters, identifying the type of structural system to be incorporated, design loads and other design parameters.
- Foundation design criteria, including the design depth for footings, allowable soil bearing pressure, equivalent fluid densities (or lateral earth pressure coefficients) for the design of earth retaining structures and building components, modulus of subgrade reaction, and any other pertinent data derived from the recommendations of the Final Geotechnical Investigation Report, a copy of which shall be included as an Appendix to the design analysis.

#### 1.7.3.3 Structural Materials

A list of structural materials shall be provided, together with the stress grades and/or ASTM designations, as applicable, for structural steel, concrete, and reinforcing steel; the series for steel joists; and identification of the proposed use of each material in the structure.

#### 1.7.3.4 Description of the Structural System

A concise description of the proposed structural system for the building, together with the reasons for its selection, shall be provided. All principal elements of the structural system selected shall be described. Typically, these shall include:

- Primary supporting members for the roof;
- Masonry walls, type of material, and whether load bearing or non-load bearing, with location of load-bearing walls defined, and measures taken to compensate for expansion/contraction and crack control in masonry walls;
- The proposed system for resisting lateral forces (wind and earthquake) and transferring them to the ground, whether diaphragms, chord bracing, shear walls, braced or moment resisting frame, etc;
- Foundations, description of special designs to accommodate existing site conditions;
- Concrete slab-on-grade floors, description of floor surface finish treatment, accommodation of live loads, and the use, location and types of crack control joints;
- The proposed treatment of any unusual structural loadings, features or unique solutions to structural problems.
- Identification of any major vibrating elements and measures taken to isolate them.

#### 1.7.4 Design Analysis Calculations

The extent of the structural calculations shall be indicative of a design which has reached a 60% level of completion. Computations shall include snow, wind, seismic, dead and live loads. Computations shall show sizing and spacing of structural members for roof and floor framing, sidewalls and foundation sizes, as appropriate to the systems to be used for these elements.

#### 1.7.5 Final Geotechnical Investigation Report

The Contractor will be responsible for verification of the actual soil conditions present at each site location prior to commencing final design.

The Contractor's geotechnical engineer shall accomplish site investigation, soil borings, and laboratory testing as deemed necessary to support the design of the project. A final geotechnical investigation report shall be prepared and submitted to the Contracting Officer.

The work will be coordinated with the Contracting Officer and shall not interfere with normal base operations. The cost of any additional geotechnical work shall be included in the contract amount.

## 1.8 MECHANICAL

Compliance with the design requirements for the building mechanical systems will be determined by a review of the submitted 60 percent drawings, design analysis, and list of technical specifications. Any conflicts in the design requirements or lack of thorough understanding of the nature and scope of work shall be identified and resolved prior to submittal of the 60 percent design.

### 1.8.1 DESIGN DRAWINGS

The 60 percent design drawings shall be fully coordinated with the design analysis. Sufficient plans, piping diagrams, sections, flow diagrams, details, schedules, and control diagrams/sequences shall be provided as necessary to define the required design intent. Floor plans shall use the architectural floor plans as a basis, with the building outline half-toned. Unless otherwise indicated, all floor plans shall be drawn at 1/8" = 1'-0" scale and show all room names and numbers. An exception to this are administrative areas being air-conditioned shall be 1/4" = 1'-0" scale and mechanical room plans shall be 1/2" = 1'-0" scale. Sheet reference number sequencing shall be in accordance with the National CADD Standards with Omaha District CADD requirements. Submittal drawings shall include, but not limited to, the following:

#### 1.8.1.1 Mechanical Index Sheet

An index sheet identifying all mechanical drawings shall be provided, including those drawings anticipated to be provided in the 100 percent design submittal. Index shall include drawing design file numbers, drawing numbers, sheet numbers, and drawing descriptions.

#### 1.8.1.2 Mechanical Abbreviation, Legend, and General Notes Sheet

This sheet shall include all mechanical abbreviations and symbols that will be used on the drawings. Symbols shall be grouped into sections; as a minimum, provide sections for Plumbing, Heating, Miscellaneous Piping, Valves and Fittings, and ventilation.

#### 1.8.1.3 Exterior Utility Drawings

The following exterior utility drawings shall be provided:

##### a. Removal Plan

All existing exterior mechanical utilities and utilities which are to be removed shall be indicated on the Site Removal Plan located in the civil section of the drawing package.

##### b. Utility Plan:

All existing and new mechanical utilities shall be indicated on the Site Composite Utilities Plan located in the civil section of the drawing package. The location of existing exterior utilities shall be thoroughly checked and indicated on plans and profiles, thus preventing interference with new services. The utility drawing shall indicate all new utilities, including tie-in points, and existing utilities which are to be abandoned.



#### 1.8.1.4 Plumbing Drawings

The following plumbing drawings shall be provided:

##### a. Plumbing Plans

Plumbing plans showing the design and tentative layout of the domestic hot and cold water distribution systems; make-up water piping; soil, waste and vent piping; and storm water drainage system shall be provided. Plans shall show all anticipated routing of piping systems from the connections within the structure to a point 5 feet outside the structure. The grade of all drain lines shall be calculated and invert elevations established. All electrical panels/equipment and pertinent HVAC equipment (expansion tanks, boilers, AHU's, pumps, lawn sprinkler system, etc.) shall be outlined in half-tone on the plumbing plans. Plans may combine building areas and be drawn at  $1/8" = 1'-0"$  scale as long as legibility is not compromised. Plumbing fixtures and drains shown on the drawings shall be designated by the same identification system used in the Technical Specification and Plumbing Fixture Schedule.

##### b. Enlarged Mechanical Room Plumbing Plan

An enlarged mechanical room plumbing plan drawn at a minimum  $1/4" = 1'-0"$  scale shall be provided. Plan shall show layout of all plumbing equipment and piping within the rooms. In addition to all the plumbing systems required, the plan shall show half-toned outlines of all HVAC equipment located in the room, gas service, lawn sprinkler apparatus, the fire protection entrance and risers, and the outline of any electrical panels or equipment located in the room.

##### c. Plumbing Detail and Schedule Sheet

The following details shall be provided: water heaters, and water service entrance. The provided plumbing fixture schedule and a contractor generated water heater schedule shall be provided.

#### 1.8.1.5 Mechanical HVAC Drawings

Show on mechanical HVAC drawings, all items of mechanical equipment, including boiler room equipment, HVAC equipment layout, air handling units, air distribution and exhaust systems, etc., to determine proper space allocation within the intent of the architectural layout requirements. Plans, elevations, and sections shall be developed sufficiently to insure that major equipment items, piping, and ductwork cause no interference with structural members, electrical equipment, etc. The following HVAC drawings shall be provided:

##### a. Mechanical HVAC Plans

Mechanical HVAC plans showing the design and tentative layout of the hot water piping distribution system and equipment, the air supply and distribution systems, and the ventilation and exhaust systems shall be provided. Air supply and distribution systems shall show all ductwork, including supply and return ductwork, ductwork to diffusers, and all diffusers. For the 60 percent submittal, all ductwork may be shown as single-lined. The final design submittal shall show all ductwork as double-lined. All electrical panels/equipment and pertinent plumbing equipment shall be outlined in half-tone on the HVAC plans.

b. Enlarged Mechanical Room HVAC Plans

Enlarged mechanical room HVAC plans showing all mechanical systems and drawn at a minimum 1/2" = 1'-0" scale shall be provided. Plans shall show layout of all equipment, piping, and ducts located within the rooms. Equipment shall include (but not limited to) air handling units with associated outside air intakes, relief air, and supply/return ducts; exhaust/supply fans, mechanical room ventilation intake/relief openings, gas service entrance, combustion air opening, unit heaters, HW pumps, boilers, expansion tanks, and temperature control panels. Plans shall show dedicated access space for items requiring maintenance. In addition to all the mechanical HVAC systems required, the plan shall show half-toned outlines of all major plumbing equipment, the water service entrance, fire protection entrance and riser, lawn sprinkler apparatus, and any electrical equipment or panels located in the room.

c. Mechanical Room Sections:

For each air handling unit within the mechanical room, a mechanical room section view shall be provided showing, but not limited to, all AHU components, ductwork connections/routing, and relationship to adjacent structural features.

d. Chilled and Heating Water System Flow Diagrams:

Provide flow diagrams showing the facility piping system including the pumps and connected chilled and heating water equipment. Each pump and equipment item shall show associated cfm flowrate. All thermometers, pressure gauges, isolation and control valves, bypass piping, freeze protection piping, etc. shall be shown on the flow diagram.

e. Mechanical Detail Sheets:

Installation details showing all specification requirements such as isolation and balancing valves, thermometers, pressure gauges, equipment pads, strainers, vents, hangers, vibration isolation, etc. shall be provided for each item of mechanical equipment. As a minimum, the following mechanical details shall be provided to the extent they are included in the design:

- Refrigerant Piping Diagram
- Hot Water Boiler and Piping Diagram
- Chilled water piping Diagram
- Chilled water pumps
- Hot Water Pumps
- Expansion Tanks
- Horizontal Unit Heater
- Vertical Unit Heater
- Chemical Shot Feeders
- Gas Service Entrance
- Cabinet Unit Heater
- Air Handling Units
- Wall Propeller Supply/Exhaust Fan
- In-line Supply/Exhaust Fan
- Relief Hood
- Relief Vent
- Exhaust Hoods
- Seismic Requirements for Floor-Mounted and Suspended Equipment

f. Mechanical Schedule Sheets

Schedules, with preliminary capacities, shall be provided for each item of mechanical equipment. Furnished typical equipment schedules shall be used whenever possible and shall be revised and completed as necessary to suit the project requirements. In addition to the furnished schedules, damper and control valve schedules shall also be provided.

1.8.1.6 HVAC Control Drawings

Simplified, one-line type control schematics showing all control system interface points and detailed sequence of operation shall be provided for all mechanical equipment and systems. Sequence of operation for each item of equipment and system shall be sub-sectioned into paragraphs describing discreet operational requirements. The following drawings shall be provided:

HVAC Controls Legend:

This sheet shall include all control abbreviations and symbols that will be used on the drawings. Furnished Controls Legend sheet shall be used as a basis for all abbreviations and symbols used on the Final Control Drawings.

a. Misc Systems

These sheets shall include all miscellaneous equipment items such as supply/exhaust fans, unit heaters, radiant floor, infra-red heaters, controls air compressor, etc. that are not interlocked to the main HW or air handling unit systems. Provide control schematic and sequence of control for each item of equipment on the same sheet.

b. Hot Water System

Provide a boiler and pumping system control schematic and sequence of operation.

c. Radiant Floor Water System

Provide a manifold and zone pumping system control schematic and sequence of operation.

d. Air Conditioning System:

Provide a condensing unit, evaporator and chilled water pumping system control schematic and sequence of operation.

e. Air Handling Systems

For each air handling system, including outside air makeup system, provide a control schematic and a sequence of operation. Include all items of equipment that are interlocked to each system.

f. Control Points Lists

Provide Local Control Panel control points lists for all items of equipment and systems, identifying all anticipated temperature control system input/output points. The format for defining the input/output

points shall be as identified on the furnished Example Control Point List sheets.

#### 1.8.2 TECHNICAL SPECIFICATIONS

For this 60% design submittal the Contractor shall provide a listing by title and number of all Technical Specifications proposed for use in the final mechanical design. Identify special sections that are to be developed.

The following UFGS guide specifications shall be listed at a minimum and as applicable with the drawings and design analysis to identify the proposed product and installation requirements for the facility:

33	51	03	Gas Distribution System
13	48	00	Seismic Protection for Miscellaneous Equipment
13	48	00	Seismic Protection for Mechanical Equipment
23	07	00	Thermal Insulation for Mechanical Systems
23	20	00	Chilled, Chilled-Hot, and Condenser Water Piping System
23	23	00	Refrigerant Piping
33	51	01	Gas Piping Systems
22	00	00	Plumbing, General Purpose
23	54	16	Heating System: Gas-fired Heating
23	52	00	Water and Steam Heating; Oil, Gas or Both; up to 20 MBTUH
42	22	00	Liquid Chillers
23	82	02	Unitary Heating and Cooling Equipment
23	00	00	Air-Supply, Distribution, Ventilation, and Exhaust System
23	09	23	Direct Digital Control for HVAC and Other Local Building Systems
23	05	93	Testing, Adjusting and Balancing of HVAC Systems

Proposed HVAC and Temperature Control System Performance Test and Functional Performance Checklists shall be included in the appropriate specifications.

#### 1.8.3 DESIGN ANALYSIS NARRATIVE

The narrative portion of the design analysis shall contain a narrative description and analysis for each of the mechanical portions of the design. The basis and reasons for specific engineering decisions, special features, unusual requirements, etc., shall be explained or summarized as applicable. If it is necessary to deviate from criteria or standard practice, reasons shall also be included. Design statements shall be provided in sufficient detail to enable the reviewer to get a clear picture and understanding of all included work so that approval will be granted. Narrative shall be complete relative to scope and intended design approaches. The total scope projected to final design shall be outlined in a form that will be conveniently adapted, expanded, and detailed at the final design stage. If alternatives were to be evaluated and selected by the designer, findings (pros and cons) and conclusions shall be included. The design analysis shall carry a complete narrative for every item and system covered in the design, and shall include, but not be limited to, the following:

##### 1.8.3.1 Index

Provide a design analysis index identifying all main and sub-paragraph headings.

#### 1.8.3.2 Project Summary

Provide a brief description of the mechanical design objectives.

#### 1.8.3.3 Applicable Criteria

A list of all applicable criteria used for basis of design.

#### 1.8.3.4 Technical Specifications

A list of Technical Guide Specifications that will be used for the project.

#### 1.8.3.5 Design Conditions

A list of Mechanical HVAC design conditions including elevation, latitude, heating/cooling degree days, winter and summer outside design temperatures, inside design temperatures for all spaces, ventilation rates, etc. shall be provided.

#### 1.8.3.6 System Descriptions

Provide a complete description of all building systems; include the designer's reasons for selecting specific materials, systems, etc. in which the reason for selection is not obvious. System descriptions shall be include, but not limited to, the following:

- Plumbing System
- Exterior Gas Distribution System
- Interior Gas Piping System
- Hot Water Heating System
- Exhaust Hoods
- Air Supply and Distribution Systems
- Ventilation and Exhaust Systems
- Temperature Control System
- Seismic Protection
- Chilled Water System
- Refrigeration System

#### 1.8.4 DESIGN ANALYSIS CALCULATIONS

The Design Analysis calculations shall provide an estimate of the heating, cooling, and ventilation loads to finalize the selection of the type and size of mechanical equipment to be used. Design calculations shall be provided in sufficient detail to enable the reviewer to get a clear understanding of all work to allow approval. Backup data shall be furnished to support basic design decisions related to sizing of major equipment and materials, performance of specific systems or equipment. Manufacturer's catalog data sheets shall be provided for each item of equipment selected. Calculations may be performed by manual or computerized procedures. Use of standardized charts, curves, tables, graphs will generally be acceptable for portions of required calculations lieu of specific calculation procedures. Such data must be from a recognized source which is identified in the design analysis and shall be included with the calculations. Design calculations and computations shall be provided for all systems and shall include, but not limited to, the following:

#### 1.8.4.1 Index

Provide a design analysis index identifying all calculation items.

#### 1.8.4.2 Design Conditions

A list of Mechanical HVAC design conditions including elevation, latitude, heating/cooling degree days, winter and summer outside design temperatures, inside design temperatures for all spaces, ventilation rates, etc. shall be provided.

#### 1.8.4.3 Zone Air-Conditioning Loads

Preliminary cooling calculations shall be prepared using the Cooling Load Temperature Differential/Cooling Load Factors (CLTD/CLF) Method as described in the ASHRAE Fundamentals Handbook.

#### 1.8.4.4 Block Air-Conditioning Loads

Preliminary block cooling load calculations, encompassing the air-conditioned areas, shall be prepared using the CLTD/DLF Method.

#### 1.8.4.5 Chilled Water Pump Selections

Include pump flow calculations and catalog selection data indicating dimensions, connection sizes, rpm, horsepower, and efficiency.

#### 1.8.4.6 Heating Loads

For each area or room requiring heat; provide calculations.

#### 1.8.4.7 Heating Load Summary

A tabular summary of all heating load calculations for each area or room, including combustion air heating, shall be provided.

#### 1.8.4.8 Boiler Selection

Include boiler capacity adjustments for altitude, inefficiency, and net rating. Provide catalog data indicating input capacity, net output capacity, dimensions, and water and flue size connections.

#### 1.8.4.9 Hot Water Pump Selection

Include pump flow calculations and catalog selection data indicating dimensions, connection sizes, rpm, horsepower, and efficiency.

#### 1.8.4.10 Combustion-Air Requirements

Include combustion air quantity and free area calculations, louver selection, combustion air heating requirements, and selection of heating equipment.

#### 1.8.4.11 Unit Heater Selections

For each area requiring a unit heater, provide data on capacity, weight, and horsepower.

#### 1.8.4.12 Mechanical Ventilation

For each area or room requiring mechanical ventilation for cooling; provide calculations similar to zone air-conditioning, louver selection, and catalog fan data.

#### 1.8.4.13 Toilets/Janitor Room Ventilation

Provide calculations, catalog fan data, and louver selections, for each toilet area.

#### 1.8.4.14 Air Handling Units

A tabular summary of all airflow calculations for each area or room shall be provided on each air distribution system for fan sizing.

#### 1.8.4.15 Domestic Water Demand

Calculations for determining the size of the domestic cold water supply line to the building shall be provided.

#### 1.8.4.16 Domestic Hot Water Demand

The design guidance provided for service water heating in ASHRAE HA shall be followed to determine the domestic hot water demand for the facility. Provide catalog data for the domestic water heaters.

#### 1.8.4.17 Electrical Load Summary

A summary of all mechanical equipment and the associated electrical load requirements shall be provided.

### 1.8.5 ENERGY CONSERVATION

Mechanical designs shall be economical, maintainable and energy conservative with full consideration given to the functional requirements and planned life of the facility. Emphasis shall be given to heat reclamation, outside air usage and other energy conservation measures for mechanical systems. Each major item of proposed mechanical equipment shall have a net efficiency rating that is equal to or exceeds the net efficiency ratings of similar or equal equipment of the four manufacturers each having one of the four highest ratings.

### 1.8.6 AIR POLLUTION CONTROL

Air pollution control shall be incorporated in all designs. The Architect-Engineer shall investigate the latest Using Service, Local, State, and Federal regulations and standards, analyze and report on requirements in the design analysis, and include in the design as applicable. The most stringent of all regulations and standards shall be implemented into the design. If in doubt as to requirements, contact this office for assistance.

## 1.9 ELECTRICAL

### 1.9.1 DRAWINGS

Drawing scale shall match architectural drawing requirements. Drawings shall show the following:

#### 1.9.1.1 Lighting Layout and List of Fixtures

Complete lighting layout of all areas shall be provided. The type of fixture shall be indicated on the drawing. Complete list of fixtures proposed with type of lamp and wattage.

#### 1.9.1.2 Receptacle Layout

Complete receptacle layout should be provided for all areas to indicate project requirements.

#### 1.9.1.3 Power Equipment and Layout

Power equipment and layout such as switchboard, panelboards, large motor driven items, etc.

#### 1.9.1.4 Power One Line Diagram

Power one line diagram shall be shown to indicate arrangement of the system.

#### 1.9.1.5 Fire Detection

Fire Detection drawings shall be provided and inserted in the Fire Protection/Fire Suppression F-Series of drawings.

#### 1.9.1.6 Miscellaneous Details of Special Equipment

Miscellaneous details of special equipment to indicate understanding of 01 86 26 ELECTRICAL REQUIREMENTS.

### 1.9.2 SPECIFICATIONS

Submit prescriptive specification sections to specify the quality, characteristics, installation procedures and testing requirements for all items of the proposed electrical design.

Specifications shall be provided (to approximately 60 percent completion). See Section 01 33 00.32 DESIGN AND CONSTRUCTION DELIVERABLES/PROCEDURES, paragraph 3.2, SPECIFICATIONS for additional requirements.

### 1.9.3 DESIGN ANALYSIS NARRATIVE

The design analysis shall contain a description and analysis of the electrical portions of the design. Special features, unusual requirements, etc., should be noted. Narrative must address all technical requirements identified in Section 01 86 26 ELECTRICAL REQUIREMENTS.

### 1.9.4 DESIGN ANALYSIS CALCULATIONS

Backup data shall be furnished to support basic design decisions related to sizing of major equipment and materials. As a minimum the following shall be submitted.



#### 1.9.4.1 Service

Sizing of building services EMD (Estimated Maximum Demand) for all the building loads.

#### 1.9.4.2 Transformers

Sizing of general purpose dry type transformers.

#### 1.9.4.3 Feeders

Sizing of main feeders.

#### 1.9.4.4 Panelboards

Sizing of panelboards and distribution equipment.

#### 1.9.4.5 Illumination Calculations

Data should identify target and calculated illumination levels for all typical rooms. Calculations should be adjusted to compensate for special applications such as irregularly shaped rooms, open sides, ceiling obstructions (beams, ductwork), corridors, etc. If the lumen method is used for corridor calculations, the calculations should be performed using a module in which the length doesn't exceed 3 times the width (2:1 ratio preferred).

#### 1.9.4.6 Short Circuit Evaluation

The maximum possible fault current at the building service should be calculated.1.10 CYBERSECURITY

Refer to Specification Sections 01 81 00 SUMMARY OF THE WORK, 01 86 10 MECHANICAL REQUIREMENTS, 01 86 13 FIRE PROTECTION REQUIREMENTS, 01 86 26 ELECTRICAL REQUIREMENTS, 01 91 00.15 10 TOTAL BUILDING COMMISSIONING, and related facility control system specification sections. Comply with all requirements for the 60% design level of completion as specified in the related facility control system specification sections.

### 1.10.1 DESIGN ANALYSIS

The design analysis shall contain a description and analysis of the proposed facility related control systems (frcs) included in the design. Special features, unusual requirements, etc., should be noted. The Narrative must address all technical requirements identified in referenced specification sections and UFC 4-010-06. The Narrative shall identify the ISSM/ISSO (Information System Security Manager/Officer) for cybersecurity, include an inventory of all frcs with associated C-I-A (Confidentiality-Integrity-Availability) Impact Level Ratings, and the mission category (support, essential, critical). The Narrative shall provide a discussion which describes the background for, and purpose of cybersecurity controls implementation for frcs. Appendix of Design Analysis shall have a preliminary CCI (Control Correlation Identifier) List for each frcs platform.

### 1.10.2 SPECIFICATIONS

Submit a specification section 25 05 11 variants which provide the applicable cybersecurity controls implementation for each frcs based upon

coordinated project reviews and coordination across all disciplines which includes Commissioning Agent(s).

Specifications shall be provided (to approximately 60 percent completion). See Section 01 33 00.32 DESIGN AND CONSTRUCTION DELIVERABLES/PROCEDURES, paragraph 3.2, SPECIFICATIONS for additional requirements.

#### 1.10.3 DRAWINGS

Identify Mission Space(s) as applicable on plan sheets.

#### 1.11 COMMUNICATIONS

##### 1.11.1 Drawings

Drawing scale shall match architectural drawing requirements. Drawings shall be organized and demonstrate that the work complies with all requirements of the RFP as follows:

##### 1.11.1.1 Outside Plant Distribution

Manhole and ductbank system layout shall show all exterior features including: quantity and sizes of ducts, manhole types, cable types and routing.

##### 1.11.1.2 Voice and Data Plans

Complete layout of all areas and outlets shall be provided. The type of outlets shall be indicated. Cable tray, conduits and other pathways shall be shown, with sizes indicated. Racks, cabinets, and other equipment shall be shown and identified.

##### 1.11.1.3 Riser Diagrams

Provide riser diagrams that indicate the ER, TR's risers, backbone trays and conduits, typical horizontal cabling, backbone termination areas, and service entrance configurations, and all backbone cabling (including types and counts).

##### 1.11.1.4 Outlet Configurations

Show all unique outlet configurations, including connector types and quantities and labeling conventions.

##### 1.11.1.5 Rack, Cabinet , and Equipment Elevations

Show typical elevations of each type of rack, cabinet, or other equipment or termination enclosures, including cable management, grounding, power, patch panels, connectors, etc.

##### 1.11.1.6 Miscellaneous Communications Systems

##### 1.11.1.7 Plans

Show all devices and equipment for Public Address, and CATV.

#### 1.11.1.8 Riser Diagrams

Provide a separate riser diagram for each system, showing all major components, typical minor components (speakers, volume control, etc.) and interconnecting cabling.

#### 1.11.2 Specifications

Submit prescriptive specification sections to specify the quality, characteristics, installation procedures and testing requirements for all items of the proposed communications design.

#### 1.11.3 Design Analysis Narrative

The design analysis shall contain a description and analysis of the communications portions of the design. Special features, unusual requirements should be noted. Narrative must address all technical requirements identified in section 01 86 29 COMMUNICATIONS REQUIREMENTS.

#### 1.11.4 Design Analysis Calculations

Backup data shall be furnished to support basic design decisions related to sizing of cable trays and conduits.

### 1.12 FIRE PROTECTION

#### 1.12.1 DRAWINGS

Features of Fire Protection, their ratings, and the hazards requiring them, shall be clearly indicated. Sprinkler and fire alarm/detection areas shall also be clearly indicated. Fire detection mass notification and sprinkler systems shall be laid out and detailed sufficiently to indicate the designers understanding of the Section 01 86 13 FIRE PROTECTION REQUIREMENTS. When other functions co-exist with the fire protection functions, their integration shall be clearly indicated, with an analysis that describes how both functions will be served. Provide a separate, composite type floor plan which makes an accurate presentation of these various features and functions. As part of the submittal, provide a set of plans that shows emergency egress for the facility.

#### 1.12.2 SPECIFICATIONS

None of the Unified Facilities Guide Specifications (UFGS) are required to be submitted at this design stage. However; any Contractor generated specifications required to meet the project specifics, or individual specification items added to the provided guide specifications shall be submitted for review. Note that UFGS sections 21 13 13.00 10, WET PIPE SPRINKLER SYSTEMS, FIRE PROTECTION, AND 28 31 76 INTERIOR FIRE ALARM AND MASS NOTIFICATION SYSTEM is required for this contract. UFGS sections may be edited only for those portions that do not apply to this project. For the items that do apply, no changes may be made.

#### 1.12.3 DESIGN ANALYSIS

The design analysis shall include a separate fire protection report containing, but not limited to, review statements and/or comments on the following items, where applicable.

- a. Location and rating of fire walls and fire partitions.
- b. Column, floor, and roof protection.
- c. Path of travel for emergency egress and operation of panic exits.
- d. Access to building for fire fighting.
- e. Design and placement of fire and smoke stop doors.
- f. Labeled windows, where required.
- g. Venting of smoke.
- h. Placement of hand fire extinguisher cabinets.
- i. Type and adequacy of sprinkler system.
- j. Building exterior fire protection facilities and building clearances.
- k. Type of occupancy.
- l. Zoning of fixed fire protection systems.
- m. Type and adequacy of fire alarm and detection systems.
- n. Zoning of fire alarm and detection systems.
- o. Number of zones of alarm and detection systems that are separately transmitted to the base or installation fire department.

#### 1.13 ENVIRONMENTAL PROTECTION COMPLIANCE

##### 1.13.1 SPECIFICATIONS

If Section 01 57 20.00 10 ENVIRONMENTAL PROTECTION is not adequate for compliance with environmental laws and regulation for this project, the Contractor shall be responsible for developing additional requirements and/or editing the specification to ensure that the project is in full environmental compliance. If Section 01 57 20.00 10 ENVIRONMENTAL PROTECTION is revised by the Contractor, the revised specification shall be included with this submittal.

##### 1.13.2 DESIGN ANALYSIS NARRATIVE

The Contractor shall prepare a chapter in the Design Analysis entitled: "Environmental Protection Compliance". This chapter shall summarize how the project complies with environmental laws and regulations with regard to environmental permits, notices, reviews and/or approvals by the governing authorities. As a minimum, the chapter shall include the following:

- a. The list of Permitting and/or Approving Authority(ies).
- b. The list Construction/Operating Permits, Notices, Reviews and/or Approvals required for the project. If, when checking with the environmental agencies, a permit, notice, or approval is not required,

include a copy of the telephone conversation memorandum or letter from the agency stating nothing required.

c. Time required by the permitting agency(ies) to process the application(s) and issue the permits.

d. Fee schedule including filing/application fees, review fees, emissions fees, certification testing, etc.

e. Monitoring and/or compliance testing requirements.

f. Copies of the completed application forms and associated documents.

#### 1.13.3 Submittal of Environmental Approvals, Permits Applications and Associated Documents

Approvals and/or Permits, for which the facility is required to be permittee or the facility is required to submit for approval to the Federal, State, or local governing agency, may be required to be submitted with 60 percent design documents because of time restraints for obtaining the permit. The Contractor shall complete the technical portions of the approvals, permit applications and complete the required associated supporting material. This package shall be submitted to the Corps of Engineers with sufficient time for the Federal Facility to receive the approval and/or permit prior to construction commencing.

### 1.14 SAFETY

#### 1.14.1 SPECIFICATIONS

At a minimum, identify the pertinent UFGS guide specification that will be edited.

01	35	29	Safety And Occupational Health Requirements
02	82	14.00	10 ASBESTOS HAZARD CONTROL ACTIVITIES
02	82	33.13	20 REMOVAL/CONTROL AND DISPOSAL OF PAINT WITH LEAD
02	83	13.00	20 LEAD IN CONSTRUCTION
02	84	16	HANDLING OF LIGHTING BALLASTS AND LAMPS CONTAINING PCBs AND MERCURY
02	84	33	REMOVAL AND DISPOSAL OF POLYCHLORINATED BIPHENYLS (PCBs)
31	21	13	RADON MITIGATION

Any interference with the Civil, Mechanical, Electrical, Geotechnical, and Environmental specifications shall be addressed and reviewed to extract the list of sampling and analysis requirements.

#### 1.14.2 DESIGN ANALYSIS

##### 1.14.2.1 Narrative

The Design Analysis Narrative shall list all conditions impacting safe work on the project for each of the sections listed above. Potentially hazardous conditions such as and materials shall be identified. The basis and reasons for specific decisions, special features, unusual requirements, etc., shall be explained or summarized as applicable. If it is necessary to deviate from criteria or standard practice, reasons shall also be included. Design statements shall be provided in sufficient detail to enable the reviewer to get a clear picture and understanding of

all included work. Narrative shall be complete relative to scope and intended design approaches. The total scope projected to final design shall be outlined in a form that will be conveniently adapted, expanded and detailed at the final design stage. The design analysis shall carry a complete narrative for every item covered in the design.

#### 1.14.2.2 Design Analysis Calculations

Amount and location of hazardous material (asbestos, lead paint, PCBs, etc) that will be removed shall be addressed.

#### 1.14.2.3 Basis, Specific goals, Objectives and Priorities for Hazardous Material

The Design Analysis should establish specific goals, objectives and priorities for safety (including the removal, handling and disposal of hazardous materials) of the project. Identify, explain and document use of design criteria and how the design meets goals, objectives and priorities. Identify the preferred site development concept. Show how systematic planning has been used in the design, and to meet the objectives. Systematic planning ensures high decision confidence and stakeholder satisfaction. It should list various regulatory, scientific and engineering decisions that must be made in order to achieve the desired outcome, list unknowns that stand in the way of making those decisions, and strategies to eliminate or manage the unknowns.

#### 1.14.3 DRAWINGS

The drawings and specifications shall clearly identify the amount and location of hazardous material.

#### 1.15 SUSTAINABLE DESIGN

See SECTION 01 33 29 SUSTAINABILITY REPORTING for sustainability documentation submittal requirements for each phase of design.

PART 2 NOT USED

PART 3 NOT USED

-- End of Section --

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## DIVISION 01 - GENERAL REQUIREMENTS

## SECTION 01 33 00.38

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**05/07**

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## SECTION 01 33 00.38

100 PERCENT DESIGN REQUIREMENTS  
05/07

## PART 1 100 PERCENT DESIGN SUBMITTALS

For general submittal requirements, see Section 01 33 00.32 DESIGN AND CONSTRUCTION DELIVERABLES/PROCEDURES.

## 1.1 REFERENCES

## AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC 360 (2016) Specification for Structural Steel Buildings

## ACI INTERNATIONAL (ACI)

ACI SP-66 (2004) ACI Detailing Manual

## INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE Std 241 (1990; REAF 1997) Electric Power Systems In Commercial Buildings

IEEE Std 242 (2001; Errata 2003) Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems - Buff Book

## AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M (2020) Structural Welding Code - Steel

## NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (2020; ERTA 20-1 2020; ERTA 20-2 2020; TIA 20-1; TIA 20-2; TIA 20-3; TIA 20-4) National Electrical Code

## U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 4-010-06 (2016; with Change 1, 2017) Cybersecurity of Facility-Related Control Systems

This reference list is not comprehensive. See references in related specification sections.

## 1.2 CIVIL/SITE

## 1.2.1 DRAWINGS

## 1.2.1.1 Location Plan and Vicinity Map

A Vicinity Map consists of a small scale drawing of the project location, similar to a road map. A Location Plan consists of a small scale drawing showing the Government property or reservation limit with the construction project site shown. The drawing shall show the facility approved

Contractor Access and Haul Routes, waste and borrow sites for all non-HTRW materials, Contractor-furnished trailer for Government use (if applicable), and Contractor staging and parking areas. A reproducible base sheet, if available, may be provided by the Omaha District for the Contractor's use in preparing the Location Plan.

#### 1.2.1.2 Survey Plan

The information depicting existing conditions used to generate site drawings shall be shown on this drawing. An engineering survey of the site will be presented to the Contractor selected as a result of this RFP process. Any additional survey information required by the Contractor for design above that shown in the prepared engineering survey shall be procured and paid for by the Contractor.

#### 1.2.1.3 Removal Plan

The removal plan will show the existing physical features and condition of the site before construction. This information should include the field survey to show all above and below ground utilities; buildings, drives, roads and parking areas, walks, and vegetation; and such facilities as retaining walls, underground storage tanks, foundations, etc. Each physical feature to be removed shall be as indicated on the standard legend sheet, a legend on the removal plan, and properly noted: to be removed, to remain, or to be relocated. The extents or limits of removals must be clearly marked.

#### 1.2.1.4 Site Plan

The Site Plan shall show all the site layout information necessary to field locate the building, walks, parking lots, and all other appurtenances to be constructed on the project. All site related work to be constructed will be located by dimensions. The Site Plan will identify all site related items such as: curbs, pavements, walks, plazas, bollards, trash enclosures, retaining walls, etc. in accordance with a standard legend sheet or with additional legends or notes. Site Plans shall be at a scale of 1 Inch = 20 Feet or 1 Inch = 40 Feet. Other drawing scales must be approved by the Omaha District. North arrows shall be oriented the same direction on all plan sheets and by all disciplines. No existing or proposed contours shall be shown on this Plan. The Site Plan, prior to adding the dimensions, should serve as the base sheet to the other Plans, such as: Utilities Plan, Grading and Drainage Plans and Landscape Plan. The Site Plan shall show all existing physical features and utilities within and adjacent to the work site that will remain after the proposed construction has been completed. This plan will also show any free zones, construction limits, and storage areas. Whenever the Site Plan occupies more than one sheet of drawings, a Key Plan shall be included. Additional plans, showing specific areas of the site in smaller scales can be included if more detail is necessary.

#### 1.2.1.5 Grading and Drainage Plan

A final grading and drainage plan shall be provided at the same scale as the site plan 1 Inch = 20 Feet or 1 Inch = 30 Feet. Other drawing scales must be approved by the Omaha District. In addition to the requirements for the preliminary plan, the final plan shall show the final location of all storm drains, culverts, and subdrains. Storm drainage lines and structures shall be labeled. The rim elevation of all manholes, curb inlets, and area inlets shall be indicated.

#### 1.2.1.6 Composite Utilities Plan

A Composite Utilities Plan shall be provided at a scale of 1 Inch = 20 Feet or 1 Inch = 30 Feet. Other drawing scales must be approved by the Omaha District. New and existing utilities shall be indicated. Plans shall show layout of the new and existing storm drainage systems, gas systems, sanitary systems, electrical systems, communication systems, water systems, steam systems and any other utilities which need to be provided for. Include new and existing contours.

#### 1.2.1.7 Road Profile

Provide centerline profile for new roads and access drives.

#### 1.2.1.8 Grading Sections

The preliminary grading sections shall be revised as necessary. Provide grading sections at 50-foot intervals along roads and drives.

#### 1.2.1.9 Storm Drain Profiles

Provide profiles of all new storm drains, subdrains, and culverts showing new and existing grades, new and existing utilities, pavement sections in detail, pipe diameters and lengths, pipe slopes, invert elevations, etc. Class and gauge of all storm drain, subdrain, and culvert pipes shall be provided. This information may also be included in Storm Drain and Subdrain Schedule drawings. Profiles of roof drain runout lines may or may not be provided, at the Contractor's discretion.

#### 1.2.1.10 Drainage Structure Details

Provide typical details of all storm drainage structures. Unless otherwise directed, use Omaha District standard detail drawings. The use of alternate details shall be approved prior to the final design documents. A, B, C, and D dimensions of all storm drain and subdrain structures shall be shown. Dimensions may be shown on either the Storm Drain and Subdrain Schedules, profiles, or structure detail drawings.

#### 1.2.1.11 Pavement Details

Provide details of concrete curb and gutter, integral curb, typical pavement sections, typical sidewalk section, pavement utility cut details, and interface detail between new and existing pavement. Concrete curb and gutter and integral curb shall conform to standard details provided, in RFP drawings.

#### 1.2.1.12 Pavement Joint Layout Plans

Provide pavement joint layout plans with spot elevations at joint intersections for all new concrete roads, parking areas, and pavements. Each type of joint shall be shown with a different symbol and a joint legend provided. Pavement joint layout plans shall be drawn at a scale of 1 Inch = 10 Feet or 1 Inch = 20 Feet. Under no circumstances shall pavement joint layout plan be combined with any other plans.

#### 1.2.1.13 Concrete Pavement Joint Details

Provide concrete pavement joint details. Use Omaha District standard

detail drawings whenever practicable.

#### 1.2.1.14 Fence Details

Provide details of fence and gates. Use Omaha District standard detail drawings whenever practicable.

#### 1.2.1.15 SWPPP Site Map

Provide a site map indicating drainage patterns and approximate slopes anticipated after major grading activities, areas of soil disturbance, areas which will not be disturbed, locations of major structural and nonstructural erosion controls identified in the Storm Water Pollution Prevention Plan, locations where stabilization practices are expected to occur, locations of off-site material, waste, borrow or equipment storage areas, surface waters (including wetlands), and locations where storm water discharges to a surface water.

#### 1.2.1.16 Erosion Control Details

Provide details of best management practices used to control erosion.

#### 1.2.1.17 Site Furnishing Details

The Contractor shall provide designs and details as necessary for site furnishings and accessories.

#### 1.2.1.18 Landscape Plan

A Landscape Plan showing trees, shrubs, ground covers, seeded and sodded areas, shall be prepared. The Landscape Plan shall be prepared by a fully qualified, experienced professional Landscape Architect. The A-E (Contractor's Designer) shall specify types of plant materials that are locally grown, commercially available and acclimated to the project environment. The Landscape Plan shall include a plant materials schedule or listing. This schedule shall include botanical names, common names, size, the method of planting and remarks. The Landscape Plan shall also show all unsurfaced ground areas disturbed by construction within the project limits with these areas shown to be seeded, sodded, or mulched as required.

#### 1.2.1.19 Landscape Details

The Contractor shall verify the methods of planting to meet the project site/installation requirements and provide the necessary Landscape Details to perform the contract design work. Details shall reflect local practices and conditions for installation. The Contractor shall provide designs and details as necessary for other required site furnishings and accessories.

#### 1.2.1.20 Planting Bed Grading and Drainage Plan

A grading and drainage plan shall be provided for all planting beds near the building that are adjacent to pavement. The plan shall show spot elevations for the planting bed final grades before mulch is added. The plan shall show the location, types and sizes for all drains, piping and sleeves required. All connections to storm drains and or ditches, invert and rim elevations shall be shown. All necessary details shall be provided.

#### 1.2.1.21 Sprinkler Irrigation System Plan

Sprinkler irrigation plan shall designate the trees, shrubs, ground cover, and lawn area to be irrigated. Plan shall show head layout piping with sizes and all other corresponding components. All appropriate details are to be shown and calculations included. Provide flow and pressure requirements.

#### 1.2.2 SPECIFICATIONS

Provide complete edited specifications for all items. Technical specifications shall be complete and fully coordinated with the drawings. All specification indexes shall be completely edited to reflect the paragraphs retained in the body of the specification. All references that have not been used in the body of the specification shall be edited from the technical specification.

#### 1.2.3 DESIGN ANALYSIS NARRATIVE

Design analysis shall include the following:

##### 1.2.3.1 References

Provide design references used in preparing the civil/site design.

##### 1.2.3.2 Basis For Design

The Design Analysis should give the basis, specific goals, objectives and priorities for civil/site design of the project. Identify, explain and document use of design criteria and how the design meets goals, objectives and priorities. Identify the preferred site development concept. Document stormwater pollution prevention measures and other environmental considerations made during design.

##### 1.2.3.3 Grading

A narrative of the grading design and criteria used.

##### 1.2.3.4 Drainage

A narrative of the drainage design and criteria used. Include information on the storm drain pipe materials selected and their ability to withstand earth dead loads and live loads that will be imposed.

#### 1.2.4 Design Analysis Calculations

##### 1.2.4.1 Storm Drainage System Calculations

Storm Drainage System Calculations shall include the following:

- a. Drainage area map showing boundaries of each drainage area and respective drain inlet or culvert.
- b. Storm run-off calculations for each drainage area.
- c. Tabulation of capacities of new storm drains including: diameter and slope of storm drain pipes, design storm discharge and velocity for each storm drain pipe, maximum discharge capacity of each storm drain pipe, headwater depth of each culvert during design storm

discharge.

d. Hydraulic capacity calculations for each new curb and area inlet.

#### 1.2.4.2 Pavement Calculations

Pavement thickness calculations for each pavement.

#### 1.2.4.3 Sprinkler Irrigation System Design Parameters

A list of applicable criteria and/or design standards shall be provided. This shall also include precipitation rates, pipe sizes and material and complete calculations of total flow and pressure requirements and head losses. A narrative description of the system including special requirements and drip systems shall be provided.

### 1.3 GEOTECHNICAL

See Structural Design Requirements.

### 1.4 WATER SUPPLY AND WASTEWATER

#### 1.4.1 DRAWINGS

Generally, the corrected and approved 60 percent plans may be used as the basis for the final plans. However, all details necessary for complete construction must be included. The 100 percent final design submittal shall include all the information presented in the 60 percent submittal, updated to final design status, corrected to reflect any changes made in response to review comments, and shall include the additional requirements specified hereinafter. Any concerns in developing the final design documents shall be resolved prior to starting the final design stage.

##### 1.4.1.1 Water Distribution and Sewage Collection Systems Plans (including building services)

Provide all existing utilities and above ground features, including sizes and material types, which may pose as an obstacle (i.e., water, sewer, gas, electrical, etc.) on the basic site plan layout. Indicate existing pipe material and sizes where new lines connect along with the type of connection and elevations of connections. Provide all new water and sewer lines with sizes. This will include all new service lines, up to within the 5-foot building line. Locations of all new manholes, fire hydrants, valves (including PIV's), similar appurtenances, connection points and etc. shall be provided. For pavement cuts, show type of pavement to be removed and replaced. Show contours on plan view. Include stationing on both plan and profile sheets.

##### 1.4.1.2 Water Distribution and Sewage Collection Systems Profiles

Profiles of all gravity sewers, waterlines (excluding service connections) and sewage forcemains shall be provided. Profiles may be omitted for short waterlines, unless necessary to assure adequate cover or avoid interference with other underground facilities. Indicate existing pipe material and sizes where new lines connect. Indicate type of connection and elevation. Include all interference elevations.



#### 1.4.1.3 Water Distribution and Sewage Collection Systems Details

Appropriate water and sewer details shall be provided. Use Omaha District standard detail drawings. The standard detail sheets will be furnished if required. For roadway pavement crossings, indicate installation method (open cut, boring, jacking, etc.). Include standard casing details.

#### 1.4.2 SPECIFICATIONS

Specifications shall be coordinated with the plans and include all items. Provide special sections to cover those subjects for which no UFGS guide specifications are used or available. These special sections shall include all approved changes from the 60 percent review stage. All UFGS guide specifications, to be provided, shall be in edited form showing all text to be deleted and added.

#### 1.4.3 DESIGN ANALYSIS NARRATIVE

Design analysis shall include the following and all applicable data contained in the 60 percent design analysis narrative shall be repeated. References shall not be made to the previous design analysis. The final design analysis shall be corrected to reflect changes in content made in response to review comments, and shall be expanded to reflect the completed design.

##### 1.4.3.1 References

Provide design references used in preparing the water and wastewater design.

##### 1.4.3.2 Water Supply and Distribution Systems

A narrative of the water supply and distribution systems design and applicable criteria used shall be provided. Include the peak and average domestic demands, the interior and exterior fire flow requirements and the available flow and residual pressures. A description of the water distribution system, and complete calculations necessary to support equipment, piping sizes, interior and exterior fire demands, and domestic demands, etc. shall be provided.

##### 1.4.3.3 Wastewater and Sewers

A narrative of the wastewater supply design and applicable criteria used shall be provided. Include the average, diurnal peak, and extreme peak flows along with the full flow capacity (70% of the total depth) of the system. The design shall be in accordance with velocity requirements of Section 01 89 00 SITE WORK REQUIREMENTS. A listing of allowable piping materials, and complete calculations necessary to support equipment and piping sizes shall be provided.

#### 1.5 ARCHITECTURAL

##### 1.5.1 DRAWINGS

The drawings shall be complete, include all necessary and required details, thoroughly checked, and fully coordinated with the technical Specifications and all other Construction Documents. Previous comments and applicable criteria changes shall have been incorporated into the design. Removal work and details should be shown on separate drawings. The

contract drawings shall fully describe the type and the scope of work required. The layout of individual sheets and the organization of the assembled set shall follow and communicate a logical sequence. General information shall be presented first, progressing to more detailed information. When assembling details, begin in the upper left-hand corner of the sheet with letters progressing to the right and down. When dimensioning, use arrowheads, not dots or slashes. Where major structural elements are included as parts of architectural detailing, do not indicate sizes. These elements must be fully defined in the structural design documents. See 60% Architectural drawing submittal requirements for drawing scales of remaining drawings to be submitted. Include all drawings from the 60% submittal plus all additional detail drawings required for complete 100% design. These shall include but not be limited to the following:

- Interior Elevations and Details
- Door Details
- Window Details
- Louver Details
- Roof Details
- Stair Details
- Casework Plans, Elevations, and Details
- Wall Plan Details and Plan Details
- Fire Wall Details and Penetration Conditions
- Sealant Details
- Ceramic Tile Details
- Ceiling Details
- Control/Expansion Joint Details
- All Miscellaneous Details

#### 1.5.2 SPECIFICATIONS

The technical specifications shall be complete and fully coordinated with the drawings. Special sections shall be prepared to cover those subjects for which no pattern guide specification is available. Notes to the Designer that accompany specifications shall be used in editing technical guide specifications. All specification indexes shall be completely edited to reflect the paragraphs retained in the body of the specification. All UFGS guide specifications shall be edited in accordance with Section 01 33 00.32 DESIGN AND CONSTRUCTION DELIVERABLES/PROCEDURES.

#### 1.5.3 DESIGN ANALYSIS NARRATIVE

The Design Analysis shall include the basic information presented in the previous submittal, corrected to reflect changes in content made in response to review comments. Outline specifications shall be omitted from the Final Design Analysis as the information is included on the final drawings and project specifications.

#### 1.5.4 DESIGN ANALYSIS CALCULATIONS

The Design Analysis calculations shall include the basic information presented in the previous submittal, corrected to reflect changes in content made in response to review comments.

#### 1.5.5 COMMON DEFICIENCIES

Some requirements of the contract have been repeatedly overlooked in the past. Subsequently these errors have been identified and the Contractor

directed to make corrections. The work involved in such corrections becomes lost effort and time for all parties involved. Carefully compare the architectural design and contract documents with these requirements at several points in the design process to avoid unnecessary changes later. Some of these requirements which are most often overlooked include:

- a. Not using correct abbreviations or terminology on the drawings. Match what is used on the standard abbreviation sheet and terminology used in the guide specifications.
- b. Not using the correct scales, north arrow designation, section cut system, or incomplete dimensioning on the drawings.
- c. Not providing sufficient space for door operation hardware at doors which swing into a wall running perpendicular to the opening.
- d. Not providing correct and complete Design Analysis information written in the past tense.
- e. Not providing a structural stoop at exterior doors where the slab is at the same approximate elevation as the interior floor. The use of simple slabs on exterior grade leads to lifting of the slab in below-freezing temperatures which interferes with the safe operation of the door.
- f. Not correctly presenting or coordinating (to avoid interference) features of Fire Protection, Noise Control, and Physical Security.
- g. Not correctly referencing and cross referencing building sections, wall sections, details, etc.
- h. Where major structural elements (beams, columns, etc.) are included as parts of architectural detailing, do not indicate sizes. Fully define these items in the structural design documents.
- i. Incorporating trade names or proprietary items into the specifications.
- j. Failure to read/use technical notes in guide specifications.
- k. Failure to coordinate all disciplines prior to submittal of projects for review.
- l. Improper use of fire-retardant wood. Fire-retardant wood is combustible; its use in buildings that are of noncombustible construction is extremely limited (see IBC for the minor allowable uses). Because of the potential for severe degradation, fire retardant plywood shall not be used in a roof or roofing system, or in structural applications.
- m. Incorrectly specifying door hardware, including door lock type and functions, and keying requirements. Coordinate the type of locks and keying with the appropriate installation stakeholders to assure that the locks provided match the post/base standard lock system.
- n. Control joints in CMU walls and brick expansion joints in face brick are not shown on both architectural and structural plans, or are inconsistent. Control joints for gypsum wallboard and steel stud walls, ceilings, and ceramic tile floors being left to the

construction contractor to locate. The designer should locate these in optimal locations that are unobtrusive.

o. Failure to delete all publications from Guide Specifications which do not apply to the particular project.

p. North is not oriented the same direction on all sheets (civil, site, arch).

q. Failures to properly edit and tailor guide specifications. Retain all edits (additions and deletions) in the guide specifications through the final review set of documents.

r. Failure to use proper gage of steel studs and appropriate substrate for ceramic tile covered walls.

s. Failure to properly edit the paint and coatings guide specification, associated applicable references, and associated schedule.

t. Consideration for how the design will eliminate construction procedures that might cause contractor claimed inefficiencies. An example might be the construction of full height fire rated walls and their sequence of construction with regard to adequate space and openings for HVAC and electrical penetrations.

u. Failure to identify and locate the continuous vapor retarders/barriers and air barriers on roof and wall details.

v. Failure to identify and set sustainability goals and select Third Party Certification system early in the design process.

w. Failure to reference and use the correct Building/Life Safety codes adopted by the UFCs.

## 1.6 INTERIORS

### 1.6.1 DESIGN ANALYSIS NARRATIVE

Updates as a result of the 60% review conference shall be made to the design analysis.

### 1.6.2 DRAWINGS

Updates required to the furniture floorplan as a result of 60% review shall be incorporated into the drawings.

### 1.6.3 SPECIFICATIONS

Technical specifications shall be in final form for construction (in accordance with the requirements of Section 01 33 00.32 DESIGN AND CONSTRUCTION DELIVERABLES/PROCEDURES and shall include all changes requested during the 60% review stage. All specifications shall be completely edited and fully coordinated with the drawings to accurately and clearly identify the product, installation requirements, and testing methods for this facility.

#### 1.6.4 FURNITURE, FIXTURES & EQUIPMENT (FF&E) PACKAGE

Updates required to the FF&E package as a result of the 60% design review should be incorporated into the FF&E Package.

#### 1.6.5 COLOR BOARDS AND LEGENDS

Color boards shall show actual color samples of all proposed exterior and interior finishes. A color board legend shall accompany the boards and shall clearly identify all finishes. Clarification of finish placement shall be required when more than one color of a single finish is proposed. Color boards shall be 8 1/2" x 11" in size and be provided in a three ring binder. Include project name and location, design stage and date on the front cover and spine of the binder.

### 1.7 STRUCTURAL

#### 1.7.1 DRAWINGS

Final drawings shall be complete, thoroughly checked, and fully coordinated with the other disciplines, specifications and all other construction documents. Previous comments and applicable criteria changes shall have been incorporated into the design. The drawings shall be complete with all plan views, elevations, sections, details, schedules, diagrams, and notes necessary for the construction of the project. For structural steel framing, the drawings shall meet the requirements for design drawings set forth in the AISC 360 AISC Specification for Structural Steel for Buildings. All structural steel members and connections shall be fully detailed. Design of structural steel connections shall be the responsibility of the structural design engineer and shall not be delegated to the steel fabricator. For structural concrete, the drawings shall conform to the standards for engineering (design) drawings set forth in the ACI Detailing Manual ACI SP-66. Additionally, those items described below which are applicable to the design shall be incorporated into the drawings. Drawings shall be at a scale appropriate for the design, in no case however, shall plan type drawings be done at a scale smaller than 1/8" = 1'-0" or detail type drawings at scale smaller than 1/2" = 1'-0".

##### 1.7.1.1 Grid Systems, Dimensions, and Floor Elevations

Each foundation and slab plan, floor framing plan and roof framing plan shall have an alpha-numeric grid system aligned with centerlines of any columns or pilasters, or with load bearing and non-load bearing walls, as applicable. The same grid system shall be used for all plan views. Each plan view shown shall have all necessary dimensions. On plan views, the dimensions shall define the location of grid lines, offsets, and all structural elements, as well as the overall sizes of the buildings and structure. The finish elevation of the floor shall be indicated as 100'-0", and elevations for all other roofs, floors, and foundations shall be numerically referenced to this basic elevation.

##### 1.7.1.2 Plan Sheets

###### a. Foundation and Slab Plans

Foundation and slab plans shall show the size and location of all foundation elements, such as foundation walls, grade beams, piers, footings, piles, and pile caps, drilled piers, and foundation drains.

Elevations for footings, pile caps, and foundation drains shall be indicated on the plan. Plans for building slabs-on-grade and exterior stoop slabs at building entrances shall show location and type of joints, slab thicknesses and reinforcing, elevation of slab surfaces, and any other design features, such as drain trenches or equipment bases, which affect the slab design. Also, indicate if slabs are placed over a vapor barrier and capillary water barrier.

b. Framing Plans

Separate framing plans shall be provided for each structural floor roof and all parts of the structure. Plans shall show the size, spacing, and location of all roof and floor framing members, their supporting columns, pilasters or walls, all auxiliary members such as bracing and bridging, sag rods and the size and location of all major openings through floors and the roof.

1.7.1.3 Elevation Views, Sections and Details Sheets

Elevation views, sections and details necessary to illustrate fully the design shall be provided. Some requirements peculiar to the various structural materials are described below.

a. Concrete

Drawings shall include elevation views as necessary, plus sections and details to show the outlines of concrete cross-sections, reinforcing bar arrangements, concrete cover for rebar, installation of embedded items, and joint construction. All lap splice and embedment lengths for reinforcing bars shall be clearly indicated on the drawings. A sill detail for each foundation condition at exterior and interior doors shall be provided.

b. Masonry

Wall reinforcing shall be located and identified on plans, in section cuts, elevation views or in schedules. Structural elevations when needed shall be included to clarify the construction requirements for masonry reinforcement, especially the reinforcement around wall openings. Details applicable to the project shall be shown on the structural drawings. Listed below are some frequently required masonry details. All details shall be fully edited to reflect the specific requirements of this project. Supplemental details shall be added as necessary to complete the design.

Masonry Details Frequently Used

- Masonry Control Joint (MCJ).
- Brick Expansion Joint (BEJ) (
- Control Joint at Bond Beam.
- Bond Beam Corner Reinforcement.
- Seismic Reinforcement Around Wall Openings.
- Wall Reinforcement Details for 1 and/or 2 bar-per-cell stiffeners.
- Doweled or Other Connection of Masonry to Foundation, Floor, Roof or Bond Beam.
- Bond Beam (or Steel) Lintels and Bearing Details
- Lateral Support Detail for Top of Masonry Partition Walls.  
(lateral support locations must be shown on framing plan sheets.)
- Steel Joist Bearing

c. Structural Steel, Steel Joists, and Steel Decking

Structural steel connections shall be fully detailed and shown on the drawings. The anchorage of beams, trusses, joists, and steel deck to walls or other bearings, and the extra framing or reinforcement required at deck openings shall also be detailed. Notes, details, or schedules on the drawings shall indicate the steel deck attachment method to be used, and shall give the size and spacing for perimeter, side lap, intermediate supports and end lap attachments. Welded connections shall be detailed using standard weld symbols illustrated in AWS D1.1/D1.1M. All applicable weld sizes, spacing, types, contours and finishes shall be shown.

1.7.1.4 Schedules

a. Foundation Schedules

Foundation schedules for the foundation type selected shall be included, as applicable. The schedule shall include all pertinent information required for the foundation system being used.

b. Framing Schedules

For concrete framing, beam and column schedules shall conform to the requirements of the ACI SP-66. For structural steel framing, provide a column schedule complete with design loads at splices, if any, and at column bases.

1.7.1.5 Equipment Loads

All equipment loads which exceed 200 lbs and are not supported by concrete slab-on-grade shall be identified on the drawings by showing equipment locations, total weights, and reaction loads at support points.

1.7.1.6 Notes

a. Design Notes

Under the heading "Designer's Notes," the structural drawings shall contain notes which begin: "The structural design was prepared using the following data:". The data then listed shall include the structural loading criteria used for design, such as roof and floor live loads, snow load design parameters, wind speed and wind load design parameters, seismic design parameters vehicular loads, allowable soil bearing pressures (as recommended by the Final Foundation Analysis report, foundation design depth, design wind uplift pressures for steel joists and other data pertinent to future alterations. Also, to be listed are the ASTM designations and stress grades of the applicable structural materials: structural steel, masonry, cold-formed metal framing, concrete for each usage, reinforcing bars, welds, and bolts.

b. General Notes

Other notes, which direct the work to be performed, the materials to be used, etc., shall be grouped under the heading of "General Notes." Included in these notes should be a description of the building's structural system, if necessary.

### 1.7.2 SPECIFICATIONS

Technical specifications for final design shall be prepared in accordance with the instructions provided in Section 01 33 00.32 DESIGN AND CONSTRUCTION DELIVERABLES/PROCEDURES, Paragraph 3.2 "Specifications". The technical specifications shall be complete and fully coordinated with the drawings. All specification indexes shall be completely edited to reflect the paragraphs retained in the body of the specification. All references that have not been used in the body of the specification shall be edited from the technical specification.

### 1.7.3 DESIGN ANALYSIS NARRATIVE

The final design analysis narrative shall repeat and expand upon the basic information presented in the 60% design analysis narrative, and shall be corrected to reflect revisions made for the final design.

### 1.7.4 DESIGN ANALYSIS CALCULATIONS

Calculations shall be prepared by a licensed structural engineer and shall include an investigation of loading, (gravity, wind, seismic, etc.) shear, moment, wind uplift, stability, progressive collapse and deflection calculations. The computations are to be systematic and accurate. Similar beams, columns, panels, or connections may be grouped by designing the largest member or connection in the group, but every individual slab, beam, column, footing, connection or other structural member or structural consideration indicated by the plans shall be accounted for by pertinent calculations, statement or reasoning, or reference to a design source. Design formulas shall be written out in symbols the first time each is used, before the numerical values are supplied. All formulas and results(answers) shall be identified by dimensional units. Basic assumptions of loads, working stresses, and methods of analysis must appear in the calculations; these assumptions must be applied consistently to a given problem. Complete design calculations shall be required for all original designs. The calculations shall be presented in a clear and legible form, incorporating a title page, table of contents, and a tabulation showing all design loads and conditions. Pages shall be numbered consecutively and identified in the table of contents. Cross referencing shall be clear. The source of loading conditions, formulas, and references will be identified. Assumptions and conclusions shall be explained. Superseded areas of computations must be ruled out. All computations shall be given a complete numerical and theoretical check within the Contractor's office. Calculation sheets shall carry the names or initials of the developer and the checker, and the dates of calculations and checking. No portion of the design calculations shall be developed and checked by the same individual.

#### 1.7.4.1 Computer Calculation Submittals

All applicable input and output data shall be included in readable printed form as part of the design calculations. Continuous paper such as that used in computer terminals or printers shall be cut into individual pages and shall not be submitted in a continuous roll form. All input and output data shall include a brief synopsis of the computer program(s) stating required input, method of solution, approximations used, codes and specifications used, output generated, extent of previous usage or certification of the program(s), and program author(s). Generalized flow chart(s) may be used to supplement description of solution process, if desired. All computer generated and long-hand calculation sheets shall be



identified by sheet number, indexing and cross-referencing. Each member or structure being analyzed shall be identified, dimensioned and shown in a loading diagram. A separate diagram shall be provided for each load case, such as dead plus live, dead plus wind, etc. Input and output values including intermediate values shall clearly be identified if such values are necessary for evaluation of the submittal. Electronic files of the computer computations shall be available upon request of the Government.

#### 1.7.5 Final Geotechnical Investigation Report

The preliminary geotechnical investigation data included in this RFP are intended for proposal preparation and preliminary design use. The Contractor will be responsible for verification of the actual soil conditions present at each site location prior to commencing final design.

The Contractor's geotechnical engineer shall accomplish additional site investigation, soil borings, and laboratory testing as deemed necessary to support the design of the project. A final geotechnical investigation report shall be prepared and submitted to the Contracting Officer.

The work will be coordinated with the Contracting Officer and shall not interfere with normal base operations. The cost of any additional geotechnical work shall be included in the contract amount.

#### 1.8 MECHANICAL

The 100 percent final design submittal shall include all the information presented in the 60 percent submittal, updated to final design status, corrected to reflect any changes made in response to review comments, and shall include the additional requirements specified hereinafter. Any concerns in developing the final design documents shall be resolved prior to starting the final design stage.

##### 1.8.1 DRAWINGS

The final design drawings shall be fully coordinated with the design analysis and specifications. Provide sufficient plans, piping diagrams and isometrics, mechanical room sections, water and air flow diagrams, details, schedules, control diagrams, sequences of operation, etc., as necessary to define the design requirements. Large-scale plans of congested areas shall be provided. Coordinate with architectural design for provision of access panels for all concealed valves, traps and air vents, etc. Floor plans shall use the architectural floor plans as a basis, with the building outline half-toned. The final design drawings shall include all the requirements and drawings defined for the 60 percent submittal. In addition, the following new drawing requirements and drawings shall be provided:

##### 1.8.1.1 Mechanical Abbreviation, Legend, and General Notes Sheet

On this sheet, include any mechanical general installation notes that may be required to clarify the construction intent that may not be readily apparent in the specifications or on the drawings. General notes may be provided on a separate sheet if space does not exist on the Abbreviation and Legend sheet.

##### 1.8.1.2 Plumbing Drawings

Enlarged Toilet Room Plans:

Enlarged toilet room plans showing all fixtures, water, waste, and vent piping shall be provided for each toilet area. Enlarged plans shall be drawn at a minimum  $1/4" = 1'-0"$  scale.

#### 1.8.1.3 Mechanical HVAC Drawings

##### Hot Water System Flow Diagram:

Provide a hot water flow diagram showing the boiler, pumps, and all connected heating equipment including radiant floor heating system. Each equipment item shall show associated flowrate. All thermometers, pressure gauges, isolation and control valves, bypass piping, etc. shall be shown on the flow diagram.

##### Chilled Water System Flow Diagram:

Provide a chilled water flow diagram showing the cooler, pumps, and all connected cooling equipment. Each equipment item shall show associated flowrate. All thermometers, pressure gauges, isolation and control valves, bypass piping, etc. shall be shown on the flow diagram.

#### 1.8.1.4 HVAC Control Drawings

In addition to the updated Controls Legend and System Block Diagram Sheets, final HVAC control drawings for each system and item of equipment shall be in accordance with the following requirements:

##### Control Diagrams:

Control Diagrams shall be provided for each system or item of equipment. Systems diagrams shall include every major component installed in or connected to the system, and only one system shall be shown on each diagram. Control Diagrams shall schematically show all sensors, controllers, actuators, indicators, and operator interface devices that are required for the complete automatic control and monitoring of the system. All sensing devices utilized in the control or instrumentation of the system, and all actuating devices shall be shown in their correct mechanical location and functionally interconnected to the other control devices which comprise the control loop. All controlling devices shall be shown with all functional interconnections to inputs and outputs. Each sensing, controlling, actuating, and indicating device shall have its own unique control loop tag identifier. Communication linkages required to complete the entire intended interface between operators and the control system shall be shown schematically. This includes interconnections between local temperature control panels and the base EMCS. All associated thermometers and pressure gauges, located in their correct mechanical locations, shall also be shown on the diagrams. See furnished Example HVAC Control Drawings for the required level of detail and formatting.

##### Sequence of Operations:

Sequence of Operations shall be provided for each item of equipment or system and shall fully describe the intended operation of the equipment or system in all different operating modes. As identified on the furnished Example Control Drawings, each Sequence shall be broken down by individual control loops and shall include descriptions of both normal operating modes (running, shutdown, standby, etc.) and abnormal, emergency or safety related modes. Sequences shall include a description of all indication

instrumentation, alarm conditions, and automatic actions to be taken upon occurrence of alarm conditions. Each device referenced in the sequence shall be referred to by its unique tag identifier, with each component designator shown in parenthesis. Design setpoints shall be specified for each control loop and indicated as being adjustable. See furnished Example HVAC Control Drawings for the required level of detail and formatting.

The designer shall analyze every component of each system and write each Sequence of Operation to compliment the Functional Performance Checklists. The Sequence of Control on the project drawings shall be explicit and written to ensure that all the requirements of the "Functional Performance Test Checklists" can be accomplished.

#### Control Points Lists:

Control points lists, identifying each temperature control system input and output, shall be developed for each temperature control panel. See furnished Example HVAC Control Drawings for the required level of detail and formatting.

### 1.8.2 SPECIFICATIONS

The submitted 60 percent technical guide specifications shall be updated, completely edited, and fully coordinated with the drawings to accurately and clearly identify the final product and installation requirements for the facility.

### 1.8.3 DESIGN ANALYSIS NARRATIVE

The Final Design Analysis Narrative shall include the information presented in the 60 percent submittal, shall be corrected to reflect changes in content made in response to review comments, and shall be expanded to reflect the completed design.

### 1.8.4 DESIGN ANALYSIS CALCULATIONS

The Final Design Analysis calculations shall include all the information presented in the 60 percent submittal, shall be corrected to reflect changes in content made in response to review comments, and shall be expanded to reflect the completed design. In addition, the following new calculations shall be provided:

- a. Pipe sizing calculations for the chilled & heating hot water, plumbing, gas piping systems.
- b. Chilled & heating hot water pump head calculations.
- c. Chilled & heating hot water expansion tank sizing.
- d. External static pressure calculations for all fans.
- e. Control Valve CV calculations.

## 1.9 ELECTRICAL

### 1.9.1 DRAWINGS

Drawing scale shall match architectural drawing requirements.

#### 1.9.1.1 Interior Drawings

Drawings shall be complete and accurate in every detail and shall include arrangements and types of light fixtures, receptacles, switching, location of special features, necessary details, including legends, fixture schedule, panel schedules, one-line diagrams, layout or functional diagrams for each of the various systems, riser diagrams if applicable, estimated maximum demand for each panel and for entire building and any other relative information which will help clear up any and all questionable items on the plans or in the specifications toward the development of a set of plans which will be clear, concise and correct. Additional drawing requirements for specific equipment or systems have been included in subsequent paragraphs pertaining to the equipment or systems.

#### 1.9.1.2 Floor Plans

All rooms must be identified by name and number. Plans must be legible. Plans shall be developed using the same scale and areas as the architectural floor plans. Separate floor plans must be provided for lighting, power, and fire detection.

#### 1.9.1.3 Diagrams

The power one-line diagram shall be on a dedicated sheet. The diagram should show ratings of major equipment including short circuit ratings. Power, communications diagrams, fire detection and telephone diagrams should be on separate sheets also.

#### 1.9.1.4 Schedules

Provide panelboard and lighting fixture schedules. Panelboard schedules shall include the designation, location, mounting (flush or surface), number of phases and wires, voltage, ampacity and total connected and demand load. Indicate the trip rating, frame size, interrupting rating and number of poles for each circuit breaker in the panelboards. List the circuit number, circuit description and load for each branch circuit.

#### 1.9.1.5 Exterior Drawings

Drawings shall be complete and accurate in all details and shall include the routing of all feeder and branch circuits.

### 1.9.2 SPECIFICATIONS

All specifications shall be completely edited and fully coordinated with the drawings to accurately and clearly identify the product, installation requirements, and testing methods for this facility.

### 1.9.3 DESIGN ANALYSIS NARRATIVE

The text of the preliminary design analysis should be expanded to reflect the completed design. Calculations used to develop the design should be

included. The document in its final form should conform in all applicable respects to the requirements of Section 01 86 26 ELECTRICAL DESIGN REQUIREMENTS.

#### 1.9.4 DESIGN ANALYSIS CALCULATIONS

Backup data shall be furnished to support basic design decisions related to sizing of major equipment and materials, selection of economic alternatives, performance of specific systems or equipment. Calculations may be performed by manual or computerized procedures. Use of standardized charts, curves, tables, graphs will generally be acceptable for portions of required calculations or in lieu of specific calculation procedures. Such data must be from a recognized source which is identified in the design analysis. If possible, a copy of applicable sheets or pages should be included with the calculations. For given equipment, the calculations must conform to requirements identified under subsequent paragraphs herein pertaining to the equipment.

##### 1.9.4.1 Service

Sizing of building service.

##### 1.9.4.2 Transformers

Sizing of all transformers. (Generally for dry type transformers, 1 or 2 samples of detailed calculations to identify the method are sufficient, if input data for remaining units can be derived from panel or feeder sizing data.)

##### 1.9.4.3 Feeders

Sizing of feeders (One detailed sample calculation is sufficient to establish the procedure, remaining data can be in schedules, tables, etc.).

##### 1.9.4.4 Panelboards

Sizing and loading of panelboards and distribution equipment.

##### 1.9.4.5 Voltage drop determination

Provide voltage drop calculations in accordance with IEEE Std 241 to demonstrate that the voltage drop requirements of NFPA 70 are satisfied.

##### 1.9.4.6 Illumination calculations

Data should identify target and calculated illumination levels for all rooms and areas. Calculations should be adjusted to compensate for special applications -- irregularly shaped rooms, open sides, ceiling obstructions (beams, ductwork), corridors, etc. If the lumen method is used for corridor calculations, the calculations should be performed using a module in which the length doesn't exceed 3 times the width (2:1 ratio preferred).

##### 1.9.4.7 Short Circuit Evaluation

Calculate the fault current in accordance with IEEE Std 242 for each node in the electrical distribution system.

#### 1.9.4.8 Protective Coordination Analysis

A protective coordination study shall be performed to show that the power system is selectively coordinated and is fully coordinated with the upstream breakers. In addition the study shall include all existing and new devices in the Base power plant affected by the installation of the Space Test and Evaluation Facility. The protective coordination / short circuit study shall be complete and approved by the government before any changes are made to the existing equipment.

#### 1.9.4.9 Specialized Applications

Additional engineering backup should be included to address special requirements such as accommodation of nonlinear loads, harmonics analysis, energy studies, etc.

### 1.10 CYBERSECURITY

Refer to Specification Sections 01 81 00 SUMMARY OF THE WORK, 01 86 10 MECHANICAL REQUIREMENTS, 01 86 13 FIRE PROTECTION REQUIREMENTS, 01 86 26 ELECTRICAL REQUIREMENTS, 01 91 00.15 10 TOTAL BUILDING COMMISSIONING, and related facility control system specification sections. Comply with all requirements for the 100% design level of completion as specified in the related facility control system specification sections.

#### 1.10.1 DESIGN ANALYSIS

The design analysis shall contain a description and analysis of the proposed facility related control systems (frcs) included in the design. Special features, unusual requirements, etc., should be noted. The Narrative must address all technical requirements identified in referenced specification sections and UFC 4-010-06. The Narrative shall identify the ISSM/ISSO (Information System Security Manager/Officer) for cybersecurity, include an inventory of all frcs with associated C-I-A (Confidentiality-Integrity-Availability) Impact Level Ratings, and the mission category (support, essential, critical). The Narrative shall provide a discussion which describes the background for, and purpose of cybersecurity controls implementation for frcs. Appendix of Design Analysis shall have a final CCI (Control Correlation Identifier) List for each frcs platform.

#### 1.10.2 SPECIFICATIONS

Submit fully edited specification section 25 05 11 variants which provide the applicable cybersecurity controls implementation for each frcs based upon coordinated project reviews and coordination across all disciplines which includes Commissioning Agent(s).

Specifications shall be provided to 100% design level of completion. See Section 01 33 00.32 DESIGN AND CONSTRUCTION DELIVERABLES/PROCEDURES, paragraph 3.2, SPECIFICATIONS for additional requirements.

#### 1.10.3 DRAWINGS

Identify Mission Space(s) as applicable on plan sheets.

## 1.11 COMMUNICATIONS

### 1.11.1 Drawings

Drawing scale shall match architectural drawing requirements. Drawings shall be complete and accurate in every detail; be coordinated with all other work, sufficiently cross referenced to other drawings and specifications; include appropriate notes, schedules, diagrams and details; shall be organized and demonstrate that the work complies with all requirements of the RFP as follows:

#### 1.11.1.1 Outside Plant Distribution

Drawings shall include manhole and ductbank system layout shall show all exterior features including: quantity and sizes of ducts, manhole types, cable types and routing, detail cross references and other notes.

#### 1.11.1.2 Voice and Data Plans

Complete layout of all areas and outlets shall be provided. The type of outlets shall be indicated. Indicate areas served by TR's and equipment rooms. Cable tray, conduits and other pathways shall be shown, with sizes indicated. Racks, cabinets, and other equipment shall be shown and identified.

#### 1.11.1.3 Riser Diagrams

Provide riser diagrams that indicate the ER and TR's; risers, backbone trays and conduits; backbone termination areas; racks and cabinets; service entrance configurations, typical horizontal cabling; and all backbone cabling (including types and counts). Provide separate diagrams for each system. Identify interfaces to other systems (fire alarm, EMCS, etc.)

#### 1.11.1.4 Outlet Configurations

Show all unique outlet configurations, including connector types and quantities and labeling conventions

#### 1.11.1.5 Rack, Cabinet, and Equipment Elevations

Show individual elevations of each type of rack, cabinet, or other equipment or termination enclosures, including cable management, grounding, power, patch panels, connectors, etc.

#### 1.11.1.6 Enlarged Room Plans

Provide enlarged room plans drawn at  $\frac{1}{4}" = 1'$  of every room containing one or more racks or cabinets. Include scaled outlines of racks, backboards, cabinets, cable

#### 1.11.1.7 Details

Provide installation details that fully define installation requirements for typical and special conditions, including all termination enclosures, break-out boxes, consolidation point or box which includes termination or cable management hardware. Provide manhole details and elevations. Provide duct bank configuration and construction details

#### 1.11.1.8 PDS Drawings

Provide a separate set of drawings for each PDS. Provide plan drawings that include conduit routing, boxes and enclosures. All materials used in the PDS shall be identified and defined, including conduit type, conduit fittings, boxes, enclosures, locking mechanisms and alarm devices.

#### 1.11.1.9 Miscellaneous Communications Systems

##### 1.11.1.10 Plans

Show all devices and equipment for Public Address, and CATV.

##### 1.11.1.11 Riser Diagrams

Provide a separate riser diagram for each system, showing all major components, typical minor components (speakers, volume controls, etc.) and interconnecting cabling.

##### 1.11.1.12 Details

Provide installation details that fully define installation requirements for typical and special conditions.

#### 1.11.2 Specifications

Submit prescriptive specification sections to specify the quality, characteristics, installation procedures and testing requirements for all items of the proposed communications design.

#### 1.11.3 Design Analysis Narrative

The design analysis shall contain a description and analysis of the communications portions of the design. Special features, unusual requirements should be noted. Narrative must address all technical requirements identified in section 01 86 29 COMMUNICATIONS.

#### 1.11.4 Design Analysis Calculations

Backup data shall be furnished to support basic design decisions related to sizing of cable trays and conduits.

### 1.12 FIRE PROTECTION

#### 1.12.1 DRAWINGS

Design will be an extension of the 60% submittal, incorporating all comments thereto and any revised criteria, all as specifically directed by the District Office. All conflicts, lack of specific criteria, and/or direction, inconsistencies, ambiguities, and lack of thorough understanding of the nature and scope of work shall be resolved prior to starting final design work. The fire protection plans shall show the following: entire sprinkler system; fire detection and mass notification system, to include control panels, remote annunciators, alarm notification devices, and each initiating device; fire walls; fire partitions; building separations; other fire protection features.



### 1.12.2 TECHNICAL GUIDE SPECIFICATIONS

The following UFGS guide specifications shall be completely edited and fully coordinated with the drawings to accurately and clearly identify the product and installation requirements for the facility:

21 13 13.00 10	Wet-Pipe Sprinkler Systems, Fire Protection
28 31 76	Interior Fire Alarm and Mass Notification System Current Loop

All items identified in the specifications not required shall be marked for deletion in accordance with the requirements of Section 01 33 00.32 DESIGN AND CONSTRUCTION DELIVERABLES/PROCEDURES. Those items of equipment, materials, or installation requirements that are required are not permitted to be modified or changed from that presently shown. Government approval is required for the final submittal of these guide specifications.

### 1.12.3 DESIGN ANALYSIS

The final design analysis will be an extension of the 60% design analysis and shall be complete for every item covered in the design and will include, but not be limited to, the following:

- a. List of design criteria.
- b. Design conditions.
- c. Design calculations.
- d. Complete description of system alarm zones.
- e. Complete description of system sprinkler system.
- f. Complete description of the building fire protection features.
- g. Other pertinent information of value for future use in construction contract administration, substantiation of design methods, or permanent record shall be included.

## 1.13 ENVIRONMENTAL PROTECTION COMPLIANCE

### 1.13.1 SPECIFICATIONS

The Contractor shall be responsible for updating/revising UFGS Specification Section 01 57 20.00 10 ENVIRONMENT PROTECTION which is furnished with Division 1 of this RFP. Any additional environmental compliances that may be required for this project shall be included. This section shall be included with the 100% Design Specifications rather it has any revisions or not. See 60% submittal requirements for additional information.

### 1.13.2 DESIGN ANALYSIS

The Contractor shall update/revise the chapter in the 60% Design Analysis entitled: "Environmental Protection Compliance".

### 1.13.3 SUBMITTAL OF ENVIRONMENTAL APPROVALS, PERMIT APPLICATION AND ASSOCIATED DOCUMENTS

Any revisions that may be required to the permits and/or approvals which were submitted with the 60 percent submittals shall be submitted with final design submittals. If these submittals were not required to be submitted to the governing agencies for a permit or approval at 60% design, they shall be submitted with the 100% Design documents. Any additional approvals and/or Permits required, which were not previously submitted, shall be submitted to the Corps of Engineers with sufficient time for the permits to be obtained prior to construction commencing or with the final design submittals.

### 1.14 SAFETY

#### 1.14.1 SPECIFICATIONS

At a minimum, the pertinent UFGS guide specification shall be completely edited and coordinated with the drawings.

- 01 35 29 Safety And Occupational Health Requirements
- 02 82 14.00 10 ASBESTOS HAZARD CONTROL ACTIVITIES
- 02 82 33.13 20 REMOVAL/CONTROL AND DISPOSAL OF PAINT WITH LEAD
- 02 83 13.00 20 LEAD IN CONSTRUCTION
- 02 84 16 HANDLING OF LIGHTING BALLASTS AND LAMPS CONTAINING PCBs AND MERCURY
- 02 84 33 REMOVAL AND DISPOSAL OF POLYCHLORINATED BIPHENYLS (PCBs)
- 31 21 13 RADON MITIGATION

Any interference with the Civil, Mechanical, Electrical, Geotechnical, and Environmental specifications shall be addressed and reviewed to extract the list of sampling and analysis requirements.

#### 1.14.2 Design Analysis

##### 1.14.2.1 Narrative

The Design Analysis Narrative shall list all conditions impacting safe work on the project for each of the sections listed above. Potentially hazardous conditions such as and materials shall be identified. The basis and reasons for specific decisions, special features, unusual requirements, etc., shall be explained or summarized as applicable. If it is necessary to deviate from criteria or standard practice, reasons shall also be included. Design statements shall be provided in sufficient detail to enable the reviewer to get a clear picture and understanding of all included work. Narrative shall be complete relative to scope and design approaches. The design analysis shall carry a complete narrative for every item covered in the design.

##### 1.14.2.2 Design Analysis Calculations

Amount and location of hazardous material (asbestos, lead paint, PCBs, etc) that will be removed shall be addressed.

##### 1.14.2.3 Basis, Specific goals, Objectives and Priorities for Hazardous Material

The Design Analysis should establish specific goals, objectives and

priorities for safety (including the removal, handling and disposal of hazardous materials) of the project. Identify, explain and document use of design criteria and how the design meets goals, objectives and priorities. Identify the preferred site development concept. Show how systematic planning has been used in the design, and to meet the objectives. Systematic planning ensures high decision confidence and stakeholder satisfaction. It should list various regulatory, scientific and engineering decisions that must be made in order to achieve the desired outcome, list unknowns that stand in the way of making those decisions, and strategies to eliminate or manage the unknowns.

#### 1.14.3 DRAWINGS

The drawings and specifications shall clearly identify the amount and location of hazardous material.

#### 1.15 SUSTAINABLE DESIGN

See SECTION 01 33 29 SUSTAINABILITY REPORTING for sustainability documentation submittal requirements for each phase of design.

PART 2 NOT USED

PART 3 NOT USED

-- End of Section --

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## SECTION 01 33 29

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02/21

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## SECTION 01 33 29

SUSTAINABILITY REQUIREMENTS AND REPORTING  
02/21

## PART 1 GENERAL

Attachments: GPA Project Information Form  
GPA Tech Guide  
Guiding Principles Assessment Handbook  
Air Force HPSB Checklist

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

## COUNCIL ON ENVIRONMENTAL QUALITY (CEQ) (WHITE HOUSE)

HPSB Guiding Principles (2016) Guiding Principles for Sustainable Federal Buildings and Determining Compliance with the Guiding Principles for Sustainable Federal Buildings

## GREEN BUILDING INITIATIVE (GBI)

GBI DOD GP Compliance (2017) GBI Department of Defense Guiding Principles Compliance Program for New Construction

GBI Green Globes for NC (2017) Green Globes(tm) for New Construction Technical Reference Manual

## GREEN BUSINESS CERTIFICATION INC. (GBCI)

GP Assessment (DOD) Guiding Principles Assessment for Department of Defense

## INTERNATIONAL CODE COUNCIL (ICC)

ICC IGCC (2018) International Green Construction Code

## SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)

ANSI/SMACNA 008 (2007) IAQ Guidelines for Occupied Buildings Under Construction, 2nd Edition

## U.S. DEPARTMENT OF AGRICULTURE (USDA)

FSRIA 9002 Farm Security and Rural Investment Act Section 9002 (USDA BioPreferred Program)

## U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 1-200-02	High Performance and Sustainable Building Requirements
UFC 3-101-01	Architecture
UFC 3-210-10	Low Impact Development
UFC 3-600-01	Fire Protection Engineering for Facilities

## U.S. DEPARTMENT OF ENERGY (DOE)

Energy Star	(1992; R 2006) Energy Star Energy Efficiency Labeling System (FEMP)
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## U.S. GREEN BUILDING COUNCIL (USGBC)

LEED v4 BD+C	LEED v4 Building Design and Construction
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## U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

10 CFR 433.300	Subpart C - Green Building Certification for Federal Buildings
40 CFR 247	Comprehensive Procurement Guideline for Products Containing Recovered Materials

## 1.2 SUMMARY

This section includes requirements for Sustainability documentation and reporting submittals per the federally mandated High Performance and Sustainable Building (HPSB) or HPSB "Guiding Principles" (GP), and Third Party Certification (TPC) requirements, in accordance with UFC 1-200-02 High Performance and Sustainable Building Requirements, and other identified requirements. It is critical to understand that Third Party Certification is intended to validate Guiding Principles Compliance, but commercially-available certification products may require actions, documentation, and features of work that are in excess of the minimum HPSB Guiding Principles. Compliance with one of these references and/or standards does not assure compliance with all of them. The Contractor shall assure that the project is in full compliance with the complete combination of requirements by HPSB Guiding Principles, UFC 1-200-02, and the required Third Party Certification system as referenced by this specification and its references.

## 1.3 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

## SD-01 Preconstruction Submittals

Construction Sustainability Coordinator; G, DO

Preliminary High Performance and Sustainable Building Checklist; G,



RO

Sustainability Action Plan; G, RO

Preliminary Sustainability eNotebook; G, ROSD-06 Test Reports

Third Party Certification Design Compliance Report; G, ROSD-11  
Closeout Submittals

Final High Performance and Sustainable Building Checklist; G, RO

Final Sustainability eNotebook; G, RO

The Sustainability eNotebook shall include all relevant documentation  
pertaining to HPSB and TPC compliance including, but not limited to:

Commissioning Reports  
Energy Efficient Products  
Indoor Water Use  
Low Emitting Materials  
Bio-Based Products  
Recycled Content  
Certification of EPA Designated Items  
Certification of USDA Designated Items  
Construction Waste Management  
Sustainability Submittals

Amended Final Sustainability eNotebook; G, RO

Amended Final High Performance and Sustainable Building Checklist;  
G, RO

Third Party Certification Certificate, Assessment, or Validation  
and Compliance Report; G, RO

#### 1.4 SUSTAINABILITY COORDINATOR

The contractor shall employ the services of a sustainability coordinator in guiding the project through all applicable sustainability documentation, certification, and validation procedures required by this project. Submit the credentials of the sustainability coordinator for approval by the Government. The sustainability coordinator shall indicate at least 5 years experience serving a similar role on at least 3 similar projects. This may include experience on other projects pursuing GBCI GP Assessment or projects pursuing LEED Certification through GBCI. The sustainability coordinator shall also possess a certification or accreditation that is relevant to the prescribed TPC system being pursued by this project. This includes, but is not limited to LEED AP BD+C credential.

The sustainability coordinator will be the main point of contact and coordination for all TPC efforts, as well as other HPSB Guiding Principles specified herein. The USACE Sustainability POC will coordinate turnover of Government-side design documentation with this individual after contract award.

#### 1.5 GUIDING PRINCIPLES VALIDATION (GPV)

Provide the following sustainability activities and documentation to

verify achievement of HPSB Guiding Principles Validation (GPV):

- a. Analysis of each Guiding Principle Requirement and how project complies. Include final government approved narrative(s) in the HPSB Checklist submittal. Multiple checklists indicate multiple buildings that require individual HPSB Checklist tracking. An editable, electronic copy of the HPSB Checklist will be provided to the contractor, upon request, after contract award. Complete a preliminary HPSB Checklist and obtain approval of the HPSB Checklist from the Contracting Officer at the Pre-design Conference. Contracting Officer's approval establishes identified HPSB Guiding Principles Requirements as the project's sustainability goals. The contractor shall complete, maintain and update the Checklist, and have the document available at any time for auditing and Air Force reporting. At project completion, the Checklist should be completely filled out with only "Yes" and "N/A" indicated in the Compliance column, to show 100% compliance with HPSB Guiding Principles as covered in UFC 1-200-02. All N/A responses must have justifications included.
- b. No changes to the HPSB Checklist are allowed without approval from the Contracting Officer, in accordance with Section 01 33 00 SUBMITTAL REQUIREMENTS. Immediately bring to the attention of the Contracting Officer any project changes that impact meeting the approved HPSB Guiding Principles Requirements for this project. Demonstrate the change will not increase the life-cycle cost and maintains or improves the building performance.
- c. Documentation of all work required to incorporate the applicable HPSB Guiding Principles requirements indicated on the HPSB Checklist and in this contract, including all "S" submittals.
- d. Sustainability Action Plan.
  - (1) HPSB Checklist(s)
  - (2) Sustainability Action Plan
  - (3) Documentation illustrating HPSB Guiding Principles Requirements compliance

#### 1.5.1 Sustainability Action Plan

Include the following information in the Sustainability Action Plan:

- a. Analysis of each HPSB Guiding Principles Requirement and how project will comply. Final government approved narrative(s) must be included in the HPSB Checklist submittal.
- b. Name and contact information for: Contractor's Point of Contact (POC) ensuring sustainability goals are accomplished and documentation is assembled. For TPC that include on-site visit by third party representative, provide list of required attendees.
- c. Indoor Air Quality plan.

### 1.5.2 Calculations

## 1.6 SUSTAINABILITY SUBMITTALS

Provide HPSB Checklist and other documentation in the Sustainability eNotebook to indicate compliance with the sustainability requirements of the project.

### 1.6.1 High Performance Sustainable Building (HPSB) Checklist

Provide construction documentation that provides proof of, and supports compliance with, the completed HPSB Checklist.

#### 1.6.1.1 HPSB Checklist Submittals

Submit updated HPSB Checklist with each design submittal as well as with each Sustainability eNotebook submittal. HPSB checklist submittal must be provided both in Adobe PDF format and native MS Excel format. Include the final HPSB Checklist(s) with the interim DD1354 Real Property Record Submittal.

### 1.6.2 Submittals for Sustainability Documentation

Various sections of this contract contain submittals that may count towards the sustainability documentation requirements cited in the various sections of this contract. Submit the GPV sustainability documentation required in this section as part of the Sustainability eNotebook for all affected UFGS Sections.

- a. Highlight GPV compliance data in each sustainability documentation submittal.
- b. Bookmark sustainability documentation submittals as required in paragraph SUSTAINABILITY ENOTEBOOK below.
- c. Ensure all approved sustainability documentation submittals are included in each Sustainability eNotebook submittal.

### 1.6.3 Sustainability eNotebook

The Sustainability eNotebook is an electronic organizational file that serves as a repository for all required sustainability submittals. To support documentation of compliance with an approved HPSB checklist, provide and maintain a comprehensive and current Sustainability eNotebook. Include all required data in Sustainability eNotebook, to support full compliance with the HPSB Guiding Principles Requirements, including:

- a. HPSB checklist
- b. Sustainability Action Plan
- c. Calculations
- d. Labels
- e. Sustainability documentation submittals contained in various UFGS sections of the contract

- f. Certifications, assessments, or validations and compliance report
- g. TPC documentation required in paragraph THIRD PARTY CERTIFICATION (TPC).

#### 1.6.3.1 Sustainability eNotebook Format

Provide Sustainability eNotebook in the form of an Adobe PDF file; bookmark each HPSB Guiding Principles Requirement and sub-bookmark at each document. Match format to HPSB Guiding Principles numbering system indicated herein. Maintain up-to-date information, such as spreadsheets, templates, with each current submittals.

Contracting Officer may deduct from the monthly progress payment accordingly if Sustainability eNotebook information is not current and on track per project goals.

#### 1.6.3.2 Sustainability eNotebook Submittal Schedule

Provide Sustainability eNotebook Submittals at the following milestones of the project:

##### a. Preliminary Sustainability eNotebook

Submit preliminary Sustainability eNotebook with updated Preliminary High Performance and Sustainable Building Checklist and TPC checklist at the first post award meeting.

##### d. Third Party Certification Design Compliance Report

Obtain Third Party Certification Design Compliance Report after final design submittal is approved. Submittal must indicate 100 percent compliance with applicable design requirements. File approved submittal in the Sustainability eNotebook.

##### e. Construction Quality Control Meetings.

Provide up-to-date GP and TPC documentation in the Sustainability eNotebook and TPC Online tool for each meeting.

##### f. Final Sustainability eNotebook

Submit updated Sustainability eNotebook with updated Final High Performance and Sustainable Building Checklist with TPC Checklist at Beneficial Occupancy Date (BOD). Final progress payment retainage may be held by Contracting Officer until Final Sustainability construction phase documentation is complete.

##### g. Amended Final Sustainability eNotebook

Amend and resubmit the Amended Final Sustainability eNotebook with Amended Final High Performance and Sustainable Building Checklist and amended TPC Checklist, to include post-occupancy corrections, updates, and requirements. Final progress payment retainage may be held by Contracting Officer until amended final sustainability documentation is complete. Submit the Amended Final Sustainability eNotebook Submittal on DVDs to the Contracting Officer no later than 30 days after final GP, TPC determination.

## 1.7 DOCUMENTATION REQUIREMENTS

- a. Incorporate each of the following HPSB Guiding Principles requirements into project and provide documentation that proves compliance with each listed requirement. Items below are organized by HPSB Guiding Principles. For life-cycle cost analysis requirements, one document with all analyses is acceptable, with Contracting Officer approval.
- b. For each of the following paragraphs that require the use of products listed on Government-required websites, provide documentation of the process used to select products, or process used to determine why listed products do not meet project performance requirements.

### 1.7.1 Commissioning (Cx)

Develop and incorporate Commissioning requirements into the documents, in accordance with Section 01 91 00.15 10 TOTAL BUILDING COMMISSIONING.

### 1.7.2 Energy Efficient Products

Provide only energy-using products that are Energy Star rated or have Federal Energy Management Program (FEMP) recommended efficiency. Where Energy Star or FEMP recommendations have not been established, provide most efficient products that are life-cycle cost-effective. Provide only energy using products that meet FEMP requirements for low standby power consumption. Energy efficient products can be found at:

<https://www.energy.gov/eere/femp/federal-energy-management-program> and <http://www.energystar.gov/>.

For construction submittal documentation, provide proof that product is labeled energy efficient and complies with the cited requirements.

### 1.7.3 Building-level Power Metering

Provide building-level meters for electricity, natural gas, and steam where applicable.

#### 1.7.3.1 Construction Submittal Documentation

Provide manufacturer's data validating compatibility with base-wide system and component advanced meter requirements.

### 1.7.4 Indoor Water Use

Provide Construction Documentation proof that fixtures are labeled EPA WaterSense, for products available with EPA WaterSense labeling; for all other fixtures, proof they comply with EPA WaterSense efficiency requirements.

### 1.7.5 Indoor Water Metering

Provide building-level meters for potable water use. Provide the requirements cited in the following paragraphs:

#### 1.7.5.1 Construction Submittal Documentation

Provide manufacturer's data validating compatibility with base-wide system and component advanced meter requirements.

#### 1.7.6 Outdoor Water Use

Where new irrigation is required, provide only non-potable sources. Provide the requirements cited in the following paragraphs:

##### 1.7.6.1 Construction Submittal Documentation

Provide manufacturer's data validating compatibility with base-wide system and component advanced meter requirements.

#### 1.7.7 Outdoor Water Meters

Provide meters for outdoor systems that use potable water. Provide the requirements cited in the following paragraphs:

##### 1.7.7.1 Construction Submittal Documentation

Provide manufacturer's data validating compatibility with base-wide system and component advanced meter requirements.

#### 1.7.8 Moisture Control

Provide the following:

##### 1.7.8.1 Construction Submittal Documentation

Ensure construction materials are separated and protected in accordance with other sections in this contract document, with adequate humidity controls during construction. In accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA, includes plan for ongoing building moisture control.

Coordinate with the moisture control requirements of Section 01 45 00.00 10 QUALITY CONTROL.

#### 1.7.9 Reduce Volatile Organic Compounds (VOC) (Low-Emitting Materials)

Meet the requirements of Table 3-1 at the end of this specification.

For Construction submittal documentation, provide certifications or labels that demonstrate compliance with cited requirements, based on the attached TABLE 3-1.

#### 1.7.10 Indoor Air Quality During Construction

Prior to construction, create indoor air quality plan. Develop and implement an IAQ construction management plan during construction and flush building air before occupancy.

For new construction and for renovation of unoccupied existing buildings, meet the requirements of ICC IGCC 1001.3.1.5 (10.3.1.4) Indoor Air Quality (IAQ) Construction Management.

Provide documentation showing that after construction ends and prior to occupancy, HVAC filters were replaced and building air was flushed out in accordance with the cited standard.

### 1.7.11 Recycled Content

Comply with 40 CFR 247. Refer to:

<https://www.epa.gov/smm/comprehensive-procurement-guideline-cpg-program> for assistance identifying products cited in 40 CFR 247. Selected products must comply with non-proprietary requirements of the Federal Acquisition Regulation and must meet performance requirements.

#### 1.7.11.1 Construction Submittal Documentation

- a. Provide manufacturers' documents stating the recycled content by material, or written justification for claiming one of the exceptions allowed on the cited website.
- b. Substitutions: Submit for Government approval for proposed alternative products or systems that provide equivalent performance and appearance and have greater contribution to project recycled content requirements. For all such proposed substitutions, submit with the Sustainability Action Plan accompanied by product data demonstrating equivalence.
- c. In order to complete compliance with FAR 52.223-9 Estimate of Percentage of Recovered Material Content for EPA Designated Items and FAR 52-223-17 Affirmative Procurement of EPA designated items in Service and Construction Contracts, submit the Certification of EPA Designated Items as part of the Final Sustainability eNotebook. Include on the certification form the following information: project name, project number, Contractor name, license number, Contractor address, and certification. The certification will read as follows and be signed and dated by the Contractor. "I hereby certify the information provided herein is accurate and that the requisition/procurement of all materials listed on this form comply with current EPA standards for recycled/recovered materials content. The following exemptions may apply to the non-procurement of recycled/recovered content materials:
  - (1) The product does not meet appropriate performance standards;
  - (2) The product is not available within a reasonable time frame;
  - (3) The product is not available competitively (from two or more sources);
  - (4) The product is only available at an unreasonable price (compared with a comparable non-recycled content product)."

Record each product used in the project that has a requirement or option of containing recycled content, noting total price, total value of post-industrial recycled content, total value of post-consumer recycled content, exemptions (1), (2), (3), or (4), as indicated, and comments. Recycled content values may be determined by weight or volume percent, but must be consistent throughout.

### 1.7.12 Bio-Based Products

Provide products and materials composed of the highest percentage of bio-based materials (including rapidly renewable resources and certified sustainably harvested products), consistent with FSRIA 9002 USDA BioPreferred Program, to the maximum extent possible without jeopardizing

the intended end use or detracting from the overall quality delivered to the end user and when available at a reasonable cost. Use only supplies and materials of a type and quality that conform to applicable specifications and standards.

Comply with FSRIA 9002 USDA BioPreferred Program. Refer to [www.biopreferred.gov](http://www.biopreferred.gov) for the product categories and BioPreferred Catalog. Selected products must comply with non-proprietary requirements of the Federal Acquisition Regulation and must meet performance requirements. Provide the following documentation:

- a. USDA BioPreferred label for each product; for bio-based products used on project but not listed with BioPreferred program, provide bio-based content and percentage.
- b. In order to complete compliance with FAR 52.223-1 Biobased Product Certification, refer to submittal requirement for biobased products in FSRIA 9002.

#### 1.7.13 Waste Material Management (Recycling - Construction)

Divert demolition and construction debris in accordance with Section 01 74 19 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL.

#### 1.7.14 Additional Sustainability Requirements

Provide the additional sustainability requirements cited in this paragraph.

##### 1.7.14.1 Third Party Certification (TPC) Documentation

Third Party Certification certificate, assessment, or validation, and compliance report requirements are in addition to all requirements under header above GUIDING PRINCIPLES VALIDATION (GPV).

##### 1.7.14.1.1 TPC Registration Required

Register and achieve Third Party Certification (TPC), by meeting all TPC and project requirements to achieve GP Assessment (DOD), or Government-approved equivalent TPC sustainability certification, assessment, or validation. An equivalent TPC organization must demonstrate equivalency for Government consideration and meet the requirements of 10 CFR 433.300, prior to use on the project. Third Party Certification is met when Government receives TPC organization certificate, assessment, or validation and compliance report.

Register project with TPC organization using the following format and content:

- a. Project Title First Line: Building Owner (US Army, US Air Force, US Navy or US Marine Corps), Building Name (if known)
- b. Project Title Second Line: MILCON P#, DD1391 Project Name
- c. Project Address: UIC (Installation code), Category code, RPUID (Real Property Unique Identifier) Number
- d. Project Owner Organization: US Army, US Air Force, US Navy or US Marine Corps



- e. Primary Contact, Project Owner: Executing DOD Service's Project Manager or Design Manager
- f. Building Owner Organization: US Army, US Air Force, US Navy or US Marine Corps
- g. Building Owner Organization Project Number
- h. Additional Contact, Building Owner: Base Civil Engineer or Designee.

#### 1.7.14.1.2 TPC Management and Certification

Execute the following TPC Certification, assessment, or validation requirements:

- a. Refer to TPC Checklist at the end of this specification section. (Multiple checklists indicate multiple buildings that require TPC.)
- b. Immediately bring to the attention of the Contracting Officer any project changes that impact meeting the approved TPC Requirements for this project. Demonstrate the change will not increase the life-cycle cost and maintains or improves the building performance.
- c. Complete all design and construction work to incorporate the applicable TPC Requirements.
- d. Maintain the design and construction related information in the Sustainability eNotebook pertaining to additions and changes to the approved sustainability requirements. Maintain the Sustainability eNotebook in electronic format. Refer to explanation in the paragraph SUSTAINABILITY eNOTEBOOK. Provide the following components in the Sustainability eNotebook, in addition to the GPV components listed above:
  - (1) TPC Checklist
  - (2) Completed TPC forms. Transmit by the method required by TPC organization.
  - (3) Copy of all correspondence with the TPC organization. Provide proof of TPC registration.
  - (4) Documentation illustrating compliance with TPC requirements and additional documentation as requested by the Third Party certifier.
  - (5) TPC Award Certificate, assessment or validation and compliance report.
- e. Provide the following information in the Sustainability Action Plan. Provide this TPC information in addition to the Sustainability Action Plan items above:
  - (1) Planned method to achieve each TPC requirement.
  - (2) Provide analysis of each TPC credit and how project will comply.
  - (3) Provide names and contact information for: Contractor sustainability point of contact (POC) and other names of sustainability professionals on the Contractor's Staff responsible

for ensuring TPC sustainability goals are accomplished and documentation is assembled.

- f. Bear all costs associated with designing, constructing, demonstrating, and documenting that project complies with approved TPC requirements, including but not limited to:
  - (1) Registration, review, certification, assessment, or validation fees.
  - (2) Online (or offline with secure facilities) TPC management and documentation.
  - (3) Obtaining TPC certification, assessment, or validation based on Government-approved sustainability goals.
  - (4) Design and construction work required to incorporate TPC requirements.
  - (5) Submittals required to demonstrate compliance with Government approved TPC checklists.
- g. Provide all design data, calculations, product data, and certifications, assessments, or validations required in this specification to demonstrate compliance with the TPC Requirements.
- h. Provide all online (or offline, with secure facilities) TPC management and documentation.
- i. Provide all required responses to third party organization.
- k. Provide TPC Certificate, assessment, or validation. Provide TPC compliance report that includes level achieved and reasons for non-compliance or not applicable elements. Use the following format to create the Plaque, Certificate, assessment, or validation, compliance report, and Letter of Congratulations. Forward to parties designated by Contracting Officer:
  - (2) Certificate, Assessment, or Validation:

Project title, first line: P-(X); (1391 Project Name). Project title, second line: UIC (installation code)
  - (3) Letter of Congratulation (when provided):

Address letter to the Facility's Installation Commander Name.  
Address the letter to an individual person.
  - (4) Compliance Report:

Title page must cite Project title: P-(X); (1391 Project Name);  
Final Building Name if known; UIC (installation code); Owner Service; User organization if known; date of compliance.

Include TPC scoresheet if applicable.
- l. Once Final Certification is achieved, turn over Administrative rights to online TPC to the Base Civil Engineer or designee, contact

information provided by the Contracting Officer.

#### 1.7.15 Additional Sustainability Requirements

The following requirements are included, as required by the project scope or the applied sustainability Third Party Certification program:

##### 1.7.15.1 Air Barrier

An air barrier shall be installed following the requirements in UFC 1-200-02 and UFC 3-101-01. Air barrier specifications 07 27 10.00 and 07 05 23 are to be edited by the contractor. On design drawings indicate air barrier limits and provide detail drawings and specifications for construction. Studs/furring shall be placed to avoid thermal bridging. Mechanical rooms are exempt from testing. All other areas shall be segregated and constructed for required air barrier construction with full blower door testing.

## PART 2 PRODUCTS

Not used.

## PART 3 EXECUTION

### 3.1 SUSTAINABILITY COORDINATION

Provide sustainability focus and coordination at all meetings to achieve sustainability goals. Coordinate meeting requirements with other UFGS Sections meeting requirements in this project. Ensure the designated sustainability professional responsible for GP documentation participates in these meetings to coordinate documentation completion. Review GP sustainability requirements, HPSB Checklist documentation, Sustainability Action Plan, and completeness status of Sustainability eNotebook at the following meetings:

- a. Pre-Construction Conference
- b. Construction Quality Control Meetings
- g. Facility Turnover Meetings

Conduct review no later than 60 days before final turnover and identify any outstanding issues that affect correct completion of all documentation, and actions that will achieve requirements. Conduct corrective actions prior to turnover, to ensure all requirements are achieved.

## 3.2 TABLE 3-1 VOLATILE ORGANIC COMPOUNDS (VOC) (LOW EMITTING MATERIALS) REQUIREMENTS

TABLE 3-1 Volatile Organic Compounds (VOC) (Low Emitting Materials) Requirements				
Source: ICC IGCC Chapter 8 (Materials) (Interior Applications Only)				
MATERIAL CATEGORY	EMISSIONS REQUIREMENT		MATERIALS WITH ADDED VOC REQUIREMENT	EMISSIONS REQUIREMENTS
Adhesives and Sealants	CDPH/EHLB/Standard method V1.1 (California Section 01350) (Use "office" or "classroom" space limits for all applications)	or	Adhesives (carpet, resilient, wood flooring; base cove; ceramic tile; drywall and panel; primers) Sealants (acoustical; firestop; HVAC Air duct; primers) Caulks	SCAQMD Rule 1168 (Use "other" category for HVAC duct sealant) (for firestop adhesive, UFC 3-600-01 overrides conflicting requirements)
			Aerosol adhesives	Section 3 of Green Seal Standard GS-36 (except: cleaners, solvent cements, and primers used with plastic piping and conduit in plumbing, fire suppression, and electrical systems; HVAC air duct sealants when the application space air temp is less than 40 F (4.5 C)).

TABLE 3-1 Volatile Organic Compounds (VOC) (Low Emitting Materials) Requirements				
Source: ICC IGCC Chapter 8 (Materials) (Interior Applications Only)				
MATERIAL CATEGORY	EMISSIONS REQUIREMENT		MATERIALS WITH ADDED VOC REQUIREMENT	EMISSIONS REQUIREMENTS
Paints and Coatings	CDPH/EHLB/Standard method V1.1 (California Section 01350) (Use "office" or "classroom" space limits for all applications)	or	Flat and nonflat, nonflat high-gloss, specialty, basement specialty, fire-resistive, floor, low-solids, rust preventative, wood, reflective wall coatings; concrete/masonry sealers; primers; sealers; undercoaters; shellacs (clear and opaque); stains; varnishes; conjugated oil varnish; lacquer; clear brushing lacquer	Green Seal Standard GS-11

<b>TABLE 3-1 Volatile Organic Compounds (VOC) (Low Emitting Materials) Requirements</b> Source: ICC IGCC Chapter 8 (Materials) (Interior Applications Only)				
<b>MATERIAL CATEGORY</b>	<b>EMISSIONS REQUIREMENT</b>		<b>MATERIALS WITH ADDED VOC REQUIREMENT</b>	<b>EMISSIONS REQUIREMENTS</b>
<b>Paints and Coatings</b>	CDPH/EHLB/Standard method V1.1 (California Section 01350) (Use "office" or "classroom" space limits for all applications)	or	Concrete curing compounds; dry fog, faux finishing, graphic arts (sign paints), industrial maintenance, mastic texture, metallic pigmented, multicolor, recycled coatings; pretreatment wash primers, reactive penetrating sealers; specialty primers, wood preservatives, and zinc primers	<b>California Air Resources Board (CARB) Suggested Control Measure for Architectural Coatings</b> or <b>SCAQMD Rule 1113r</b>
<b>Paints and Coatings</b>	CDPH/EHLB/Standard method V1.1 (California Section 01350) (Use "office" or "classroom" space limits for all applications)	or	High-temperature coatings; stone consolidants; swimming-pool coatings; tub- and tile-refining coatings; and waterproofing membranes	<b>California Air Resources Board (CARB) Suggested Control Measure for Architectural Coatings</b>

<b>TABLE 3-1 Volatile Organic Compounds (VOC) (Low Emitting Materials) Requirements</b> Source: ICC IGCC Chapter 8 (Materials) (Interior Applications Only)				
<b>MATERIAL CATEGORY</b>	<b>EMISSIONS REQUIREMENT</b>		<b>MATERIALS WITH ADDED VOC REQUIREMENT</b>	<b>EMISSIONS REQUIREMENTS</b>
<b>Floor Covering Materials</b>	For carpet, all locations: CDPH/EHLB/Standard Method V1.1 (California Section 01350) or label for Section 9 of CDPH/EHLB/Standard Method V1.1 (California Section 01350)		none	none
<b>Insulation</b>	CDPH/EHLB/Standard method V1.1 (California Section 01350) (Use "office" or "classroom" space limits for all applications)		none	none

<b>TABLE 3-1 Volatile Organic Compounds (VOC) (Low Emitting Materials) Requirements</b> Source: ICC IGCC Chapter 8 (Materials) (Interior Applications Only)				
<b>MATERIAL CATEGORY</b>	<b>EMISSIONS REQUIREMENT</b>		<b>MATERIALS WITH ADDED VOC REQUIREMENT</b>	<b>EMISSIONS REQUIREMENTS</b>
<b>Composite Wood, Wood Structural Panel, and Agrifiber Products,</b> no added urea-formaldehyde resins including laminating adhesives for composite wood and agrifiber assemblies - particleboard, medium density fiberboard (MDF), wheatboard, strawboard, panel substrates, door cores	Third-party certification (approved by CARB) of <b>California Air Resource Board's (CARB) regulation,</b> Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products	or	none	<b>CDPH/EHLB/Standard method V1.1</b> (California Section 01350) (Use "office" or "classroom" space limits for all applications) (except: Structural panel components such as plywood, particle board, wafer board, and oriented strand board identified as "EXPOSURE 1," "EXTERIOR," or "HUD-APPROVED" are considered acceptable for interior use.)
<b>Office Furniture Systems and Seating</b> installed prior to occupancy	<b>ANSI/BIFMA X7.1</b> <b>ANSI/BIFMA X7.1:</b> (95-percent of installed office furniture system workstations and seating units)  <b>Section 7.6.2 of ANSI/BIFMA e3</b> (50-percent of office furniture system workstations and seating units)		none	none



<b>TABLE 3-1 Volatile Organic Compounds (VOC) (Low Emitting Materials) Requirements</b> Source: ICC IGCC Chapter 8 (Materials) (Interior Applications Only)				
<b>MATERIAL CATEGORY</b>	<b>EMISSIONS REQUIREMENT</b>		<b>MATERIALS WITH ADDED VOC REQUIREMENT</b>	<b>EMISSIONS REQUIREMENTS</b>
Ceiling and Wall assemblies and systems including: acoustical treatments; ceiling panels and tiles; tackable wall panels and coverings; wall coverings; wall and ceiling paneling and planking	CDPH/EHLB/Standard method V1.1 (California Section 01350) (Use "office" or "classroom" space limits for all applications)		none	none

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# Air Force Sustainability Requirements Scoresheet

HPSB COMPLIANCE (Updated Jan 2017)

\* required entry

## General Information



**SURVEY  
INCOMPLETE**

INCOMPLETE	
XQPZ104002	Project ID (e.g. ABCD12345)
	Real Property Unique ID (RPUID)
	Facility Number
Consolidate Cadet Prep School Dormitory	Building Name
USAF Academy	Installation
Colorado Springs	City
CO	State
Yes	CONUS
USAFA	MAJCOM
USACE	Construction Agent
Hedderer, Russell	AFCEC DM/CM (Last Name, First Name)
\$49,000,000.00	PA
88,630	Building Size (SF)
2021	Program Year (FY####)
RFP/35% Design	Project Phase
	Design Started (MM/DD/YY)
07/01/24	BOD (MM/DD/YY)
USGBC GP	Guiding Principles Compliance Certification Method
	<input type="text"/> Date Project Registered (MM/DD/YY) <input type="text"/> Date Project Certified (MM/DD/YY)
100%	HPSB Compliant
30%	Energy Efficiency Achieved (% below ANSI/ASHRAE/IESNA Standard 90.1-2010)
2017V1	Scoresheet version

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# Air Force Sustainability Requirements Scoresheet

HPSB COMPLIANCE (Updated Jan 2017)

\* required entry

Color Coding: See Instructions Tab for more detail

Drop-Down Box	Yes or N/A
No Entry Required	No
Custom Entry	Recommended not Required

## 90.1-2013

### HPSB I: Employ Integrated Design Principles (UFC 1-200-02 para 2-2)

Total Points	2	Possible Points	2
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Yes	HPSB I.1	Integrated Design	1
Yes	HPSB I.2	Commissioning	1

### HPSB II: Optimize Energy Performance (UFC 1-200-02 para 2-3)

Total Points	5	Possible Points	5
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Yes	HPSB II.1	Energy Efficiency	1
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Yes	Reduce energy use 30% below ANSI/ASHRAE/IESNA Standard 90.1-2010 or IECC, or if not - achieve maximum energy efficiency that is lifecycle cost effective
30.0%	Insert percentage below ANSI/ASHRAE/IESNA Standard 90.1-2010 or IECC, in terms of energy use (e.g. 32)
0	Insert building energy intensity (kBtu/yr-sqft) calculated IAW 10 CFR 433
Yes	Roof Attributes (Recommended)
1	Select roof types (Check below)

☒ Cool roof ☐ Solar electric ☐ Solar Passive

☐ Green roof ☐ Solar thermal

Energy Efficient Products	1
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Yes	
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Yes	HPSB II.2	On-site Renewable Energy	1
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Yes	Installed renewable energy elements or projects were not lifecycle cost effective
1	Renewable energy types (check below)

☐ Solar PV ☐ Geothermal ☐ Hydro ☐ Waste to Energy  
☐ Solar CP ☐ GSHP ☐ Wind ☒ Renewables were not lifecycle cost effective  
☐ Solar Thermal Electric

	Insert generation capacity (kW)
	Insert percentage of total building

Yes	HPSB II.3	On-site Renewable Energy - Solar Hot Water Heater System	1
-----	-----------	--	---

Yes	Installed solar hot water heater system or found installation not lifecycle cost effective
	Insert generation capacity (MMBtu/yr)
	Insert percentage of demand

Yes	HPSB II.4	Metering	1
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Yes	Electric Metering: Select N/A if no service
Yes	Natural Gas Metering: Select N/A if no service
N/A	Steam Metering: Select N/A if no service

### HPSB III: Protect and Conserve Water (UFC 1-200-02 para 2-4)

Total Points	6	Possible Points	6
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Yes	HPSB III.1	Indoor Water	1
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Yes		Indoor Water Metering	1
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Yes	HPSB III.2	Outdoor Water	1
-----	------------	---------------	---

Yes		Outdoor Water Metering	1
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Yes	HPSB III.3	Alternative Water	1
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Yes	HPSB III.4	Stormwater Management (LID Documentation per UFC 3-210-10)	1
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	Change in Impervious Area (SF)
	Pre-Award Cost Estimate (\$)
Yes	Project addressed EISA 438
0	EISA Technical Constraints

☐ Retaining stormwater impact receiving water flow ☐ Shallow bedrock, contaminated soil, high ground water table, underground utilities ☐ Soil infiltration capacity limited  
☐ Site too small to infiltrate significant volume ☐ Non-potable water demand to small ☐ Structural, plumbing, and other mods not feasible  
☐ State or local restrict water harvesting ☐ State or local restrict use of green infrastructure or LID ☐ Other

	Percent Increase in Stormwater Runoff for 95 Percentile Storm (%) - or- Percent Increase in Stormwater Runoff from continuous simulation model, published data, studies, or other established tools (Reference UFC 3-210-10 Figure 2-1 Implementation of EISA Section 438)
Both	LID Features Locations
0	Integrated Management Practices Employed

# Air Force Sustainability Requirements Scoresheet

HPSB COMPLIANCE (Updated Jan 2017)

\* required entry

- |  |   |  |  |
|--|---|--|--|
| <input type="checkbox"/> Bio-Retention       | <input type="checkbox"/> Dry Wells                      | <input type="checkbox"/> Filter Strips             | <input type="checkbox"/> Grassed Swells        |
| <input type="checkbox"/> Infiltration Trench | <input type="checkbox"/> Inlet Pollution Removal Device | <input type="checkbox"/> Permeable Pavement/Pavers | <input type="checkbox"/> Rain Barrels/Cisterns |
| <input type="checkbox"/> Soil Amendments     | <input type="checkbox"/> Tree Box Filters               | <input type="checkbox"/> Vegetated Buffers         | <input type="checkbox"/> Vegetated Roof        |
| <input type="checkbox"/> Other               |   |  |  |

	Final LID Construction Cost (\$)
	Post Construction Analysis (Name of DOR)

## HPSB IV: Enhance Indoor Environmental Quality (UFC 1-200-02 para 2-5)

Total Points	8	Possible Points	8
Yes	HPSB IV.1	Thermal Comfort	1
Yes	HPSB IV.2	Ventilation	1
Yes	HPSB IV.3	Daylighting	1
Yes	HPSB IV.4	Moisture Control	1
Yes	HPSB IV.5	Low Emitting Materials	1
Yes	HPSB IV.6	Protect Indoor Air Quality during Construction	1
Yes	HPSB IV.7	Environmental Tobacco Smoke Control	1
Yes	HPSB IV.8	Occupant Health and Wellness	1

## HPSB V: Reduce Environmental Impact of Materials (UFC 1-200-02 para 2-6)

Total Points	5	Possible Points	5
Yes	HPSB V.1	Recycled Content	1
Yes	HPSB V.2	Biologically-based Products	1
Yes	HPSB V.3	Ozone Depleting Substances	1
Yes	HPSB V.4	Waste and Materials Management - Recycling	1
Yes	HPSB V.5	Waste and Materials Management - Divert 60% from Disposal	1
	Yes	60% or greater diverted	
	60.0%	Insert percentage diverted from landfill	

## HPSB VI: Address Climate Change Risk (UFC 1-200-02 para 2-7)

Total Points	1	Possible Points	1
Yes	HPSB VI.1	Address Climate Change Risk	1
27	Federal Requirements - Yes or N/A		
0	Federal Requirements - No		
100%	Percentage of Federal Requirements Met		

## Federal Requirements for High Performance and Sustainable Buildings (HPSB) & UFC 1-200-02

Instructions: Provide a common or project specific justification for an element to be non-applicable, when completed, the Scoresheet tab will allow an N/A response.

Justification for Non-Applicable Answers		Common Justification	Project Specific Justification	Complete?
<b>HPSB I: Employ Integrated Design Principles (UFC 1-200-02, 2-2)</b>				
HPSB I.1	<b>Integrated Design</b>			Applicable
HPSB I.2	<b>Commissioning</b>			Applicable
<b>HPSB II: Optimize Energy Performance (UFC 1-200-02, 2-3)</b>				
HPSB II.1	<b>Energy Efficiency</b>			Applicable
HPSB II.1	<b>Energy Efficient Products</b>			Applicable
HPSB II.2	<b>On-site Renewable Energy</b>			Applicable
HPSB II.3	<b>On-site Renewable Energy - Solar Hot Water Heater System</b>			Applicable
HPSB II.4	<b>Metering</b>			
HPSB II.4	Electric Metering: Select N/A if no service			Applicable
HPSB II.4	Natural Gas Metering: Select N/A if no service			Applicable
HPSB II.4	Steam Metering: Select N/A if no service	No service	No Service	Yes
<b>HPSB III: Protect and Conserve Water (UFC 1-200-02, 2-4)</b>				
HPSB III.1	<b>Indoor Water</b>			Applicable
HPSB III.1	Indoor Water Metering: Select N/A if no service			Applicable
HPSB III.2	<b>Outdoor Water</b>			Applicable
HPSB III.2	Outdoor Water Metering: Select N/A if no service			Applicable
HPSB III.3	<b>Alternative Water</b>			Applicable
HPSB III.4	<b>Stormwater Management</b>			
HPSB III.4	Project addressed EISA 438			Applicable
<b>HPSB IV: Enhance Indoor Environmental Quality (UFC 1-200-02, 2-5)</b>				
HPSB IV.1	<b>Thermal Comfort</b>			Applicable
HPSB IV.2	<b>Ventilation</b>			Applicable
HPSB IV.3	<b>Daylighting</b>			Applicable
HPSB IV.4	<b>Moisture Control</b>			Applicable
HPSB IV.5	<b>Low Emitting Materials</b>			Applicable
HPSB IV.6	<b>Protect Indoor Air Quality during Construction</b>			Applicable
HPSB IV.8	<b>Occupant Health and Wellness</b>			Applicable
<b>HPSB V: Reduce Environmental Impact of Materials (UFC 1-200-02, 2-6)</b>				
HPSB V.1	<b>Recycled Content</b>			Applicable
HPSB V.2	<b>Biologically based products</b>			Applicable
HPSB V.3	<b>Ozone Depleting Substances</b>			Applicable
HPSB V.4	<b>Waste and Materials Management - Recycling</b>			Applicable
HPSB V.5	<b>Waste and Materials Management - Divert 60% from Disposal</b>			Applicable
<b>HPSB VI: Address Climate Change Riskd (UFC 1-200-02, 2-7)</b>				
HPSB VI.1	<b>Address Climate Change Risk</b>			Applicable

## High Performance Sustainable Building Requirements

### References

Executive Order (EO) 13693, Planning for Federal Sustainability in the Next Decade

HPSB I: Employ Integrated Design Principles	
<b>Integrated Design</b> <b>HPSB I.1</b> <b>UFC 1-200-02 para 2-2.1</b>	<p>Incorporate the following planning and evaluation into the integrated design, as described in ASHRAE 189.1 Informative Appendix F (Integrated Design). Follow the steps of design optimization, as applicable, in ASHRAE 189.1 Section F1.1.1 (Charrette Process).</p> <p>Use a collaborative, integrated planning and design team, composed of user, government support staff, and appropriate professionals, to identify requirements and to establish performance goals for siting, energy, water, materials, indoor environmental quality, and other comprehensive design goals. Ensure incorporation of these goals throughout the design and lifecycle of the building, including deconstruction.</p> <p>Evaluate the site and building components to determine whether passive and natural design strategies and features are cost effectively incorporated before the active and mechanical systems are designed. Incorporate these features where applicable.</p> <p>Take into account site attributes, including climate and local and regional context, which impact the design of the building.</p> <p>During the site selection process, meet the requirements of UFC 2-100-01. See Appendix B “Best Practices” for desirable site characteristics.</p> <p>During the planning and design process meet the requirements of applicable UFCs, and use the following site development considerations and passive strategies:</p> <ul style="list-style-type: none"><li>• Site design elements that ensure safe and convenient pedestrian access.</li><li>• Meet the requirements of UFC 3-201-02.</li><li>• Incorporate results of site analysis, in order to design the building, focusing on orientation, configuration and massing.</li><li>• Orient building to maximize energy efficiency, passive solar and daylighting potential.</li><li>• Select, design and integrate into the overall building, high performance and sustainable systems (e.g., HVAC, plumbing, water heating systems, lighting systems, control systems, elevators, building envelope and fire protection systems).</li><li>• Promote opportunities for occupants to voluntarily increase physical movement such as making stairwells a desirable option for circulation and active workstations.</li></ul>
<b>Commissioning</b> <b>HPSB I.2</b> <b>UFC 1-200-02 para 2-2.2</b>	<p>In order to verify design and performance, and ensure that the Government requirements are met, employ commissioning practices appropriate to the size and complexity of the building and its system components. This must include an experienced commissioning provider, who should be independent of the project design and construction team, and the operations team. The choice of either contracted services or Government personnel to serve as the commissioning provider will be determined at project level.</p> <p>Meet the requirements of ASHRAE 189.1 Section 10.3.1.2 (Building Project Commissioning), with the following modifications:</p> <ul style="list-style-type: none"><li>• For buildings and systems that are less complex, commissioning may be tailored as determined by the DOD Component AHJ.</li><li>• “Schematic design” is the design charrette or similar conceptual design activity.</li><li>• Documentation as described in ASHRAE 55 Section 6.2 is not required.</li></ul> <p>For Air Force projects, the Project Delivery Team must determine the level of commissioning activities required.</p>
<b>Requirement Source Document(s)</b>	<p><a href="#">Executive Order 13693</a></p> <p><a href="#">UFGS 01 91 00.15, Total Building Commissioning</a></p>

**High Performance Sustainable Building Requirements****HPSB II: Optimize Energy Performance****Energy Efficiency  
HPSB II.1  
UFC 1-200-02 para 2-3.1****Energy Efficiency -**

Base energy efficiency design decisions on life-cycle cost as indicated in Chapter 1 of UFC 1-200-02.

**Commercial and Multi-Family High-Rise Residential Buildings:**

- Meet the requirements of ASHRAE 90.1. Use ASHRAE 90.1(2010) for all projects with design starts before November 6, 2016. Use ASHRAE 90.1(2013) thereafter.
- Design the building to achieve at least 30% energy consumption reduction from ASHRAE 90.1 baseline.
- If a 30% reduction is not LCCE, modify the design of the proposed building to achieve an energy consumption level at the highest level of energy efficiency that is LCCE.
- Determine energy consumption levels for both the ASHRAE Baseline Building and proposed building by using the Performance Rating Method found in appendix G of ASHRAE 90.1, except the formula for calculating the Performance Rating.

Replace the formula in G1.2 with the following:

Percentage improvement =  $100 \times ((\text{Baseline building consumption} - \text{Receptacle and process loads}) - (\text{Proposed building consumption} - \text{Receptacle and process loads})) / (\text{Baseline building consumption} - \text{Receptacle and process loads})$

**Low-Rise Residential Buildings:**

- Meet the requirements of International Energy Conservation Code (IECC).
- Design the building to achieve at least 30% energy consumption reduction from the IECC baseline using the Simulated Performance Alternative found in Section 405 of the IECC.
- If a 30% reduction is not LCCE, modify the design of the proposed building to achieve an energy consumption level at the highest level of energy efficiency that is LCCE.

**Renovations:**

- Renovation projects that replace everything above the foundation must either apply 2-3.1.1 or 2-3.1.2 as applicable.
- All other renovations choose one of the following options:
  1. Reduce measured building energy use by at least 30%, below FY 2003 energy use baseline.
  2. Reduce measured building energy use by at least 20% below FY 2015 energy use baseline.
  3. Reduce modeled energy use (from all sources including renewable energy) by 20% compared to the ASRHAE 90.1 baseline building design.
- If none of the reduction choices is life-cycle cost-effective, modify the design of the proposed building system(s) to achieve an energy consumption level at the highest level of energy efficiency that is life-cycle cost-effective.

**Energy Efficient Products  
HPSB II.1  
UFC 1-200-02 para 2-3.1.4****Energy Efficient Products –**

Per EISA 2007 Section 525, acquire products that are ENERGY STAR®-qualified or meet FEMP-designated efficiency requirements in all covered product categories. Select products based on life cycle cost, not initial cost. Link to EPA sites: <http://www.energystar.gov/> or <http://www1.eere.energy.gov/femp/>

Per EISA 2007 Section 524, provide commercially available, off-the-shelf products that use no more than 1 watt in their standby mode.

**Requirement Source Document(s)** [10 CFR 433, EPAAct 05](#)

**Links** [Energy Star®](#)  
[Federal Energy Management Program](#)



**High Performance Sustainable Building Requirements**

**On-site Renewable Energy**  
**HPSB II.2**  
**UFC 3-440-01 para 2-3.2**

Provide on-site renewable energy systems in accordance with ASHRAE 189.1 Section 7.4.1.1 (On-Site Renewable Energy Systems) and UFC 3-440-01 where LCCE, considering climate, infrastructure condition, mission compatibility, and effects on base wide electrical system (grid) power quality. Exception: Do not use purchase of renewable energy certificates (RECs) as a substitute for the Section 7.4.1.1 new building requirement.

Air Force will utilize an installation-level solution to renewable energy systems and will not require ASHRAE 189.1 Section 7.3.2 if a building-level solution is not LCCE.

**Requirement Source**  
**Document(s):**

[Executive Order 13693](#)

**On-Site Renewable Energy –**  
**Solar Hot Water Heater**  
**System**  
**HPSB II.3**  
**UFC 1-200-02 para 2-3.2.1**

Per EISA 2007 Section 523, meet at least 30% of the annual domestic hot water requirement through the installation of solar water heating unless SDHW is not LCCE. If 30% is not LCCE, modify the design of the proposed system to achieve the highest level of solar water heating that is LCCE.

**Requirement Source**  
**Document(s):**

<b>High Performance Sustainable Building Requirements</b>	
<b>Measurement and Verification</b> <b>HPSB II.4</b> <b>UFC 1-200-02 para 2-3.4</b>	A utility meter must be installed at each building, for each utility serving the building (e.g., district steam, district hot and chilled water, electricity, natural gas, fuel oil, etc.) in the standard units of the measure. Meters must be connected to a base wide energy and utility monitoring and control system using the installation's advanced metering protocols. The installation of meters is required per DODI 4170.11, and as amended by DOD Utilities Meter Policy, 16 April 2013.
<b>Requirement Source Document(s):</b>	Federal Leadership in High Performance and Sustainable Buildings MOU
<b>HPSB III: Protect and Conserve Water</b>	
<b>Indoor Water</b> <b>HPSB III.1</b> <b>UFC 1-200-02 para 2-4.1</b>	Indoor Water – Base water efficiency design decisions on life-cycle cost as indicated in Chapter 1 of UFC 1-200-02.  <ul style="list-style-type: none"> <li>• Meet the requirements of ASHRAE 189.1 Section 6.3.2 (Building Water Use Reduction), which incorporates USEPA WaterSense-labeled products. Water closet replacements in renovations may have a flush value of up to 1.6 GPF (6.1 LPF) to accommodate existing plumbing capacity.</li> <li>• Meet the requirements of ASHRAE 189.1 Section 6.4.2 (Building Water Use Reduction).</li> <li>• Meet the requirements of ASHRAE 189.1 Section 6.4.3 (Special Water Features).</li> </ul>
<b>Indoor Water Metering</b> <b>HPSB III.1</b> <b>UFC 1-200-02 para 2-4.1.1</b>	Indoor Water Metering -- Install advanced water meters to monitor building indoor potable water consumption, as required by DOD Utilities Meter Policy, 16 April 2013.
<b>Requirement Source Document(s):</b>	<a href="#">EPA Act 1992</a>
<b>Outdoor Water</b> <b>HPSB III.2</b> <b>UFC 1-200-02 para 2-4.2</b>	Outdoor Water -- <ul style="list-style-type: none"> <li>• Limit potable irrigation water use by 50% compared to the conventional methods, and when LCCE, by using the methodologies in ASHRAE 189.1: Section 6.3.1 (Mandatory Provisions: Site Water Use Reduction) and either Section 6.4.1 (Prescriptive Option: Site Water Use Reduction) or Section 6.5.1 (Performance Option: Site Water Use Reduction).</li> <li>• For existing systems, if a building has a single water meter, reduce indoor and outdoor potable water use combined by at least 20% compared to building water use in 2007. Compare results to a baseline building, using the EPA WaterSense landscape water budget tool version 1.01 or later, or a Component approved tool.</li> <li>• Show preference for irrigation contractors who are certified through a WaterSense labeled program, or other industry-recognized credentialing programs.</li> <li>• Refer to UFC 3-201-02 for additional requirements.</li> </ul>
<b>Outdoor Water Metering</b> <b>HPSB III.2</b> <b>UFC 1-200-02 para 2-4.2.1</b>	Water metering for landscaping – When potable water is used, provide water meters for irrigation systems serving more than 25,000 square feet of landscape, when life-cycle cost-effective. Install advanced water meters to monitor outdoor potable water consumption, as required by DOD Utilities Meter Policy, 16 April 2013.  For all other irrigation systems, separate water meters for locations with outdoor water use are encouraged.
<b>Requirement Source Document(s):</b>	<a href="#">Executive Order 13693</a>
<b>Alternative Water</b> <b>HPSB III.3</b> <b>UFC 1-200-02 para 2-4.3</b>	Where life-cycle cost-effective and permitted by local laws and regulations, use alternative water sources, such as harvested rainwater, treated wastewater, air handler condensate capture, grey water, and reclaimed water.
<b>Requirement Source Document(s):</b>	

**High Performance Sustainable Building Requirements****Stormwater Management  
HPSB III.4  
UFC 3-210-10 para 2-4.3.1**

The criteria and design standards in UFC 3-210-10 are required for the planning, design and construction of all Department of Defense (DoD) projects in the United States, United States Territories and Possessions of the United States that meet both of the following conditions:

- 1) The project includes construction or expansion of one or more buildings as part of its primary scope (i.e., primary facilities vice supporting facilities).
- 2) The "footprint" is greater than 5,000 gross square feet (464.5 square meters). "Footprint" consists of all new impervious surfaces associated with the building(s), including both building area and pavement area of associated supporting facilities (such as parking and sidewalks). "Footprint" does not include existing building area to be renovated, existing pavement area to be resurfaced, or new pavement area other than supporting facilities associated with the building(s).

For projects in the United States, United States Territories, and Possessions of the United States that do not meet the applicability requirements above, LID techniques apply to the extent practical.

**Requirement Source  
Document(s):**

[EISA 2007 Sec 438](#)

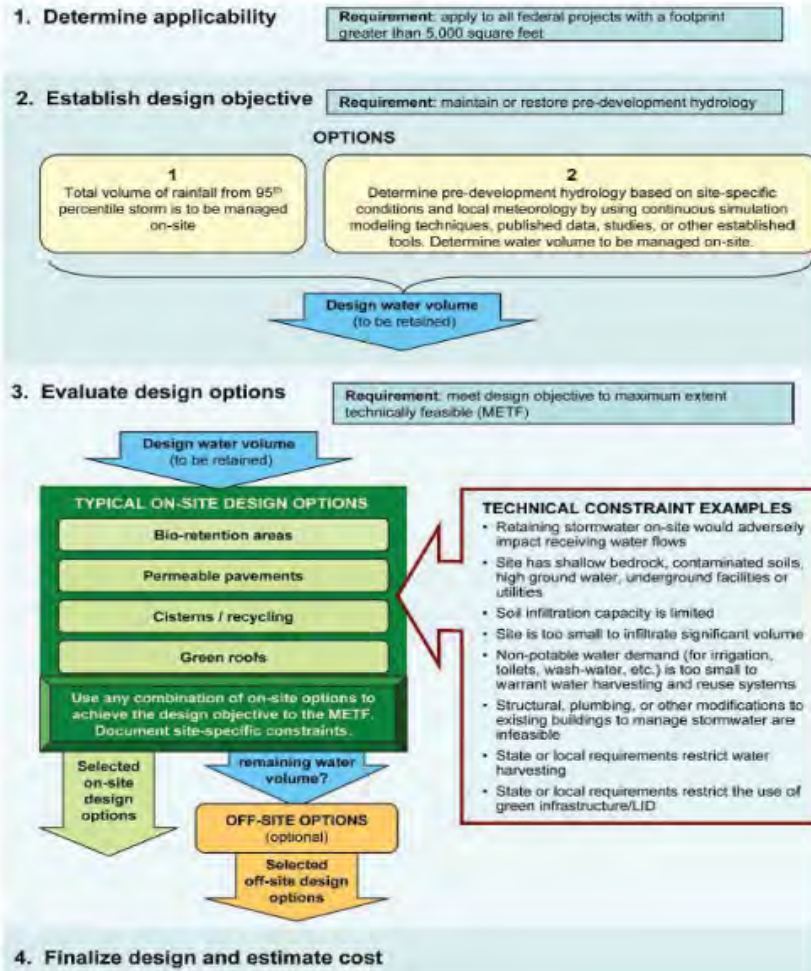
High Performance Sustainable Building Requirements	
HPSB IV: Enhance Indoor Environmental Quality	
<b>Thermal Comfort</b> <b>HPSB IV.1</b> <b>UFC 1-200-02 para 2-5.1</b>	<p>Meet the requirements of ASHRAE 55. Compliance with standards by providing passive (non-mechanical) thermal comfort methods are allowed and encouraged as described in paragraph entitled, "Integrated Design" in UFC 1-200-02.</p> <p>Exception: For Medical Treatment Facilities, refer to UFC 4-510-01 Medical Military Facilities for thermal comfort criteria.</p>
Requirement Source Document(s):	<a href="#">Executive Order 13693</a>
<b>Ventilation</b> <b>HPSB IV.2</b> <b>UFC 1-200-02 para 2-5.1</b>	<p>Meet the requirements of ASHRAE 62.1 (62.2 for low-rise residential).</p> <p>Exception: For Medical Treatment Facilities, refer to UFC 4-510-01 Medical Military Facilities for ventilation criteria.</p>
Requirement Source Document(s):	<a href="#">Executive Order 13693</a>
<b>Daylighting</b> <b>HPSB IV.3</b> <b>UFC 1-200-02 para 2-5.2</b>	<p>All regularly occupied spaces located on the exterior wall must have vision fenestration. Where mission precludes vision fenestration for regularly occupied spaces located on the exterior wall, daylighting is still required. All classrooms and offices must have daylighting. Meet the requirements of ASHRAE 189.1 Section 8.4.1.2 (Minimum Sidelighting effective Aperture for Office Spaces and Classrooms) or Section 8.5.1.2 (Usable Daylight Illuminance in Office Spaces and Classrooms). Provide automated lighting controls in accordance with UFC 3-530-01.</p> <p>Exception: For Medical Treatment Facilities, refer to UFC 4-510-01 Medical Military Facilities for additional daylighting criteria.</p>
Requirement Source Document(s):	<a href="#">Executive Order 13693</a>
<b>Moisture Control</b> <b>HPSB IV.4</b> <b>UFC 1-200-02 para 2-5.3.1</b>	<p>Establish and implement a moisture control strategy for controlling moisture flows and condensation to prevent building damage, minimize mold contamination, and reduce health risks related to moisture. Meet the requirements of ASHRAE 189.1 Section 10.3.1.5 (Moisture Control), UFC 3-410-01, Chapter 3, Sections 3-2 and 3-3 (Ventilation Air), and UFC 3-101-01 Chapter 3 (Building Envelope Requirements). Refer to Appendix B "Protect Indoor Air Quality" for best practices.</p>
Requirement Source Document(s):	<a href="#">Executive Order 13693</a>
<b>Low Emitting Materials</b> <b>HPSB IV.5</b> <b>UFC 1-200-02 para 2-5.3.2</b>	<p>Specify materials and products with low or no pollutant emissions, including composite wood products, adhesives, sealants, interior paints and finishes, carpet systems, and furnishings. Meet the requirements of ASHRAE 189.1 Section 8.4.2 (Prescriptive Option: Materials).</p> <p>Exception: Exclude compliance with 8.4.2, first sentence.</p>
Requirement Source Document(s):	<a href="#">Executive Order 13693</a>
<b>Protect Indoor Air Quality during Construction</b> <b>HPSB IV.6</b> <b>UFC 1-200-02 para 2-5.3.3</b>	<p>For new construction and for renovation of unoccupied existing buildings, comply with ASHRAE 189.1 Section 10.3.1.4 (Indoor Air Quality (IAQ) Construction Management), with maximum outdoor air consistent with achieving relative humidity no greater than 60%.</p> <p>For renovation of occupied existing buildings, comply with ANSI/SMACNA 008-2008, 2nd Edition, SMACNA IAQ Guidelines for Occupied Buildings Under Construction.</p>
Requirement Source Document(s):	<a href="#">Executive Order 13693</a>

**High Performance Sustainable Building Requirements**

<b>Environmental Tobacco Smoke Control</b> HPSB IV.7 UFC 1-200-02 para 2-5.3.4	Prohibit smoking within the building and within a minimum of 50 feet (15.24 meters) of all building entrances, operable windows, and building ventilation intakes. Verify if more stringent facility criteria or Installation policy applies.
Requirement Source Document(s):	<a href="#">Federal Register: December 22, 2008 (Volume 73, Number 246) - EO 13058</a>
<b>Occupant Health and Wellness</b> HPSB IV.8 UFC 1-200-02 para 2-5.4	Promote opportunities for occupants to voluntarily increase physical movement such as making stairwells a desirable option for circulation, active workstations, fitness centers, and bicycle commuter facilities. Support occupant health by considering options such as providing convenient access to healthy dining options, potable water, daylight, plants, and exterior views. Indicate in the Integrated Design Process how these efforts were evaluated.
Requirement Source Document(s):	

High Performance Sustainable Building Requirements	
HPSB V: Reduce Environmental Impact of Materials	
<b>Recycled Content</b> <b>HPSB V.1</b> <b>UFC 1-200-02 para 2-6.1.1</b>	Use RCRA Section 6002 compliant products that meet or exceed EPA's recycled content recommendations, available on EPA's Comprehensive Procurement Guideline web site at <a href="http://www.epa.gov/">http://www.epa.gov/</a>
Requirement Source Document(s):	RCRA 2002, Sec 6002
<b>Biologically-based Products</b> <b>HPSB V.2</b> <b>UFC 1-200-02 para 2-6.1.2</b>	Per Section 9002 of the Farm Security and Rural Investment Act, specify products composed of the highest percentage of biobased content consistent with the USDA BioPreferred Program, if products meet performance requirements and are available at a reasonable cost. Exceptions taken to biobased product procurement must be documented. A preference for purchasing products with the highest biobased content per USDA recommendations for designated product categories must be included in all applicable solicitations. USDA's biobased product designations and biobased content (which includes certified sustainably-harvested and rapidly renewable resources) recommendations are available on USDA's BioPreferred web site at <a href="http://www.biopreferred.gov/">http://www.biopreferred.gov/</a>
Requirement Source Document(s):	FSRIA 2002 Section 9002
<b>Environmentally Preferable Products</b> <b>HPSB V.3</b> <b>UFC 1-200-02 para 2-6.1.4</b>	Meet the requirements of ASHRAE 189.1 Section 9.3.3 (Refrigerants), if equipment or systems using ozone depleting substances are included in the project. Do not use ozone depleting substances (ODS) or high Global Warming Potential (GWP) chemicals where EPAs Significant New Alternative Policy (SNAP) has identified acceptable substitutes or where other environmentally preferable products are available for use in construction, repair or end-of-life replacements: <a href="http://www.epa.gov/snap">www.epa.gov/snap</a>  Exceptions: Refer to UFC 3-600-01 for fire protection system requirements.
Requirement Source Document(s):	<a href="#">Executive Order 13693</a>
<b>Waste and Materials Management - Recycling</b> <b>HPSB V.4</b> <b>UFC 1-200-02 para 2-6.2.1</b>	Meet the requirements of ASHRAE 189.1 Section 9.3.4.1 (Storage and Collection of Recyclables – Recyclables), where markets or onsite recycling exist.
Requirement Source Document(s):	<a href="#">Executive Order 13693</a>
<b>Waste and Materials Management, Divert 60% from Disposal</b> <b>HPSB V.5</b> <b>UFC 1-200-02 para 2-6.2.2</b>	Divert minimum 60% of nonhazardous construction and demolition waste material from landfills.
Requirement Source Document(s):	<a href="#">Executive Order 13693</a>
	<a href="#">UFGS 01 74 19, Construction and Demolition Waste Management</a>
HPSB VI: Address Climate Change Risk	
<b>Address Climate Change Risk</b> <b>HPSB VI.1</b> <b>UFC 1-200-02 para 2-7</b>	Provide building design solutions responsive to any Government-provided projections of climate change projection and determination of acceptable risk.  For a building located in a floodplain of concern, provide design solutions which mitigate both impact on the floodplain, and impact of the design flood event on building function and occupants, consistent with mission criticality.

Figure 2-1 Implementation of EISA Section 438



AF Sustainable Building Requirements Legend	
Gray Text	Recommended (Federal Requirement not fully defined at this time)
Light Gray Cell	Cell is populated by other cells. User is not required to enter values.
Light Green Cell (When used, conditional formatting changes cell to Green or Red depending on entry)	Cell provides a drop-down box for the user to select which LEED Credits and HPSB Requirements that the project is attempting. When a "Yes" or "No" is selected the cell follows the stoplight convention to visually represent progress. The stoplight convention is also used for "Yes" or "No" totals. Some light green boxes also have an option for "N/A" when used for subquestions
	Cell uses a drop down box and user is designating "Yes" or "N/A" when applicable
	Cell uses a drop down box and user is designating "No"
Light Yellow Cell	Cell is for custom entry on how the project is pursuing HPSB requirements. These are subquestions and also general information questions. Boxes that appear when cell is selected give further instruction on entering data. Some cells restrict values that can be entered - which is explained if incorrectly entered



Note: This contract requires compliance with UFC 1-200-02 to the extent that the criteria intersects with the scope of work for the project. The contractor shall document compliance with all guiding principles metrics that do intersect with the scope of the project. This checklist indicates which provisions do apply. Where indicated, the contractor has the option to use LEED documentation templates to document compliance with provisions of the UFC. Intent is for this to be a "streamlined" approach for documenting compliance. It is not intended to force LEED third-party certification (TPC) on the project, or to require the project to meet LEED thresholds for credits rather than comply with the UFC.

PROJECT INFORMATION FORM		
Guiding Principles Assessment, Department of Defense by GBCI v2.1		
UFC 1-200-02: Chapter 2 Building Design & Construction		
General Information		
Project Name	Consolidate Prep. School Dormitories	PNXQPZ104002
Project ID	TBD	
Project City	U.S. Air Force Academy	
Project State	Colorado	
2-2 Employ Integrated Design Principles		
2-2.1 Integrated Design - Design Submittal		
<b>Select 1 of the 3 compliance paths</b> - Step-by-Step Implementation as described in the Technical Guide for Guiding Principles Assessment for DoD - Streamlined LEED path as described in the Technical Guide for Guiding Principles Assessment for DoD - Not applicable to project, provide written justification for missed targets as relates to mission, location, LCCA, non-applicable to scope, or other reason specific to requirement		Notes: Contractor shall comply with UFC 1-200-02 requirements for integrated design. Document compliance.
Compliance Path:	- Step-by-Step OR LEED streamline	LEED v4 Integrative Process Credit
2-2.1.1 Integrative Planning - Design Submittal		
<b>Select 1 of the 2 compliance paths</b> - Step-by-Step Implementation as described in the Technical Guide for Guiding Principles Assessment for DoD - Not applicable to project, provide written justification for missed targets as relates to mission, location, LCCA, non-applicable to scope, or other reason specific to requirement		Notes: Contractor shall comply with UFC 1-200-02 requirements for integrative planning. Document compliance.
Compliance Path:	- Step-by-Step OR LEED streamline	LEED v4 Integrative Process Credit
2-2.1.1 Evaluation for Design Strategies - Design Submittal		
<b>Select 1 of the 2 compliance paths:</b> - Step-by-Step Implementation - Not applicable to project		Notes: Contractor shall comply with UFC 1-200-02 requirements for Evaluation for Design Strategies. Document compliance.
Compliance Path:	- Step-by-Step OR LEED streamline	LEED v4 Integrative Process Credit
2-2.1.3 Evaluation of the Site - Design Submittal		
<b>Select 1 of the 2 compliance paths:</b> - Step-by-Step Implementation - Not applicable to project		Notes: Contractor shall comply with UFC 1-200-02 requirements for Evaluation of the Site. Document compliance.
Compliance Path:	- Step-by-Step OR LEED streamline	
2-2.1.4 Site Integration and Design of the Building - Design Submittal		
<b>Select 1 of the 2 compliance paths:</b> - Step-by-Step Implementation - Not applicable to project		Notes: Contractor shall comply with UFC 1-200-02 requirements for this item. Document compliance.
Compliance Path:	- Not applicable	
2-2.2 Commissioning - Construction Submittal		
<b>Select 1 of the 3 compliance paths</b> - Step-by-Step Implementation - Streamlined LEED path - Not applicable to project		Notes: Contractor shall comply with requirements of RFP section 01 91 00.15 TOTAL BUILDING COMMISSIONING.
Compliance Path:	- Step-by-step	See RFP section 01 91 00.15 10

PROJECT INFORMATION FORM		
Guiding Principles Assessment, Department of Defense by GBCI v2.1		
UFC 1-200-02: Chapter 2 Building Design & Construction		
General Information		
Project Name	Consolidate Prep. School Dormitories	PNXQPZ104002
Project ID	TBD	
Project City	U.S. Air Force Academy	
Project State	Colorado	
2-3 Optimize Energy Performance		
2-3.1.1 Commercial and Multi-Family High-Rise Residential Building - Design Submittal		
Select 1 of the 2 compliance paths: - Step-by-Step Implementation - Not applicable to project		Notes: Contractor shall comply with UFC 1-200-02 requirements for energy performance. Document compliance.
Compliance Path:	- Step-by-Step OR LEED streamline	LEED v4 Optimize Energy Performance Credit.
2-3.1.2 Low-Rise Residential Buildings - Design Submittal		
Select 1 of the 2 compliance paths: - Step-by-Step Implementation - Not applicable to project		Notes: Project is a commercial building. As such, requirement is not applicable. No documentation required.
Compliance Path:	- Not applicable	
2-3.1.3 Renovations - Design Submittal		
Select 1 of the 2 compliance paths: - Step-by-Step Implementation - Not applicable to project		Notes: Project is new construction. As such, requirement is not applicable. No documentation required.
Compliance Path:	- Step-by-Step OR LEED streamline	LEED v4 Optimize Energy Performance Credit.
2-3.1.4 Energy Efficient Products - Design Submittal		
Select 1 of the 2 compliance paths: - Step-by-Step Implementation - Not applicable to project		Notes: Per EISA 2007, acquire products that are ENERGY STAR®-qualified or meet FEMP-designated efficiency requirements in all covered product categories. Document compliance
Compliance Path:	- Step-by-Step	
2-3.1.5 Standby Powered Device - Design Submittal		
Select 1 of the 2 compliance paths: - Step-by-Step Implementation - Not applicable to project		Notes: Per EISA 2007 Section 524, provide commercially available, off-the-shelf products that use no more than 1 watt in their standby mode. Document compliance.
Compliance Path:	- Step-by-Step	
2-3.2 On-Site Renewable Energy - Design Submittal		
Select 1 of the 3 compliance paths: - Step-by-Step Implementation - Streamlined LEED path - Not applicable to project		Notes: On-Site Renewable Energy has already undergone Life Cycle Cost Analysis for this project and is not cost effective. No documentation required.
Compliance Path:	- Not applicable	
2-3.2.2 Solar Domestic Hot Water (SDHW) - Design Submittal		
Select 1 of the 2 compliance paths: - Step-by-Step Implementation - Not applicable to project		Notes: SDHW has already undergone Life Cycle Cost Analysis and is not cost effective. No documentation required.
Compliance Path:	- Not applicable	
2-3.3 Metering - Design Submittal		

PROJECT INFORMATION FORM		
Guiding Principles Assessment, Department of Defense by GBCI v2.1		
UFC 1-200-02: Chapter 2 Building Design & Construction		
General Information		
Project Name	Consolidate Prep. School Dormitories	PNXQPZ104002
Project ID	TBD	
Project City	U.S. Air Force Academy	
Project State	Colorado	
Select 1 of the 3 compliance paths - Step-by-Step Implementation - Streamlined LEED path - Not applicable to project		Notes: Contractor shall comply with UFC 1-200-02 requirements for utility metering. Document compliance.
Compliance Path:	- Step-by-step	

PROJECT INFORMATION FORM		
Guiding Principles Assessment, Department of Defense by GBCI v2.1		
UFC 1-200-02: Chapter 2 Building Design & Construction		
General Information		
Project Name	Consolidate Prep. School Dormitories	PNXQPZ104002
Project ID	TBD	
Project City	U.S. Air Force Academy	
Project State	Colorado	
2-4 Protect and Conserve Water		
2-4.1 Indoor Water - Design Submittal		
<b>Select 1 of the 3 compliance paths</b> - Step-by-Step Implementation - Streamlined LEED path - Not applicable to project		Notes: Contractor shall comply with UFC 1-200-02 requirements for indoor water. Document compliance.
<b>Compliance Path:</b>	- Step-by-Step OR LEED streamline	LEED v4 Water Efficiency Credit.
2-4.1.1 Indoor Water Metering - Design Submittal		
<b>Select 1 of the 3 compliance paths</b> - Step-by-Step Implementation - Streamlined LEED path - Not applicable to project		Notes: Contractor shall comply with UFC 1-200-02 requirements for utility metering. Document compliance.
<b>Compliance Path:</b>	- Step-by-step	
2-4.2.1 Outdoor Water Landscaping - Design Submittal		
<b>Select 1 of the 3 compliance paths</b> - Step-by-Step Implementation - Streamlined LEED path - Not applicable to project		Notes: Contractor shall comply with UFC 1-200-02 requirements for outdoor water landscaping. Document compliance.
<b>Compliance Path:</b>	- Step-by-Step OR LEED streamline	
2-4.2.2 Outdoor Water Metering - Design Submittal		
<b>Select 1 of the 3 compliance paths</b> - Step-by-Step Implementation - Streamlined LEED path - Not applicable to project		Notes: Project does not include existing irrigation systems, therefore requirement is not applicable. No documentation required.
<b>Compliance Path:</b>	- Not applicable	
2-4.3 Alternate Water- Design Submittal		
<b>Select 1 of the 3 compliance paths</b> - Step-by-Step Implementation - Streamlined LEED path - Not applicable to project		Notes: Local regulations limit harvesting rainwater. Evaluate other alternative water sources. Document Compliance
<b>Compliance Path:</b>	- Step-by-Step OR LEED streamline	
2-4.3.1 Stormwater Management - Design Submittal		
<b>Select 1 of the 3 compliance paths</b> - Step-by-Step Implementation - Streamlined LEED path - Not applicable to project		Notes: Contractor shall comply with UFC 3-210-10 for stormwater management. Document Compliance
<b>Compliance Path:</b>	- Not applicable	

PROJECT INFORMATION FORM		
Guiding Principles Assessment, Department of Defense by GBCI v2.1		
UFC 1-200-02: Chapter 2 Building Design & Construction		
General Information		
Project Name	Consolidate Prep. School Dormitories	PNXQPZ104002
Project ID	TBD	
Project City	U.S. Air Force Academy	
Project State	Colorado	
2-5 Enhance Indoor Environmental Quality		
2-5.1 Part 1 - Ventilation - Design Submittal		
<b>Select 1 of the 3 compliance paths</b> - Step-by-Step Implementation - Streamlined LEED path - Not applicable to project		Notes: Contractor shall comply with UFC 1-200-02 requirements for ventilation. Document compliance.
<b>Compliance Path:</b>	- Step-by-Step OR LEED streamline	LEED v4 Minimum/Enhanced IAQ Credit(s).
2-5.1 Part 2 - Thermal Comfort - Design Submittal		
<b>Select 1 of the 3 compliance paths</b> - Step-by-Step Implementation - Streamlined LEED path - Not applicable to project		Notes: Contractor shall comply with UFC 1-200-02 requirements for thermal comfort. Document compliance.
<b>Compliance Path:</b>	- Step-by-Step OR LEED streamline	LEED v4 Thermal Comfort Credit.
2-5.2 Daylighting & Lighting Controls - Design Submittal		
<b>Select 1 of the 3 compliance paths</b> - Step-by-Step Implementation - Streamlined LEED path - Not applicable to project		Notes: Contractor shall comply with UFC 1-200-02 requirements for automated lighting controls. Document compliance.
<b>Compliance Path:</b>	- Step-by-Step OR LEED streamline	LEED v4 Interior Lighting Credit.
2-5.3.1 IAQ Moisture Control - Design Submittal		
<b>Select 1 of the 2 compliance paths:</b> - Step-by-Step Implementation - Not applicable to project		Notes: Contractor shall comply with UFC 1-200-02 requirements for moisture control. Document compliance.
<b>Compliance Path:</b>	- Step-by-step	
2-5.3.2 Reduce VOC Low-Emitting Materials - Construction Submittal		
<b>Select 1 of the 2 compliance paths:</b> - Step-by-Step Implementation - Not applicable to project		Notes: Contractor shall comply with UFC 1-200-02 requirements for low-emitting materials (low VOC). Document compliance.
<b>Compliance Path:</b>	- Step-by-Step OR LEED streamline	LEED v4 Low-Emitting Materials Credit.
2-5.3.3 Protect Indoor Air Quality During Construction - Construction Submittal		
<b>Select 1 of the 3 compliance paths</b> - Step-by-Step Implementation - Streamlined LEED path - Not applicable to project		Notes: Contractor shall comply with UFC 1-200-02 requirements for IAQ during construction. Document compliance.
<b>Compliance Path:</b>	- Step-by-Step OR LEED streamline	LEED v4 Construction IAQ Management Credit.
2-5.4 Occupant Health and Wellness - Design Submittal		
<b>Select 1 of the 3 compliance paths</b> - Step-by-Step Implementation - Streamlined LEED path - Not applicable to project		Notes: Contractor shall comply with UFC 1-200-02 requirements for occupant health and wellness during construction. Document compliance.
<b>Compliance Path:</b>	- Not applicable	

PROJECT INFORMATION FORM		
Guiding Principles Assessment, Department of Defense by GBCI v2.1		
UFC 1-200-02: Chapter 2 Building Design & Construction		
General Information		
Project Name	Consolidate Prep. School Dormitories	PNXQPZ104002
Project ID	TBD	
Project City	U.S. Air Force Academy	
Project State	Colorado	
2-6 Reduce Environmental Impact of Materials		
2-6.1.1 Recycled Content - Construction Submittal		
<b>Select 1 of the 3 compliance paths</b> - Step-by-Step Implementation - Streamlined LEED path - Not applicable to project		<b>Notes:</b> Contractor shall comply with requirements of RFP section 01 62 35 RECYCLED/RECOVERED MATERIALS. Document compliance.
<b>Compliance Path:</b>	- Step-by-Step OR LEED streamline	LEED v3 Recycled Content Credit.
2-6.1.2 Biologically-Based Products - Construction Submittal		
<b>Select 1 of the 3 compliance paths</b> - Step-by-Step Implementation - Streamlined LEED path - Not applicable to project		<b>Notes:</b> Contractor shall comply with requirements of RFP section 01 33 29 SUSTAINABILITY REPORTING, for biologically preferred products. Document compliance.
<b>Compliance Path:</b>	- Step-by-Step OR LEED streamline	LEED v3 Rapidly Renewable Materials Credit.
2-6.1.4 Ozone Depleting Substances - Construction Submittal		
<b>Select 1 of the 3 compliance paths</b> - Step-by-Step Implementation - Streamlined LEED path - Not applicable to project		<b>Notes:</b> Contractor shall comply with UFC 1-200-02 requirements for ozone depleting substances. Document compliance.
<b>Compliance Path:</b>	- Step-by-step	
2-6.2.1 Storage and Collection of Recyclables - Design Submittal		
<b>Select 1 of the 3 compliance paths</b> - Step-by-Step Implementation - Streamlined LEED path - Not applicable to project		<b>Notes:</b> Contractor shall comply with UFC 1-200-02 requirements for storage and collection of recyclables. Document compliance.
<b>Compliance Path:</b>	- Step-by-Step OR LEED streamline	LEED v3 or v4 Storage & Collection of Recyclables
2-6.2.2 Waste Diversion- Construction Submittal		
<b>Select 1 of the 3 compliance paths</b> - Step-by-Step Implementation - Streamlined LEED path - Not applicable to project		<b>Notes:</b> Contractor shall comply with requirements of RFP section 01 74 19 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL.
<b>Compliance Path:</b>	- LEED streamline	LEED v3 or v4 Construction & Demo Waste Mngmnt.
2-7 Address Climate Change Risk		
2-7 Address Climate Change Risk - Design Submittal		
<b>Select 1 of the 3 compliance paths</b> - Step-by-Step Implementation - Streamlined LEED path - Not applicable to project		<b>Notes:</b> Contractor shall comply with UFC 1-200-02 requirements for address climate change risk. Document compliance.
<b>Compliance Path:</b>	- Step-by-Step OR LEED streamline	

Note: This contract requires compliance with UFC 1-200-02 to the extent that the criteria intersects with the scope of work for the project. The contractor shall document compliance with all guiding principles metrics that do intersect with the scope of the project. This checklist indicates which provisions do apply. Where indicated, the contractor has the option to use LEED documentation templates to document compliance with provision of the UFC. Intent is for this to be a "streamlined" approach for documenting compliance. It is not intended to force third-party certification (TPC) on the project, or to require the project to meet LEED thresholds for credits rather than comply with the UFC.



# TECHNICAL GUIDE

New Construction and Renovations

Guiding Principles Implemented by UFC 1-200-02

(December 2016)

Contact: [GuidingPrinciplesAssessment@gbci.org](mailto:GuidingPrinciplesAssessment@gbci.org)

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Dated: January 2019

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## Introduction

*For use with Guiding Principles Assessment, Department of Defense: Building Design and Construction UFC 1-200-02*

From the EPA to NASA, federal agencies work to abide by the Guiding Principles for Federal Leadership in High Performance and Sustainable Buildings<sup>1</sup> for building, renovating, and operating optimal, efficient buildings. The Green Business Certification Inc. (GBCI) has been working with these federal agencies to offer assessments of each agency's work to meet the Guiding Principles. GBCI can help you evaluate your success, streamline reporting, and guide your efforts toward complying with the principles, using its depth and breadth of knowledge of green building certification.

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<sup>1</sup> Guiding Principles for Sustainable Federal Buildings and Associated Instructions  
[https://www.whitehouse.gov/sites/default/files/docs/guiding\\_principles\\_for\\_sustainable\\_federal\\_buildings\\_and\\_associated\\_instructions\\_february\\_2016.pdf](https://www.whitehouse.gov/sites/default/files/docs/guiding_principles_for_sustainable_federal_buildings_and_associated_instructions_february_2016.pdf) Determining Compliance with the Guiding Principles for Sustainable Federal Buildings  
[https://www.whitehouse.gov/sites/default/files/docs/determining\\_compliance\\_with\\_the\\_guiding\\_principles\\_for\\_sustainable\\_federal\\_buildings\\_february\\_2016.pdf](https://www.whitehouse.gov/sites/default/files/docs/determining_compliance_with_the_guiding_principles_for_sustainable_federal_buildings_february_2016.pdf)

The Department of Defense (DOD) initiated the Unified Facilities Criteria (UFC) program to unify all technical criteria and standards pertaining to planning, design, construction, and operation and maintenance of real property facilities<sup>2</sup>. The Guiding Principles requirements are incorporated into the UFC 1-200-02 High Performance and Sustainable Building Requirements (UFC 1-200-02). For the DOD compliance with UFC 1-200-02 is compliance with Guiding Principles for Federal Sustainable Buildings. Guiding Principles Assessment (GPA) assesses compliance with UFC 1-200-02.

This Technical Guide along with the Guiding Principles Assessment Handbook will take you through the steps to show your projects' compliance with the Guiding Principles as specified in the UFC 1-200-02<sup>3</sup>. The UFC 1-200-01 DoD Building Code (General Building Requirements)<sup>4</sup> provides clarification for projects eligible for this version of the program. Questions and requests for clarification can be directed to: [GuidingPrinciplesAssessment@gbci.org](mailto:GuidingPrinciplesAssessment@gbci.org)

## TECHNICAL GUIDANCE

### 2-1. OVERVIEW

These requirements apply to all New Construction, New Addition and Renovation projects. [See the UFC 1-200-02 Appendix D for project requirements impacted by historic buildings, historic districts and those near historic facilities, view sheds and other designated cultural resources.]

### Technical Guidance Overview

The Requirements noted for each of the following are directly quoted from the UFC 1-200-02 dated 01Dec16 with change 01 dated 01Oct17.

There are Guiding Principle Requirements that are addressed in the UFC 1-200-02 in Chapter 3 Assessment of Existing Buildings for High Performance and Sustainable Building (HPSB) Compliance that are intentionally excluded from this Building Design and Construction assessment. For example, Benchmarking, Environmental Tobacco Smoke Control, Integrated Pest Management and Radon are requirements covered by DoD policy at later project stages.

### Life Cycle Cost Analysis

**1-7 LIFE-CYCLE COST ANALYSIS (LCCA).** The purpose of the LCCA methodology as detailed in CFR Title 10 Part 436 Subpart A is to identify and compare life-cycle cost-effective (LCCE) building energy and water systems that will in total achieve the energy and water requirements stated in this document. An LCCA is required for the following:

<sup>2</sup> Department of Defense (DOD) UNIFIED FACILITIES CRITERIA PROGRAM <http://www.wbdg.org/ffc/dod>

<sup>3</sup> UFC 1-200-02 dated 01Dec16 change 1 01Oct17 <http://www.wbdg.org/ffc/dod/unified-facilities-criteria-ufc/ufc-1-200-02>

<sup>4</sup> UFC 1-200-01 <http://www.wbdg.org/ffc/dod/unified-facilities-criteria-ufc/ufc-1-200-01>

1. Energy consuming systems (e.g.: HVAC systems)<sup>5</sup>
2. Renewable energy generating systems (ex: photovoltaic panels)
3. When LCCE is selected as the reason any requirement of this document is “Partially compliant” or “Not Applicable” (reference paragraph 4-2).

The LCCA methodology may also be used to evaluate multiple options, such as selecting the building construction type and comparing compliant materials; and is at the discretion of the project team.

**1-7.1 LCCA Format.** Prepare the LCCA in accordance with CFR Title 10 Part 436, Subpart A and NIST Handbook 135 *“Life-Cycle Costing Manual for the Federal Energy Management Program”*. The LCCA must be prepared using the Building Life-Cycle Costing (BLCC) program, available from the National Institute of Standards and Technology (<http://energy.gov/eere/femp/building-life-cycle-cost-programs>). The implied long-term inflation rate and discount rates identified in the Annual supplement to NIST Handbook 135 must be used. A link to BLCC can also be found at the Department of Energy’s building energy tools web site: <http://energy.gov/eere/femp/building-life-cycle-cost-programs>. When needed, refer to UFC 3-410-01 for requirements to obtain weather data.

**1-7.2 LCCA Building-Level Analysis** Any building-level LCCA must be calculated using a maximum of a 40-year building life and equipment lives based on accepted industry averages. Individual components or systems life expectancies must be reflected by inclusion of appropriate replacement and salvage values in the appropriate year of this analysis.

**1-7.3 LCCA Individual Component or System Alternatives Analysis.** LCCAs comparing at least three individual component or system alternatives must use the estimated life of the mutually exclusive alternative having the longest life, not to exceed 40 years from the beginning of beneficial use or the lowest common multiple of the expected lives of the alternatives. Include the appropriate replacement and salvage values for each of the other alternatives. A number of tools comparing energy system alternatives and evaluating specific efficiency measures may be of benefit in performing energy efficiency calculations.

Perform this analysis based on the actual conditions expected over the life of the facility including anticipated occupancies, scheduled hours of operation and process loads. Include realistic energy usage and efficiencies, maintenance cost and repairs renovations, all costs or savings associated with the utilization of recovered energy, solar heat, solar photovoltaic energy and other renewable or waste heat applications. Credit any alternative funding such as rebates in the LCCA. Use UFC 3-410-01 Appendix E.

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<sup>5</sup> In addition to the new building requirements, all existing building large capital energy investments (all projects for which the cost of the systems that impact energy consumption exceeds \$250K, which constitutes a capital investment, per National Defense Authorization Act) employ the most energy efficient designs, systems, equipment, and controls that are life cycle cost effective.

## Project Team Definitions

**Owner Organization:** The “Owner Organization” is the building owner organization or the DOD department that will own and occupy after construction (US Army, US Air Force, US Navy or US Marine Corps)

**Owner Name:** The “Owner Name” is the name of the person within the Owner Organization responsible for the project.

**Primary Contact Organization:** The “Primary Contact Organization” is the DOD department that is executing project for Owner Organization (US Army, US Air Force, US Navy or US Marine Corps).

**Primary Contact Name:** The “Primary Contact Name” is the name of the person within the Primary Contact Organization responsible for the project.

**Project Administrator Organization:** “The Project Administrator Organization” is often the non-DoD organization hired to manage project execution for the Primary Contact Organization.

**Project Administrator Name:** The “Project Administrator” is the name of the person within the Project Administrator Organization responsible for the project.

## Projects Outside of United States

If working with a project outside of the United States review excerpts from the UFC and contact GBCI with any questions or concerns:

**FORWARD:** All construction outside of the United States is also governed by Status of Forces Agreements (SOFA), Host Nation Funded Construction Agreements (HNFA), and in some instances, Bilateral Infrastructure Agreements (BIA.) Therefore, the acquisition team must ensure compliance with the most stringent of the UFC, the SOFA, the HNFA, and the BIA, as applicable.

## Compliance with federal requirements

**4-2 COMPLIANCE WITH FEDERAL REQUIREMENTS.** Not applicable – the requirement is not applicable, based on LCCE (e.g., LCCE excludes use of Alternate Water); mission exclusion (e.g., no daylighting in a theater or a SCIF); location/regional exclusion (e.g., Host Nation Agreement or no local recycling facility); or locale exclusion (e.g., there is no steam to meter), and is marked “Not Applicable” with justification.

Note, in instances where a requirement is only partially applicable, within the Project Information Form, select the documentation path that will be used to document the applicable portions of the Requirement. Not applicable should only be selected if the Requirement is not applicable in its entirety. If requirements are only partially applicable, (i.e. Daylighting not permitted in select secure areas of the building), it is expected that the project comply in other portions of the project and provide documentation delineating the portions of the project that are in compliance versus those that are not applicable.

**4-3.2 SUSTAINABLE THIRD PARTY CERTIFICATION.** TPC is not required for buildings being constructed by or for use by the United States under the laws, codes, rules and regulations of a Host Nation, but may need to comply with similar requirements of the Host Nation, as applicable international agreements provide. Incorporate sustainable development strategies and features to the greatest extent practical.

## Definition of Terms

**Life-Cycle Costing (LCC):** An important economic analysis used in the selection of alternatives that impact both pending and future costs. It compares initial investment options and identifies the least cost alternatives for a 40-year period. As applied to building design energy conservations measures, the process is mandated by law and is defined in 10 CFR Part 426, Subpart A: Program Rules of the Federal Energy Management Program (NIST Handbook 135). The National Institute of Standards and Technology has established the Building Life-Cycle Cost (BLCC) computer program to perform LCC analyses. The program incorporates user entered data for and compares the following: Sunk Costs, First Costs, Salvage Value, Future Investment, Residual Value, Annually Recurring Fixed Costs, Annually Recurring Escalating Costs, and Energy (Fuel Costs) Escalation Rates.

**Life-Cycle Cost Analysis (LCCA):** Assessment of the direct, indirect, recurring, nonrecurring, and other related costs incurred or estimated to be incurred in the design, development, production, operation, maintenance, support, and final disposition of a major system over its anticipated useful life span. LCCA considers all costs (capital, operating, and decommissioning expenses for the duration of a project) for various alternative approaches, including inflation and discount rates.

**Life-Cycle Cost Effectiveness (LCCE):** A documented statement of costs to be incurred to complete all stages of a project from planning through acquisition, maintenance, operation, remediation, disposition, long-term stewardship, and disposal. The results of a LCCA.

**DD Form 1391:** A programming document used by the Department of Defense to submit requirements and justifications in support of funding requests for military construction to Congress.

## 2-2. EMPLOY INTEGRATED DESIGN PRINCIPLES

Integrated design is the most important requirement in achieving a high performance building. A design team must have strong, consistent representation from all stake-holders throughout the project phases to avoid missing opportunities to improve building performance and to fully realize increased savings potential.

### 2-2.1 Integrated Design

#### Requirements

Integrated Design (2-2.1): Incorporate the following planning and evaluation into the integrated design, as described in ASHRAE 189.1 Informative Appendix F (Integrated Design). Follow the steps of design optimization, as applicable, in ASHRAE 189.1 Section F1.1.1 (Charrette Process).

The Integrated Design requirements are addressed by the Enacted DD1391 coordination from Base to Congress, prior to delivery to project team.

#### Compliance

##### *Step-By-Step Implementation*

#### Step 1. Review ASHRAE 189.1 Requirements & DD1391

- Obtain the Enacted DD1391 form to understand the owner's project goals and any department, base or other requirements provided by the Owner
- If possible obtain the design charrette process information from the Owner that would have been created as part of the creation and approval of the "Enacted DD1391"

#### Step 2. Assemble team

- In addition to the owner or primary contact, core members of the integrated design team often include the architect, engineers, construction manager or general contractor, landscape architect, facilities manager, green building or sustainable design specialist, other professionals from relevant disciplines, building users, and government support staff.
- Team members with broad experience play a key role in contributing meaningfully to the major areas of focus: siting, energy, water, materials, indoor environmental quality, and other design goals.

#### Step 3. Document performance goals and targets

- Well-defined performance objectives serve as a road map to guide the integrated design team throughout the building process. They help keep the team on track and provide a basis for systematic decision-making. Document performance goals, such as compliance with the DD1391, the UFC 1-200-02 and/or any Owner specific goals and targets.
- If practical use natural systems for energy conservation, lighting, ventilation, and passive heating and cooling are maximized before mechanical systems are engaged, taking into account the impact of the design on the site and its larger context including the environmental impact on a life-cycle cost basis.

- Use building information modeling (BIM) software, design tools, and the experience of the design team if practical to help optimize the design.

#### **Step 4. Establish and maintain an open communication process throughout design and construction**

- Members of the team will communicate frequently throughout both the design and construction phases of the project. Provide opportunities for communication through coordinated meetings and workshops, document sharing, and/or collaborative software.
- Consider and ensure how project goals will be maintained should the project transition from one responsible party to another
- Collaboration is an iterative process rather than a checklist, with team members brainstorming, testing, and refining their design ideas against the performance targets.
- If possible when making design decisions solicit feedback and inform all members of the design and construction team and consider future operation and maintenance (O&M) requirements.

### ***Documentation Requirements***

#### Design Submittal

##### Path One:

- Copy of Enacted DD1391 Form
- Narrative description of project teams process for distributing and incorporating the results from the DD1391 and process for ensuring owner and project goals will be met throughout the lifetime of the project including necessary transition from design to construction to project completion
- If the Owner is requiring goals more specific or beyond what is required in the UFC 1-200-02 generate a narrative document including the goals and how the team addressed them

##### Path Two:

- Demonstrate compliance with [LEEDv4 BD+C IPc Integrative process](#)
- Copy of Enacted DD1391 Form
- Narrative description of project teams process for distributing and incorporating the results from the DD1391 and process for ensuring owner and project goals will be met throughout the lifetime of the project including necessary transition from design to construction to project completion
- If the Owner is requiring goals more specific or beyond what is required in the UFC 1-200-02 generate a narrative document including the goals and how the team addressed them

##### Path Three:

- Not applicable to project. Provide written justification for missed targets as relates to mission, location, LCCA, non-applicable to scope, or other reason specific to requirement.



## 2-2.1.1 Integrated Planning

### Requirements

Integrated Planning (2-2.1.1): Use a collaborative, integrated planning and design team, composed of user, government support staff, and appropriate professionals, to identify requirements and to establish performance goals for siting, energy, water, materials, indoor environmental quality, and other comprehensive design goals. Ensure incorporation of these goals throughout the design and lifecycle of the building, including deconstruction.

*(The requirements noted above “to establish performance goals for siting” and “Ensure incorporation of these goals through the .....lifecycle of the building, including deconstruction” are addressed by the 1391 coordination from Base to Congress, prior to project team)*

### Compliance

#### Step-By-Step Implementation

#### Step 1. Performance goals

- Performance goals will have been established by the Enacted DD1391 as well as the work completed to meet Integrated Design (2-2-.1) requirement as described in ASHRAE 189.1 Appendix F.
- Ensure that all stages of the building’s life cycle, including deconstruction, are considered while incorporating the performance goals into the final design and construction of the project.

#### Step 2. Documentation

- Maintain a log dedicated to tracking discussions and decisions related to the Integrated Planning.

### Documentation Requirements

#### Design Submittal

#### Path One:

- Narrative regarding how the project team ensured that all stages of the building’s life cycle, including deconstruction, were considered while incorporating the performance goals into the final design and construction of the project.
- Copy of Integrated Planning Log

#### Path Two:

- Not applicable to project. Provide written justification for missed targets as relates to mission, location, LCCA, non-applicable to scope, or other reason specific to requirement



## 2-2.1.2 Evaluation for Design Strategies

### Requirements

Evaluation for Design Strategies (2-2.1.2): Evaluate the site and building components to determine whether passive and natural design strategies and features are cost effectively incorporated before the active and mechanical systems are designed. Incorporate these features where applicable. Take into account site attributes, including climate and local and regional context, which impact the design of the building.

### Compliance

#### *Step-By-Step Implementation*

#### **Step 1. Leverage Integrated Design and Integrated Planning**

- While working the Integrated Design and Planning requirements and within the context of the DD1391, incorporate as many passive and natural design strategies as are cost effective prior to incorporating the active and mechanical systems.
- Evaluate the local climate, site conditions, waste treatment infrastructure, energy load distribution, water sources, transportation options, and potential building features – understanding these aspects will help inform which sustainable strategies to employ on the project.

### Documentation Requirements

#### Design Submittal

#### Path One:

- For site and building attributes, highlight the documentation that demonstrates that the passive and natural design strategies and features were evaluated and incorporated where life cycle cost effective.

#### Path Two:

- Not applicable to project. Provide written justification for missed targets as relates to mission, location, LCCA, non-applicable to scope, or other reason specific to requirement.

## 2-2.1.3 Evaluation of the Site

### Requirements

Evaluation of the Site (2-2.1.3): During the site selection process, meet the requirements of UFC 2-100-01.

### ***Compliance***

#### *Step-By-Step Implementation*

#### **Step 1. Implement DD1391**

- Usually the evaluation and site selection has been addressed and incorporated into the DD1391. If this is not the case utilize UFC 2-100-01.

### ***Documentation Requirements***

#### Design Submittal

#### Path One:

- Copy of DD1391 and narrative regarding items implemented.

#### Path Two:

- Not applicable to project. Provide written justification for missed targets as relates to mission, location, LCCA, non-applicable to scope, or other reason specific to requirement.

## 2-2.1.4 Site Integration and Design of the Building

### **Requirements**

Site Integration and Design of the Building (2-2.1.4): During the planning and design process meet the requirements of applicable UFCs, and use the following site development considerations and passive strategies:

- Site design elements that ensure safe and convenient pedestrian access.
- Meet the requirements of UFC 3-201-02 (Landscape Architecture).
- Incorporate results of site analysis into the design of the building, focusing on orientation, configuration and massing.
- Orient building to maximize energy efficiency, passive solar and daylighting potential.
- Select, design and integrate into the overall building, high performance and sustainable systems (e.g. HVAC, plumbing, water heating systems, lighting systems, control systems, elevators, building envelope and fire protection systems).
- Promote opportunities for occupants to voluntarily increase physical activity.

### **Compliance**

#### *Step-By-Step Implementation*

#### **Step 1. Identify site characteristics**

- Determine which portions of the site have been previously developed, if any.
- Additionally, for each site that is under consideration, examine the following factors, enumerated in the requirements and summarized below:
  - Site factors that are conducive to the implementation of sustainable building strategies (e.g., opportunity for daylighting and passive energy efficiency measures)
  - Building orientation to maximize energy efficiency, passive solar and daylighting potential of the building
  - Site design elements that provide safe and convenient pedestrian access

#### **Step 2. Meet the Landscape Design Requirements from UFC 3-201-02**

- 1-4 Critical Design Requirements: The designer shall address the following critical design issues:
  - Planting and Irrigation Establishment Period
    - Typical time: 1-year warranty and maintenance
    - Periodic inspections: Establishment start, completion, and as directed by the designer.

### **Documentation Requirements**

#### Design Submittal

#### **Path One:**

- Narrative that addresses actions and/or considerations taken when selecting project site as it relates to the following:
  - How site design elements that ensure safe and convenient pedestrian access were considered and/or implemented

- How the project meets the requirements of UFC 3-201-02 (Landscape Architecture).
  - How the results of the site analysis were incorporated into design of the building, focusing on orientation, configuration and massing.
  - How the building orientation maximizes energy efficiency, passive solar and daylighting potential.
  - How high performance and sustainable systems (e.g. HVAC, plumbing, water heating systems, lighting systems, control systems, elevators, building envelope and fire protection systems) were selected, designed and integrated into the overall building.
  - Opportunities for occupants to voluntarily increase physical activity are promoted within the project.
- Narrative confirming details related to meeting the Landscape Design Requirements from UFC 3-201-02 1-4 Critical Design Requirements

#### Path Two:

- Demonstrate compliance with [LEED v2009 BD+C SSc1 Site selection](#)
  - Provide narrative confirming details related to meeting the Landscape Design Requirements from UFC 3-201-02 1-4 Critical Design Requirements
- OR**
- Demonstrate compliance with [LEED v4 BD+C SSc Site assessment](#)
  - Provide narrative confirming details related to meeting the Landscape Design Requirements from UFC 3-201-02 1-4 Critical Design Requirements

#### Path Three:

- Not applicable to project. Provide written justification for missed targets as relates to mission, location, LCCA, non-applicable to scope, or other reason specific to requirement.

## 2-2.2 Commissioning

### Requirements

To verify design and performance and ensure that the Government requirements are met, employ commissioning practices appropriate to the size and complexity of the building and its system components. This must include an experienced commissioning provider, who should be independent of the project design and construction team, and the operations team. The choice of either contracted services or Government personnel as the commissioning provider will be determined at project level.

Meet the requirements of ASHRAE 189.1 Section 10.3.1.2 (Building Project Commissioning), with the following modifications:

- For buildings and systems that are less complex<sup>6</sup>, commissioning can be tailored as determined by the DoD Component AHJ<sup>7</sup>.
- “Schematic design” is the design charrette or similar conceptual design activity. Documentation as described in ASHRAE 55 Section 6.2 is not required.

*Exception: For Medical Treatment Facilities, refer to UFC 4-510-01 Medical Military Facilities for commissioning requirements. /1/*

**Commissioning:** Per DOE Guidance 42 USC 8253(f), “The commissioning process ensures that all of the equipment and systems within a facility are currently operating and functioning properly and identifies items that need to be fixed or adjusted, typically in a low or no cost fashion.”

### Compliance

#### Step-By-Step Implementation

When working with the following guidance, for buildings and systems that are less complex (for Army projects, refer to Army policy for determination of systems to commission), commissioning can be tailored as determined by the DoD Component AHJ (for Air Force projects, the Project Delivery Team must determine the level of commissioning activities required.)

#### Step 1. Develop OPR and BOD

- For buildings and systems that are less complex, commissioning can be tailored as determined by the DoD Component AHJ<sup>3</sup>.
- The owner, with the help of the design team and other stakeholders, must develop the initial owner’s project requirements (OPR) in the predesign stage. This document establishes the owner’s goals and the building’s intended function and operation. Update the commissioning plan throughout the design and construction process.
- In the schematic design phase, the design team will create a basis of design (BOD) – the project team’s interpretation of the OPR – to provide clear technical guidance for the project. Update the BOD throughout the design and construction process.

<sup>6</sup> For Army projects, refer to Army policy for determination of systems to commission.

<sup>7</sup> For Air Force & Navy projects, the Project Delivery Team must determine the level of commissioning activities required.

## Step 2. Engage a commissioning authority with relevant experience

- “Provide a Commissioning Firm that is certified in commissioning by one of the following: the AABC Commissioning Group (ACG); the National Environmental Balancing Bureau (NEBB); the International Certification Board/Testing, Adjusting, and Balancing Bureau (ICB/TABB), the Building Commissioning Association (BCA); the Association of Energy Engineers (AEE). [The Commissioning Firm may employ a commissioning professional certified by the University of Wisconsin-Madison or the American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) as required in paragraph LEAD COMMISSIONING SPECIALIST as an alternative to certification of the Commissioning Firm.] The Commissioning Firm must be certified in all systems to be commissioned to the extent such certifications are available from the certifying body. Describe any lapses in certification or disciplinary action taken by the certifying body against the proposed Commissioning Firm or Lead Commissioning Specialist in detail. Any firm or commissioning professional that has been the subject of disciplinary action by the certifying body within the five years preceding contract award is not eligible to perform any duties related to commissioning. " UFGS-01 91 00.15 (May 2016)

## Step 3. Commission all required systems

- Work with the CxA to determine the systems that need to be commissioned for compliance with the OPR, and include the requirements in 189.1 and UFGS-01 91 00.15 (May 2016):

When included in the building project, the following systems must be commissioned:

- a. Heating, ventilating, air-conditioning, IAQ, and refrigeration systems (mechanical and/or passive) and associated controls. Control sequences to be verified for compliance with construction documentation as part of verification.
- b. Building envelope systems, components, and assemblies to verify the thermal and moisture integrity.
- c. Building envelope pressurization to confirm air-tightness if included in BOD requirements.
- d. Lighting systems.
- e. Fenestration control systems: Automatic controls for shading devices and dynamic glazing.
- f. Irrigation.
- g. Plumbing.
- h. Domestic and process water pumping and mixing systems.
- i. Service water heating systems.
- j. Renewable energy systems.
- k. Water measurement devices, as required in 189.1 Section 6.3.3.
- l. Energy measurement devices, as required in 189.1 Section 7.3.3.

## Step 4 CxA reviews OPR and BOD

- The review provides a third party, acting as an advocate for the owner, and to document that the BOD reflects the OPR and that both contain sufficient detail.
- Conduct first review during 35% / concept design, to allow the project team to make any necessary changes that emerge from the review.

### Step 5. Develop preliminary commissioning plan

- Outline the scope of commissioning, including systems to be commissioned. Include project roles and responsibilities, the commissioning team's project directory, and schedule of commissioning activities. Update the commissioning plan throughout the design and construction process.

### Step 6. Incorporate commissioning requirements into construction documents

- Incorporate commissioning requirements into construction documents per 189.1 and UFGS 01 91 00.15, Total Building Commissioning<sup>8</sup>

### Step 7. Confirm that the CxA reviews design documents

- Construction documents and project specifications must meet the requirements of the OPR and BOD, the CxA need to review and supply feedback on these documents twice:
  - At 50% design completion
  - Prior to hand-off to contractor

### Step 8. Develop construction checklists

- Construction checklists must be generated and completed for all equipment, assemblies, and systems included in the CxA scope. They provide confirmation that systems have been installed, started up, programmed, tested, and balanced, and that the team is ready to proceed with functional testing.
- The CxA, design team, or contractor must prepare the construction checklists. Generally, contractors are responsible for completing them and returning to the CxA.

### Step 9. Confirm that the CxA reviews submittals

- Verify that the CxA reviewed project submittals for construction quality control and specification conformance.

### Step 10. Conduct prefunctional inspections

- The CxA conducts site visits as determined and scheduled in Cx plan as indicated in the Cx plan to inspect the installation of individual systems and components. Site visits are an important opportunity to observe equipment installation and identify issues before a system becomes difficult to access or change.

### Step 11. Execute functional testing

- CxA to provide contractors and design engineers with the functional test scripts prior to testing to allow them the opportunity to review the scripts, verify proper operating mode, and comment on any modifications to match actual operation.
- CxA to perform functional performance testing once all system components are installed, energized, programmed, balanced, and otherwise ready for operation under part- and full-load conditions.

### Step 12. Verify operations training and documentation

- Verify operations training in accordance with the OPR. Include the owner, building engineer, and/or relevant staff in the commissioning testing execution.

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<sup>8</sup> <https://www.wbdg.org/ffc/dod/unified-facilities-guide-specifications-ufgs/ufgs-01-91-00-15>

- Review O&M documentation
- Confirm that a system manual has been developed and contains O&M documentation, warranty information, and provides future operating staff the information to understand and optimally operate the commissioned systems

### **Step 13. Conduct warranty period & after occupancy review**

- CxA reviews current building operation by 10 months warranty period to find any discrepancies between actual and design performance and identify any repairs.

### **Step 14. Complete final commissioning report**

- Ensure project design is in alignment with what was constructed and incorporate findings into final commissioning report.
- Once all systems testing is complete, the CxA will prepare a final commissioning report that covers all components of the commissioning process, including the following:
  - Executive summary of commissioning process and results, system deficiencies identified and resolution, and outstanding issues
  - Project directory
  - Cx process overview
  - Owner's project requirements
  - Basis of design
  - Submittals
  - Design review log
  - Cx specifications
  - List of systems commissioned
  - Installation verification checklists
  - Functional performance tests

## ***Documentation Requirements***

### **Construction Submittal**

#### **Path One:**

- CxA previous experience narrative
- Confirmation of OPR and BOD contents
- List of systems to be commissioned
- Verification of CxA activities and reviews
- Cx plan
- Documentation of testing and verification
- CFR, O&M plan
- Cx report

#### **Path Two:**

- Demonstrate compliance with [LEED v2009 BD+C EAp1 Fundamental commissioning of building energy systems](#)



- Provide CxA previous experience narrative
- Clarification that the following systems were included during the commissioning process: irrigation systems, building envelope, process water and meters

**OR**

- Demonstrate compliance with [LEED v4 BD+C EAp Fundamental commissioning and verification](#)
- Provide CxA previous experience narrative
- Clarification that the following systems were included during the commissioning process: irrigation systems, building envelope, process water and meters

#### Path Three:

- Not applicable to project. Provide written justification for missed targets as relates to mission, location, LCCA, non-applicable to scope, or other reason specific to requirement.

## 2-3. OPTIMIZE ENERGY PERFORMANCE

**Energy Modeling:** The process by which conceptual designs, including size, material choices, factors such as site, solar, and wind orientations, daylighting percentages, and energy system choices (solar water heat, underfloor vs. overhead air distribution systems) are analyzed to show how to optimize these factors for efficient building operation and resource consumption.

### 2-3.1.1 Energy Efficiency - Commercial and Multi-Family High-Rise Residential Buildings

#### Requirements

Meet the requirements of ASHRAE 90.1.

Design the building to achieve at least 30% energy consumption reduction from ASHRAE 90.1 baseline.

If a 30% reduction is not life-cycle cost-effective (LCCE<sup>9</sup>), modify the design of the proposed building to achieve an energy consumption level at the highest level of energy efficiency that is LCCE.

Determine energy consumption levels for both the ASHRAE Baseline Building and proposed building by using the Performance Rating Method found in appendix G of ASHRAE 90.1, except the formula for calculating the Performance Rating. Replace the formula in G1.2 with the following:

Percentage improvement =  $100 \times ((\text{Baseline building consumption} - \text{Receptacle and process loads}) - (\text{Proposed building consumption} - \text{Receptacle and process loads})) / (\text{Baseline building consumption} - \text{Receptacle and process loads})$ <sup>10</sup>

*Base energy efficiency design decisions on LCCA as indicated in Chapter 1 of this UFC. The LCCA includes a minimum of three energy efficient alternatives to the baseline standard (ASHRAE 90.1, IECC, etc.).*

**Commercial and Multi-Family High-Rise Residential Buildings:** All buildings, other than low-rise residential buildings.

#### Compliance

Step-By-Step Implementation:

**Step 1. Design the building to achieve at least 30% energy consumption reduction.**

<sup>9</sup> See Reference section at end of document for description and definition for LCCE and LCCA.

<sup>10</sup> Energy consumption for the purposes of calculating the 30 percent savings requirements in CFR Title 10 Part 433 §433.100 shall include the building envelope and energy consuming systems normally specified as part of the building design by ASHRAE 90.1 such as space heating, space cooling, ventilation, service water heating, and lighting, but shall not include receptacle and process loads not within the scope of ASHRAE 90.1 such as specialized medical or research equipment and equipment used in manufacturing processes.

- Utilize current version of ASHRAE Standard 90.1. “Design the building to achieve at least 30% energy consumption reduction from ASHRAE 90.1 baseline.”
- Follow all applicable guidance in the UFC 3-410-01 1 HEATING, VENTILATING, AND AIR CONDITIONING SYSTEMS, WITH CHANGE 3. Be sure to utilize the step by step instructions in the UFC 3-410-01 Appendix E: HVAC System Selection Flow Chart<sup>11</sup>
  - Image of Appendix E: HVAC System Selection Flow Chart include for reference only, utilize interactive source document.
  - Ensure that step 3, “Develop three energy-efficient solutions for each individual building energy system.” is completed
  - Use the following formula to calculate the percentage improvement =  $100 \times ((\text{Baseline building consumption} - \text{Receptacle and process loads}) - (\text{Proposed building consumption} - \text{Receptacle and process loads})) / (\text{Baseline building consumption} - \text{Receptacle and process loads})$ <sup>12</sup>
  - When evaluating energy usage in different scenarios, inspect strategies for lighting and daylighting, envelope, orientation, and passive conditioning and ventilating systems, in terms of projected energy savings and capital costs as they relate to all building systems
  - If a 30% reduction is not life-cycle cost-effective (LCCE<sup>13</sup>), modify the design of the proposed building to achieve an energy consumption level at the highest level of energy efficiency that is LCCE.
  - When working to determine the LCCA, utilize the NIST handbook 135 “Life-cycle cost Manual for the Federal Energy Management Program”<sup>4</sup> along with the “Annual Supplement to Handbook 135, Energy Price Indices and Discount Factors for Life-Cycle Cost Analysis”<sup>5</sup>.

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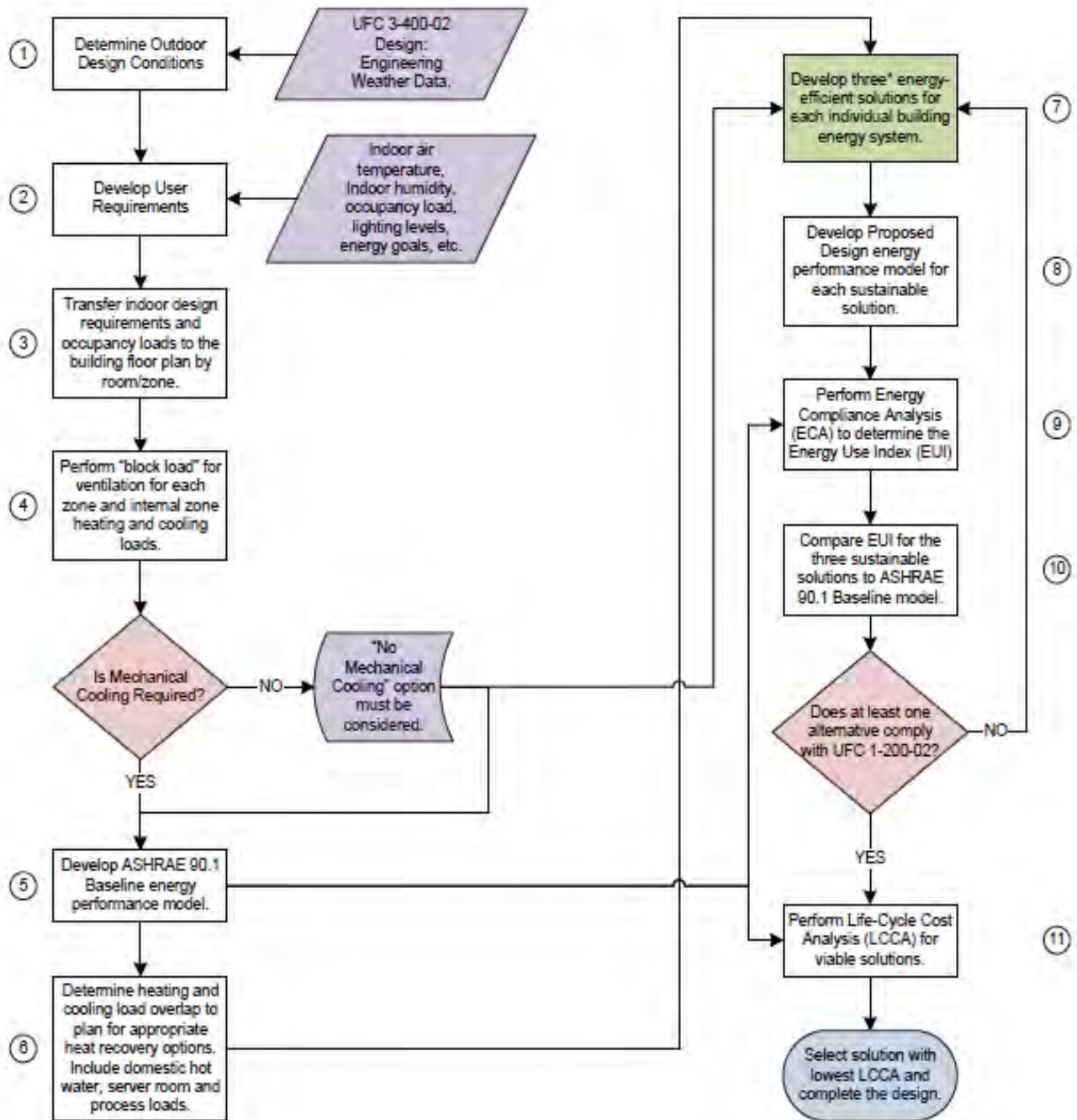
<sup>11</sup> UFC 3-410-01 1 HEATING, VENTILATING, AND AIR CONDITIONING SYSTEMS, WITH CHANGE 3  
<https://www.wbdg.org/ffc/dod/unified-facilities-criteria-ufc/ufc-3-410-01>

<sup>12</sup> Energy consumption for the purposes of calculating the 30 percent savings requirements in CFR Title 10 Part 433 §433.100 shall include the building envelope and energy consuming systems normally specified as part of the building design by ASHRAE 90.1 such as space heating, space cooling, ventilation, service water heating, and lighting, but shall not include receptacle and process loads not within the scope of ASHRAE 90.1 such as specialized medical or research equipment and equipment used in manufacturing processes.

<sup>13</sup> See Reference section at end of document for description and definition for LCCE and LCCA.

## APPENDIX E – HVAC SYSTEM SELECTION FLOW CHART

11



## ***Documentation Requirements***

### Design Submittal

#### Path One:

- If achieved target
  - Energy model
  - LCCA
  - Summary of how target was achieved, and the three energy-efficient solutions reviewed for each individual building energy system
- If target not achieved
  - Energy model
  - LCCA
  - Summary of why target was not achieved, and the three energy-efficient solutions reviewed for each individual building energy system
  - Narrative inclusive of; Energy reduction target; Energy standard utilized; Total design energy use intensity EUI in kBtu/sf/yr
  - Calculated energy use by type
  - List of energy end uses for the project building (for both the baseline case and the design case)
  - If the project is using a computer energy simulation, adhere to Appendix G of ASHRAE 90.1- (or equivalent local code) and retain the final report indicating the annual energy cost of the baseline and design cases
  - If the project is using the prescriptive compliance path, assemble documentation demonstrating that the project meets all applicable requirements
  - Energy Compliance Analysis (ECA) that identifies the specific energy conservation criteria that applies to the project, the software used to prepare the necessary calculations, a summary of all input to and output from the calculations, and the calculated baseline and as-designed building energy consumption of the proposed design

#### Path Two:

Not applicable to project. Provide written justification for missed targets as relates to mission, location, LCCA, non-applicable to scope, or other reason specific to requirement

## 2-3.1.2 Energy Efficiency - Low-Rise Residential Buildings

### Requirements

Meet the requirements of the International Energy Conservation Code (IECC).

Design the building to achieve at least 30% energy consumption reduction from the IECC baseline using the Simulated Performance Alternative found in Section 405 of the IECC.

If a 30% reduction is not LCCE, modify the design of the proposed building to achieve an energy consumption level at the highest level of energy efficiency that is LCCE.

**Low-Rise Residential Buildings:** All buildings three stories or less in height above grade that include sleeping accommodations where the occupants are primarily permanent in nature (30 days or more).

*Base energy efficiency design decisions on LCCA as indicated in Chapter 1 of this UFC. The LCCA includes a minimum of three energy efficient alternatives to the baseline standard (ASRHA 90.1, IECC, etc.).*

### Compliance

*Step-By-Step Implementation:*

#### Step 1. Design the building to achieve at least 30% energy consumption reduction

- Utilize current version of International Energy Conservation Code (IECC). “Design the building to achieve at least 30% energy consumption reduction from the IECC baseline using the Simulated Performance Alternative found in Section 405 of the IECC.”
- Follow all applicable guidance in the UFC 3-410-01 1 HEATING, VENTILATING, AND AIR CONDITIONING SYSTEMS, WITH CHANGE 3. Be sure to utilize the step by step instructions in the UFC 3-410-01 Appendix E: HVAC System Selection Flow Chart<sup>14</sup>,
  - Image of Appendix E: HVAC System Selection Flow Chart include for reference only, utilize interactive source document.
  - Ensure that step 3, “Develop three energy-efficient solutions for each individual building energy system.”
  - When evaluating energy usage in different scenarios, inspect strategies for lighting and daylighting, envelope, orientation, and passive conditioning and ventilating systems, in terms of projected energy savings and capital costs as they relate to all building systems
  - If a 30% reduction is not life-cycle cost-effective (LCCE<sup>15</sup>), modify the design of the proposed building to achieve an energy consumption level at the highest level of energy efficiency that is LCCE.
  - When working to determine the LCCA, utilize the NIST handbook 135 “Life-cycle cost Manual for the Federal Energy Management Program”<sup>4</sup> along with the “Annual Supplement to Handbook 135, Energy Price Indices and Discount Factors for Life-Cycle Cost Analysis”<sup>5</sup>.

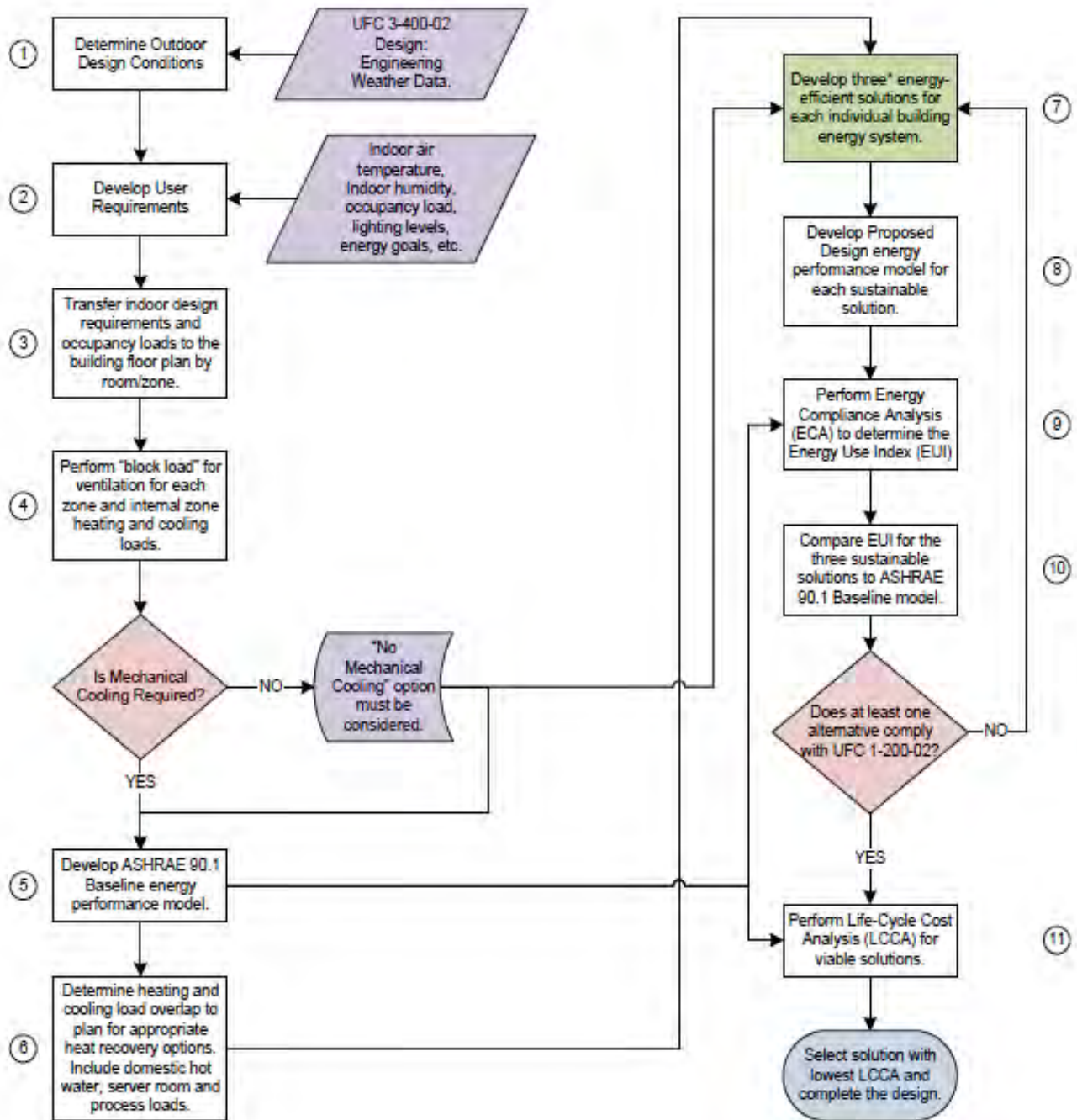
<sup>14</sup> UFC 3-410-01 1 HEATING, VENTILATING, AND AIR CONDITIONING SYSTEMS, WITH CHANGE 3  
<https://www.wbdg.org/ffc/dod/unified-facilities-criteria-ufc/ufc-3-410-01>

<sup>15</sup> See Reference section at end of document for description and definition for LCCE and LCCA.



## APPENDIX E – HVAC SYSTEM SELECTION FLOW CHART

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## ***Documentation Requirements***

### Design Submittal

#### Path One:

- If achieved target
  - Energy model
  - LCCA
  - Summary of how target was achieved, and the three energy-efficient solutions reviewed for each individual building energy system
- If target not achieved
  - Energy model
  - LCCA
  - Summary of why target was not achieved, and the three energy-efficient solutions reviewed for each individual building energy system
  - Narrative inclusive of; Energy reduction target; Energy standard utilized; Total design energy use intensity EUI in kBtu/sf/yr
  - Calculated energy use by type
  - List of energy end uses for the project building (for both the baseline case and the design case)
  - If the project is using the prescriptive compliance path, assemble documentation demonstrating that the project meets all applicable requirements
  - Energy Compliance Analysis (ECA) that identifies the specific energy conservation criteria that applies to the project, the software used to prepare the necessary calculations, a summary of all input to and output from the calculations, and the calculated baseline and as-designed building energy consumption of the proposed design

#### Path Two:

- Not applicable to project. Provide written justification for missed targets as relates to mission, location, LCCA, non-applicable to scope, or other reason specific to requirement.



## 2-3.1.3 Energy Efficiency - Renovations

### Requirements

Renovation projects that replace everything above the foundation must either apply 2-3.1.1 or 2-3.1.2 as applicable.

All other renovations choose one of the following options:

1. Reduce measured building energy use by at least 30%, below FY 2003 energy use baseline.
2. Reduce measured building energy use by at least 20% below FY 2015 energy use baseline.
3. Reduce modeled energy use (from all sources including renewable energy) by 20% compared to the ASRHAE 90.1 baseline building design.

If none of the reduction choices is life-cycle cost-effective, modify the design of the proposed building system(s) to achieve an energy consumption level at the highest level of energy efficiency that is life-cycle cost-effective.

*Base energy efficiency design decisions on LCCA as indicated in Chapter 1 of this UFC. The LCCA includes a minimum of three energy efficient alternatives to the baseline standard (ASRHAE 90.1, IECC, etc.).*

### Compliance

*Step-By-Step Implementation:*

#### Step 1. Determine if project is eligible for 2-3.1.3 Renovation requirement

- If the renovation project is replacing everything above the foundation, do not follow the 2-3.1.3 Energy Efficiency - Renovation requirements.
- Depending on project type follow the 2-3.1.2 Energy Efficiency - Low-Rise Residential Buildings or the 2-3.1.1 Energy Efficiency - Commercial and Multi-Family High-Rise Residential Buildings requirements.

#### Step 2. Choose one of the following methods to reduce measured building energy use:

- Reduce measured building energy use by at least 30%, below FY 2003 energy use baseline  
or
- Reduce measured building energy use by at least 20% below FY 2015 energy use baseline.  
or
- Reduce modeled energy use (from all sources including renewable energy) by 20% compared to the ASRHAE 90.1 baseline building design.

#### Step 3. Utilize the UFC 3-410-01 1

- Follow all applicable guidance in the UFC 3-410-01 1 HEATING, VENTILATING, AND AIR CONDITIONING SYSTEMS, WITH CHANGE 3. Be sure to utilize the step by step instructions in the UFC 3-410-01 Appendix E: HVAC System Selection Flow Chart<sup>16</sup>,

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<sup>16</sup> UFC 3-410-01 1 HEATING, VENTILATING, AND AIR CONDITIONING SYSTEMS, WITH CHANGE 3  
<https://www.wbdg.org/ffc/dod/unified-facilities-criteria-ufc/ufc-3-410-01>

- Image of Appendix E: HVAC System Selection Flow Chart include for reference only, utilize interactive source document.
- Ensure that step 3, “Develop three energy-efficient solutions for each individual building energy system.”
- Use the following formula to calculate the percentage improvement =  $100 \times ((\text{Baseline building consumption} - \text{Receptacle and process loads}) - (\text{Proposed building consumption} - \text{Receptacle and process loads})) / (\text{Baseline building consumption} - \text{Receptacle and process loads})$ <sup>17</sup>
- When evaluating energy usage in different scenarios, inspect strategies for lighting and daylighting, envelope, orientation, and passive conditioning and ventilating systems, in terms of projected energy savings and capital costs as they relate to all building systems
- If a 30% reduction is not life-cycle cost-effective (LCCE<sup>18</sup>), modify the design of the proposed building to achieve an energy consumption level at the highest level of energy efficiency that is LCCE.
- When working to determine the LCCA, utilize the NIST handbook 135 “Life-cycle cost Manual for the Federal Energy Management Program”<sup>4</sup> along with the “Annual Supplement to Handbook 135, Energy Price Indices and Discount Factors for Life-Cycle Cost Analysis”<sup>5</sup>.

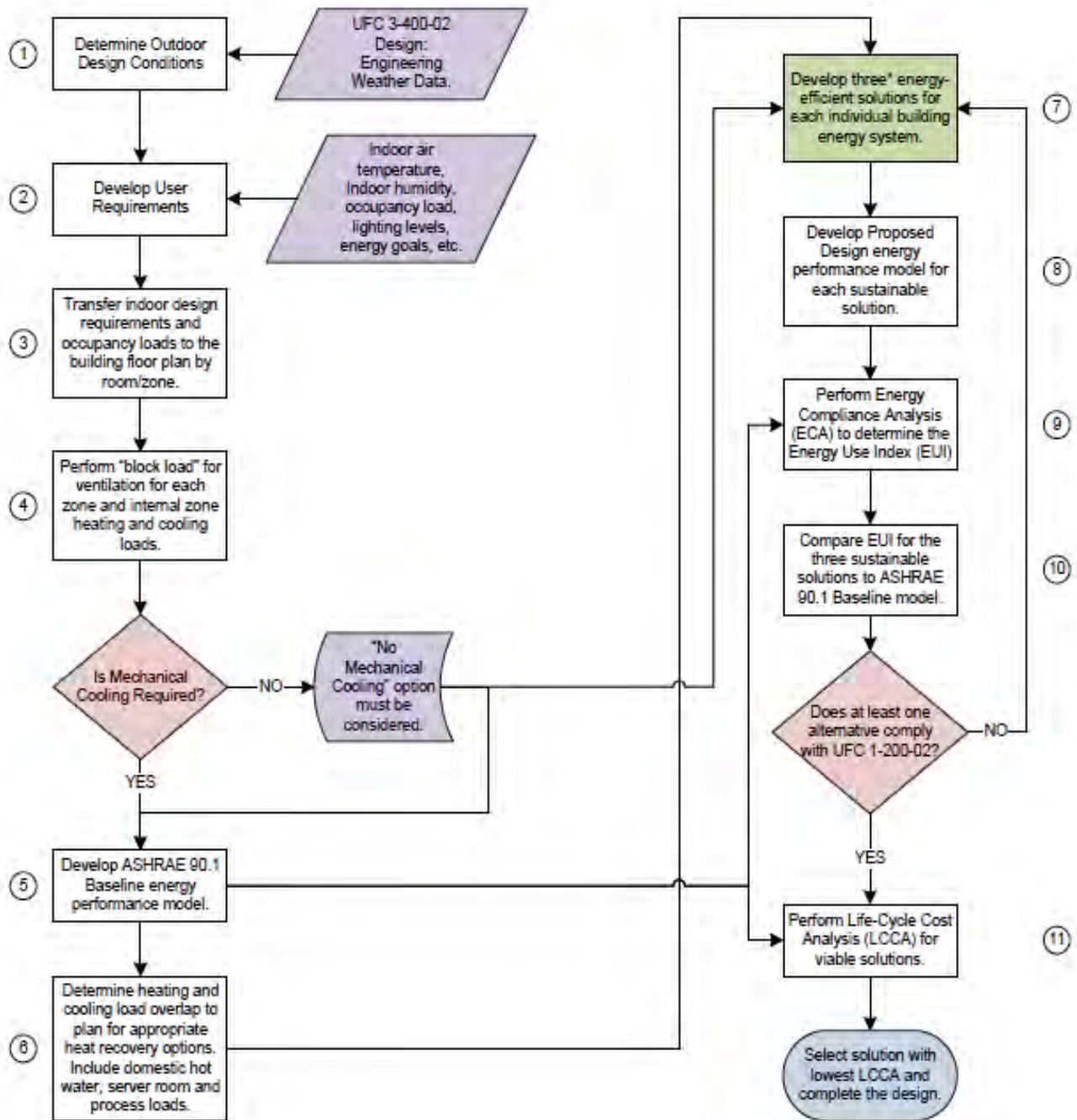
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<sup>17</sup> Energy consumption for the purposes of calculating the 30 percent savings requirements in CFR Title 10 Part 433 §433.100 shall include the building envelope and energy consuming systems normally specified as part of the building design by ASHRAE 90.1 such as space heating, space cooling, ventilation, service water heating, and lighting, but shall not include receptacle and process loads not within the scope of ASHRAE 90.1 such as specialized medical or research equipment and equipment used in manufacturing processes.

<sup>18</sup> See Reference section at end of document for description and definition for LCCE and LCCA.

## APPENDIX E – HVAC SYSTEM SELECTION FLOW CHART

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## ***Documentation Requirements***

### Design Submittal

#### Path One:

- If achieved target
  - Energy model
  - LCCA
  - Summary of how target was achieved, and the three energy-efficient solutions reviewed for each individual building energy system
- If target not achieved
  - Energy model
  - LCCA
  - Summary of why target was not achieved, and the three energy-efficient solutions reviewed for each individual building energy system
  - Narrative inclusive of; Energy reduction target; Energy standard utilized; Total design energy use intensity EUI in kBtu/sf/yr
  - Calculated energy use by type
  - List of energy end uses for the project building (for both the baseline case and the design case)
  - If the project is using the prescriptive compliance path, assemble documentation demonstrating that the project meets all applicable requirements
  - Energy Compliance Analysis (ECA) that identifies the specific energy conservation criteria that applies to the project, the software used to prepare the necessary calculations, a summary of all input to and output from the calculations, and the calculated baseline and as-designed building energy consumption of the proposed design

#### Path Two:

- Not applicable to project. Provide written justification for missed targets as relates to mission, location, LCCA, non-applicable to scope, or other reason specific to requirement.

## 2-3.1.4 Energy Efficient Products

### Requirements

Per EISA 2007 Section 525, acquire products that are ENERGY STAR®-qualified or meet FEMP-designated efficiency requirements in all covered product categories. Select products based on life cycle cost, not initial cost. Link to EPA sites: <http://www.energystar.gov/> or <https://energy.gov/eere/femp/federal-energy-management-program>

### Compliance

#### *Step-By-Step Implementation*

#### **Step 1. Specify energy efficient products in construction documents when applicable and part of project scope**

**Review project documents to verify that all applicable ENERGY STAR, FEMP-designated energy efficient products, and products meeting other energy efficiency requirements have been called out in the construction specifications.**

- Document any required product substitutions.

#### **Step 2. Perform construction submittal reviews to verify implementation**

- During construction, coordinate a review of the construction submittals to verify that energy efficient products as specified were purchased and installed

### Documentation Requirements

#### Construction Submittal

##### *Path One:*

- List of ENERGY STAR and FEMP – designated Energy Efficient Products where applicable
- Narrative regarding exclusions or substitutions

##### *Path Two:*

- Not applicable to project. Provide written justification for missed targets as relates to mission, location, LCCA, non-applicable to scope, or other reason specific to requirement.

## 2-3.1.5 Standby Powered Devices

### Requirements

Per EISA 2007 Section 524, provide commercially available, off-the-shelf products that use no more than 1 watt in their standby mode.

### Compliance

#### *Step-By-Step Implementation*

#### **Step 1. Specify devices in accordance with EISA 2007 Section 524**

- In the construction documents specify commercially available, off-the-shelf products that use no more than 1 watt in their standby mode according to EISA 2007 Section 524 when applicable.

#### **Step 2. Perform construction submittal reviews to verify implementation**

- During construction, coordinate a review of the construction submittals to verify products as specified were purchased and installed

### Documentation Requirements

#### Construction Submittal

#### Path One:

- Narrative with confirmation that specified and installed products will use no more than 1 watt in their standby mode

#### Path Two:

- Not applicable to project. Provide written justification for missed targets as relates to mission, location, LCCA, non-applicable to scope, or other reason specific to requirement.

## 2-3.2 On-Site Renewable Energy

### Requirements

Provide on-site renewable energy systems in accordance with ASHRAE 189.1 Section 7.4.1.1 (On-Site Renewable Energy Systems) and UFC 3-440-01 where LCCE, considering climate, infrastructure condition, mission compatibility, and effects on base wide electrical system (grid) power quality. When available, utilize Installation-specific studies to determine LCCE renewable energy systems. Studies must be dated within five years of project design start. /1/ Exception: Do not use purchase of renewable energy certificates (RECs) as a substitute for the Section 7.4.1.1 new building requirement.

- For Army projects, if not life-cycle cost effective, utilize ASHRAE 189.1 Section 7.3.2 (On-Site Renewable Energy Systems) for future installation of on-site renewable energy systems.
- Navy and Air Force will utilize an installation-level solution to renewable energy systems and will not require ASHRAE 189.1 Section 7.3.2 if a building-level solution is not LCCE.
- Components may choose centralized renewable energy development in lieu of building by building application. Meet the requirements of UFC 3-540-08.

### Compliance

#### Step-By-Step Implementation

#### Step 1. Research opportunities for renewables

- Determine the feasibility of renewable systems, where LCCE, given the project site's climate, context, mission, and infrastructure. Analyze the features of the site, such as solar availability (greater than 1.2 kBtu/ft<sup>2</sup>/day or 4.0 kWh/m<sup>2</sup>/day), wind patterns, and other renewable energy sources, and any seasonal or daily variations in supply. If regional feasibility analysis, conducted within the last 3-5 years, is available and applicable teams can utilize to inform LCCE decisions.
- According to EPCA 2005, Section 203, qualifying renewable technologies include solar, wind, biomass, landfill gas, ocean (including tidal, wave, current, and thermal), geothermal, municipal solid waste, or hydroelectric energy generation if it is from new generation capacity achieved from increased efficiency or addition of new capacity at an existing hydroelectric site.
- Follow guidance for designing and installing facility-scale renewable energy systems in the UFC 3-440-01 FACILITY-SCALE RENEWABLE ENERGY SYSTEMS<sup>19</sup>.
- FEMP supported resources to support research:
  - FEMP Screening maps  
<https://maps.nrel.gov/femp/#/?aL=0&bL=groad&cE=0&lR=0&mC=40.21244%2C-91.625976&zL=4>
  - NREL develops an array of maps to support renewable energy development and generation projects: <https://www.nrel.gov/gis/maps.html>
  - PV Solar Resources of the United States:  
[https://www.nrel.gov/gis/images/eere\\_pv/national\\_photovoltaic\\_2012-01.jpg](https://www.nrel.gov/gis/images/eere_pv/national_photovoltaic_2012-01.jpg)

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<sup>19</sup> UFC 3-440-01 FACILITY-SCALE RENEWABLE ENERGY SYSTEMS <https://www.wbdg.org/ffc/dod/unified-facilities-criteria-ufc/ufc-3-440-01>



### Step 2. Conduct LCCE cost analysis

- Determine the projected energy demand and cost for the project.
- Conduct LCCE cost analysis for renewable systems. “When available, utilize Installation-specific studies to determine LCCE renewable energy systems. Studies must be dated within five years of project design start.”

### Step 3. Set a renewable energy target

- Use the environmental goals of the project, and results of the LCCE analysis work, as defined in the OPR and integrated design process to inform the establishment of a renewable energy target for the project beyond the minimum requirements of ASRHAE 189.1, 7.4.1.1.
- Calculate the renewable energy requirement as per ASHRAE 189.1 Section 7.4.1.1:
  - For single-story buildings: Renewable energy required = 6.0 kBtu/ft<sup>2</sup> (20 kWh/m<sup>2</sup>) \* Total roof area
  - For all other buildings: Renewable energy required = 10.0 kBtu/ft<sup>2</sup> (32 kWh/m<sup>2</sup>) \* Total roof area

### Step 4. Compare renewable energy technology requirements

- Given the target renewable energy generation, carefully evaluate the space requirements, upfront and maintenance costs, and efficiencies for each renewable technology under review.

### Step 4. Design and specify system criteria

- For technologies that are determined life-cycle cost effective, design and specify requirements for their implementation.
- Many resources are available, some for no or little cost, for planning and designing a renewable energy system. Given basic information for the project, many manufacturers can complete the necessary calculations for the project team. Teams will also find software tools that help in sizing.
- Review and implement the IEEE 1547 requirements for the renewable systems-grid interface.

## Documentation Requirements

### Design Submittal

#### Path One:

- Relevant excerpt of the design or construction documents showing onsite renewable energy generation project or demonstrating installation of the renewable energy generation project
- Renewable system rated capacity
- Calculations to determine energy generated
- LCCA report if installed renewable energy elements or projects were not lifecycle cost effective

#### Path Two:

- Demonstrate compliance with [LEED v2009 BD+C EAc2 On-site renewable energy](#), minimum of 1 point
- OR
- Demonstrate compliance with [LEED v4 BD+C EAc Renewable energy production](#), minimum of 1 point and must include renewable energy generated on-site





Path Three:

- Not applicable to project. Provide written justification for missed targets as relates to mission, location, LCCA, non-applicable to scope, or other reason specific to requirement.

## 2-3.2.1 Solar Domestic Hot Water (SDHW)

### Requirements

Per EISA 2007 Section 523, meet at least 30% of the annual domestic hot water requirement through the installation of solar water heating unless SDHW is not Life-Cycle Cost Effective (LCCE).

### Compliance

#### Step-By-Step Implementation

#### Step 1. Conduct LCCE cost analysis

- Determine the projected hot water demand for the project.
- Research energy cost for heating water.
- The following link will take you to the FEMP solar hot water calculator a tool that may be utilized to estimate what size solar system will work best and how much it will cost:  
[http://apps1.eere.energy.gov/femp/solar\\_hotwater\\_system/](http://apps1.eere.energy.gov/femp/solar_hotwater_system/). Additional information:  
<https://energy.gov/energysaver/estimating-cost-and-energy-efficiency-solar-water-heater>

#### Step 2. Determine if including SDHW system

- Determine LCCE calculations for providing 30% of hot water demand through the installation of solar hot water heaters
- Generate report with results of the SDHW LCCE analysis

#### Step 3. If LCCE determines SDHW is cost effective

- If LCCE is cost effective, include the solar domestic hot water heater in design documents.

#### Step 4. If LCCE determines SDHW is not cost effective

- If LCCE is not cost effective, do not include solar domestic hot water heater in project design.

### Documentation Requirements

#### Design Submittal

#### Path One:

- For LCCE cost effective project, copies of relevant excerpts of the design or construction documents showing solar water heating system, and calculations that demonstrate minimum of 30% hot water demand will be met
  - Report with results of the LCCE analysis
- OR**
- Report with results of the LCCE analysis, the lifecycle calculations demonstrating that providing 30% of hot water demand through the installation of solar hot water heaters is not cost effective

#### Path Two:

- Not applicable to project. Provide written justification for missed targets as relates to mission, location, LCCA, non-applicable to scope, or other reason specific to requirement.

## 2-3.4 Metering

### Requirements

A utility meter must be installed at each building, for each utility serving the building (steam, electricity, and natural gas) in the standard units of the measure. Where base wide energy and utility monitoring and control systems exist, meters must be connected using the installation's advanced metering protocols. The installation of meters is required per DODI 4170.11, and as amended by DOD *Utilities Meter Policy*, 16 April 2013. Meter configuration must comply with requirements of UFC 4-010-06.

A utility meter must be installed at each building, for each utility serving the building (e.g. district steam, district hot and chilled water, electricity, natural gas, fuel oil, etc.) in the standard units of the measure (i.e. kWh, kW, cf, gallons, etc.). Meters must be connected to a base wide energy and utility monitoring and control system (if installed) using the installation's advanced metering protocols. The installation of meters is required per DODI 4170.11, (Installation Energy Management) and as amended by DOD *Utilities Meter Policy*, 16 April 2013.

### Compliance

#### *Step-By-Step Implementation*

#### **Step 1. Review relevant DOD metering policies**

- Review and follow guidance included in the DoD *Utilities Meter Policy*, 16 April 2013 and UFGS 26 27 13.10 30 Electricity Meters<sup>20</sup>, UFGS 26 27 14.00 20 Electricity Meters and Accessories<sup>21</sup> and UFGS 33 51 13.00 30 Natural-Gas Metering<sup>22</sup>.

#### **Step 2. Identify all energy sources that serve the building**

- Identify all sources of energy delivered to the building. Sources of energy that must be metered include: steam, electricity, and natural gas

#### **Step 3. Determine number, type, and location of all meters**

- Utilize the Overarching metering policy: Office of the Under Secretary of Defense (OSD) *Utilities Meter Policy*<sup>23</sup> to implement the following as applicable:
  - If the project uses multiple sources of energy, verify meter is designed to read all sources.
  - If the project shares utility meters with other buildings or includes energy sources that are not metered by the supplier, install submeters that will provide monthly data.
  - If a base wide energy and utility monitoring and control system is in place connect meters using the installation's advanced metering protocols

<sup>20</sup> <https://www.wbdg.org/ffc/dod/unified-facilities-guide-specifications-ufgs/ufgs-26-27-13-10-30>

<sup>21</sup> <https://www.wbdg.org/ffc/dod/unified-facilities-guide-specifications-ufgs/ufgs-26-27-14-00-20>

<sup>22</sup> <https://www.wbdg.org/ffc/dod/unified-facilities-guide-specifications-ufgs/ufgs-33-51-13-00-30>

<sup>23</sup> <http://www.denix.osd.mil/references/dod/policy-guidance/16-apr-13-odusd-policy-memo-on-utilities-metering-policy/>

## Documentation Requirements

### Design Submittal

#### Path One:

- Location of all meters
- Systems metered
- Confirmation that meters are connected to a base wide energy and utility monitoring and control system using the installation's advanced metering protocols, if applicable
- Confirmation that all applicable policies have been met.

#### Path Two:

- Demonstrate compliance with [LEED v4 BD+C EAp Building-level energy metering](#) (except do not share metered data, per DOD Waiver<sup>24</sup>)
- Confirmation that meters are connected to a base wide energy and utility monitoring and control system using the installation's advanced metering protocols, if applicable
- Confirmation that all applicable policies have been met.

#### Path Three:

- Requirement is not applicable to project (already installed or separate contract in progress)
- Not applicable to project. Provide written justification for missed targets as relates to mission, location, LCCA, non-applicable to scope, or other reason specific to requirement.

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<sup>24</sup> [https://www.wbdg.org/FFC/NAVFAC/dod\\_waiver\\_leed\\_wep\\_eap.pdf](https://www.wbdg.org/FFC/NAVFAC/dod_waiver_leed_wep_eap.pdf)

## 2-4. PROTECT AND CONSERVE WATER

Base water efficiency design decisions on life-cycle cost as indicated in Chapter 1 of this UFC.

### 2-4.1 Indoor Water

#### Requirements

Meet the requirements of ASHRAE 189.1 Section 6.3.2 (Building Water User Reduction) which incorporates EPA WaterSense-labeled products. Water closet replacements in major renovations may have a flush value of up to 1.6 GPF (6.1 LPF) to accommodate existing plumbing infrastructure.

Fixtures used for sanitizing potential biohazards are exempt from low-flow and WaterSense labeling requirements.

Meet the requirements of ASHRAE 189.1 Section 6.4.2 (Building Water Use Reduction).

Meet the requirements of ASHRAE 189.1 Section 6.4.3 (Special Water Features).

#### Compliance

##### Step-By-Step Implementation

##### Step 1. Specify high-efficiency fixtures

- For all product categories included in Table 1 below, specify and install fixtures that comply with the maximum water uses listed in the second column of the table.
- WaterSense-labeled products contribute toward meeting efficiency requirements. Where possible, use WaterSense-labeled products,
- When included in the project scope, clothes washers and dishwashers must meet the current program requirements of ENERGY STAR (as per ASHRAE 189.1 Section 6.3.2.2).

Table 1

Fixture	Maximum Water Use (as per ASHRAE 189.1 Section 6.3.2.1)	EPA WaterSense Standards
Water closet (toilet) (includes single flush, dual flush, and tank-type)	1.28 GPF (4.8 LPF)*	1.28 GPF
Urinal	0.5 GPF (1.9 LPF)	0.5 GPF
Public lavatory faucet	0.5 GPM (1.9 LPM) at 60 psi	
Public metering self-closing faucet	0.25 gal per metering cycle (1.0 L per metering cycle)	
Residential bathroom lavatory sink faucet	1.5 GPM (5.7 LPM) at 60 psi	1.5 GPM at 60 psi
Residential kitchen faucet	2.2 GPM (8.3 LPM) at 60 psi	

Residential showerhead or shower compartment	2.0 GPM (7.6 LPM) at 80 psi**	2.0 GPM at 80 psi
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\* Maximum Water Use for renovations is 1.6 GPF (6.1 LPF)

\*\* Where the area of a shower compartment exceeds 2600 in<sup>2</sup> (1.7 m<sup>2</sup>), an additional flow of 2.0 GPM (7.6 LPM) shall be permitted for each multiple of 2600 in<sup>2</sup> (1.7 m<sup>2</sup>) of floor area or fraction thereof.

## Step 2. Compile documentation

- Compile fixture cut sheets or manufacturers' information for all fixtures and appliances. The fixture data must highlight the flush or flow rates and the water factor or evidence of ENERGY STAR label for appliances. A plumbing fixture schedule is acceptable, provided it includes information on the manufacturer and model for each fixture, flush or flow rate, and water factor for appliances.

## Documentation Requirements

### Design Submittal

#### Path One:

- Manufacturers' data showing the water consumption rates, manufacturer, and model of each fixture and fitting, cutsheets or fixture schedules
- The fixture documentation must highlight the flush or flow rates and the water factor or evidence of ENERGY STAR label for appliances. A plumbing fixture schedule is acceptable, provided it includes information on the manufacturer and model for each fixture, flush or flow rate, and water factor for appliances.

#### Path Two:

- Demonstrate compliance with [LEED v4 BD+C WEp Indoor water use reduction](#) Compliance Path 1 Prescriptive Achievement

#### Path Three:

- Not applicable to project. Provide written justification for missed targets as relates to mission, location, LCCA, non-applicable to scope, or other reason specific to requirement.

## 2-4.1.1 Indoor Water Metering

### Requirements

Install advanced water meters to monitor building indoor potable water consumption as required by DoD Utilities Meter Policy, 16 April 2013. Meter configuration must comply with requirements of UFC 4-010-06.

### Compliance

#### *Step-By-Step Implementation*

#### **Step 1. Review relevant DOD metering policy**

- Review and follow guidance included in the DoD Utilities Meter Policy, 16 April 2013 and UFGS 33 12 33.00 30 Water Meters<sup>25</sup>

#### **Step 2. Identify all potable water end uses**

- Determine all end uses of potable water in the project building and on the grounds. These could include water consumption for plumbing fixtures, cooling towers and evaporative condensers, laundering, dishwashing, indoor and outdoor features, irrigation, exterior cleaning, and manufacturing processes. Examples of potable water sources to meter include the following:
  - Public water supply
  - On-site well
  - On-site potable water treatment system

#### **Step 3. Determine number, type, and location of all meters**

- If the project is not served by a public water supply, or if the project uses multiple sources of potable water, additional meters will be required. A single meter installed downstream of multiple potable water supply systems must be used if it is upstream of all project water uses.
- Project teams must elect to use multiple meters to gain additional information on water use. Determine metering subsystems that consume the most water, are the most expensive to operate, or most closely align with the goals of the building management.
- Select locations with easy access for reading and maintenance.

### **Documentation Requirements**

#### Design Submittal

#### **Path One:**

- Provide excerpt of design drawing highlighting the location for the project indoor potable water meter

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<sup>25</sup> <https://www.wbdg.org/ffc/dod/unified-facilities-guide-specifications-ufgs/ufgs-33-12-33-00-30>

Path Two:

- Demonstrate compliance with [LEED v4 BD+C WEp Building-level water metering](https://www.wbdg.org/FFC/NAVFAC/dod_waiver_leed_wep_eap.pdf) (except do not share metered data, per DOD Waiver [https://www.wbdg.org/FFC/NAVFAC/dod\\_waiver\\_leed\\_wep\\_eap.pdf](https://www.wbdg.org/FFC/NAVFAC/dod_waiver_leed_wep_eap.pdf))

Path Three:

- Not applicable to project. Provide written justification for missed targets as relates to mission, location, LCCA, non-applicable to scope, or other reason specific to requirement.



## 2-4.2.1 Outdoor Water - Landscaping

### Requirements

In accordance with DOD Memo “Water Use for Landscape Architecture on Department of Defense Installations/Sites”, potable water use is prohibited for irrigating new landscaping, other than for plant establishment.

For existing systems, if a building has a single water meter, reduce combined indoor and outdoor potable water use by at least 20% compared to building water use in 2007. Compare results to a baseline building, using the EPA WaterSense landscape water budget tool version 1.01 or later, or a Component approved tool.

Show preference for irrigation contractors who are certified through a WaterSense labeled program, or other industry-recognized credentialing programs.

Refer to UFC 3-201-02 for additional requirements.

### Compliance

**Step-By-Step Implementation – for projects with permanent irrigation system (no system means compliant, select Path 3)**

#### **Step 1. Follow guidance as outlined in the Memo dated March 10, 2017 “Water Use for Landscape Architecture on Department of Defense Installations/Sites”**

- Prohibit potable water use to irrigate new landscaping other than for plant establishment;
- Apply drought resistant, water smart, and/or Xeriscaping landscape architectural design to all new and updated landscape architecture;
- Prohibit ornamental or potable water features in new landscape design;
- Phase out ornamental or potable water features in older landscape designs. Water features listed in the National Register of Historic Places are exempt;
- Assess irrigated turf grass areas and install non-water intensive native vegetation where reasonable;
- Assess existing landscape irrigation systems for leaks and system inefficiencies, and consider replacing, upgrading, or converting to an alternative water source when reasonable;
- Make water conservation for golf courses a priority, and use alternative water in lieu of potable water if sources are available

#### **Step 2. Engage a qualified landscape designer**

- Use the UFC-3-201-02 to determine if required to engage a qualified landscape designer.
- The landscape professional will be responsible for safety, sustainability, accessibility, and cost effectiveness of the project site, along with compliance with the Outdoor Water guiding principle requirements.

### Documentation Requirements

Design Submittal

#### Path One:

- Site plan showing vegetated areas
- Narrative for plant species and water requirements
- Site plan showing location and size of landscape zones
- Water Budget Tool calculations and report that demonstrates reduction of outdoor potable water consumption by at least 50%

#### Path Two:

- Demonstrate compliance with [LEED v4 BD+C WEp Outdoor water use reduction](#)
- [LEED v4 BD+C WEc Outdoor water use reduction](#) minimum 2 points

#### Path Three:

- Not applicable to project. Provide written justification for missed targets as relates to mission, location, LCCA, non-applicable to scope, or other reason specific to requirement.

## 2-4.2 Outdoor Water Meter

### Requirements

For existing irrigation system using potable water and serving more than 25,000 square feet of landscape, provide water meters, when life-cycle cost-effective. Install advanced water meters to monitor outdoor potable water consumption, as required by DOD *Utilities Meter Policy*, 16 April 2013. Meter configuration must comply with requirements of UFC 4-010-06.

For all other existing irrigation systems using potable water, meters are encouraged.

### Compliance

#### Step-By-Step Implementation

#### Step 1. Determine if project has 25,000 SF of landscaping or more

- If the project has more than 25,000 SF of landscaping install water meter if life-cycle cost effective.
- Install advanced water meters to monitor outdoor potable water consumption, as required by DOD *Utilities Meter Policy*, 16 April 2013. Meter configuration must comply with requirements of UFC 4-010-06.
- For all other existing irrigation systems using potable water, meters are encouraged.

### Documentation Requirements

#### Design Submittal

#### Path One:

- Location of all meters
- Meter ownership
- Systems metered

#### Path Two:

- Demonstrate compliance with [LEED v4 BD+C WEp Building-level water metering](#)

#### Path Three:

- Not applicable to project. Provide written justification for missed targets as relates to mission, location, LCCA, non-applicable to scope

## 2-4.3 Alternative Water

### Requirements

Outdoor Water - Alternative Water: Where life-cycle is cost-effective and permitted by local laws and regulations, use alternative water sources.

**1\Alternate Water Sources:** Non-potable water from sources such as harvested rainwater (refer to UFC 3-210-10), treated wastewater, air handler condensate capture, grey water, or reclaimed water. The use of alternate water sources must comply with applicable codes and standards. /1/

### Compliance

#### Step-By-Step Implementation

#### Step 1. Determine if applicable to project

- No permanent irrigation system means Compliant.

#### Step 2. Use alternative water sources

- Evaluate opportunities for alternate water sources and implement the use of alternative water sources where life-cycle cost effective.
- Alternative water sources include but are not limited to: reclaimed wastewater, graywater, swimming pool backwash filter, refrigeration system condensate, captured rainwater, stormwater and foundation drain water, steam system condensate, fluid cooler discharge, food steamer discharge, combination oven discharge, industrial process water, fire pump test water, municipally supplied treated wastewater, and ice machine condensate.

### Documentation Requirements

#### Design Submittal

#### Path One:

- Alternative water source and controls calculations if applicable

#### Path Two:

- Not applicable to project. Provide written justification for missed targets as relates to mission, location, LCCA, non-applicable to scope, or other reason specific to requirement.

## 2-4.3.1 Stormwater Management

### Requirements

Meet the requirements of UFC 3-210-10 (Low impact development)

### Compliance

#### Step-By-Step Implementation

#### Step 1. Meet all low impact development requirements

- Utilize UFC 3-210-10<sup>26</sup>, Low impact development, meet all conditions that apply to project
- Document strategies implemented and percent change in runoff volume achieved.

### Documentation Requirements

Design Submittal

#### Path One:

Report inclusive of the following:

- Runoff volume calculations
  - Results of percent change in runoff volume (increase or decrease)
  - Rainfall data
  - Rainfall events calculator or calculations for the chosen percentile storm
- LID features implemented to reduce run off
  - Vegetative roofs, bioretention, infiltration trenches, re-vegetation, quantity of reduced impervious area, cisterns, permeable pavers, roof leader disconnection, dry wells, porous concrete, soil amendments, grass buffers, rain barrels, tree boxes, grass swales, rain gardens, tree preservation, etc.
- If the run off volume was increased relevant technical constraints
  - Non-potable water demand (i.e., irrigation, toilets, and wash-water) is too small to warrant water; harvesting and reuse system; retaining stormwater on-site would adversely impact receiving water flows; site has shallow bedrock; site has contaminated soils; site has high groundwater table; site has underground facilities or utilities; site is too small to infiltrate significant volume; soil infiltration capacity is limited; state or local regulations restrict water harvesting; state or local regulations restrict use of green infrastructure or lid; structural, plumbing, and other modifications to existing building to manage stormwater are infeasible; etc.

#### Path Two:

- Demonstrate compliance with [LEED BD+C 2009 SSc6.1 Stormwater design - quantity control](#)  
**OR**
- Demonstrate compliance with [LEED v4 BD+C WEc Rainwater management](#)

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<sup>26</sup> <https://www.wbdg.org/ffc/dod/unified-facilities-criteria-ufc/ufc-3-210-10>

- [LEED v4 BD+C SSp Construction activity pollution prevention](#)

Path Three:

- Not applicable to project. Provide written justification for missed targets as relates to mission, location, LCCA, non-applicable to scope, or other reason specific to requirement.

## 2-5. ENHANCE INDOOR ENVIRONMENTAL QUALITY

### 2-5.1 Part 1 Ventilation

#### Requirements

Comply with UFC 3-410-01 for ventilation criteria. Consider the use of passive (non-mechanical) thermal comfort methods as described in paragraph entitled, “Integrated Design” in this UFC.

Exception: For Medical Treatment Facilities, refer to UFC 4-510-01 Medical Military Facilities for ventilation and thermal comfort criteria

#### Compliance

##### *Step-By-Step Implementation*

#### Step 1. Evaluate project site characteristics

- Investigate local outdoor air quality at the project location. Use the results of this analysis to inform ventilation strategy selection and system design. For example, natural ventilation will not be appropriate in high-pollution areas, where outdoor air requires significant filtration. Outdoor air quality can affect mechanical equipment filtration specifications.
- Determine whether the project is a candidate for natural conditioning. Understand the climate by season, including temperature, humidity, and air quality, to determine optimal times of the year for natural conditioning.
- Determine if project is a medical treatment facility, if so see the UFC 4-510-01 Design: Medical Military Facilities<sup>27</sup> for ventilation criteria. Work directly with GBCI to determine compliance path and Documentation Requirements.

#### Step 2. Select ventilation strategy

- Utilized the current version of the HEATING, VENTILATING, AND AIR CONDITIONING SYSTEMS UFC 3-410-01<sup>28</sup> to select ventilation strategy
- Determine whether mechanical ventilation, natural ventilation, or a mixed-mode approach is appropriate for the project.
- Review how the building’s form, location, orientation, programming and depth of the floor plate can create opportunities for low-energy, high-quality natural ventilation or mixed-mode systems.
- Utilized the UFC 3-410-01 to determine if mechanical ventilation systems are required in addition to natural ventilation, unless specific exceptions are met.

#### Step 3. Select conditioning system

- Identify program areas that could be designed to accommodate cross or stack ventilation and review ways they could be organized to create microclimates and to expand annual hours of natural conditioning.

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<sup>27</sup> UFC 4-510-01 Design: Medical Military Facilities <http://www.wbdg.org/ffc/dod/unified-facilities-criteria-ufc/ufc-4-510-01>

<sup>28</sup> UFC 3-410-01. HEATING, VENTILATING, AND AIR CONDITIONING SYSTEMS <http://www.wbdg.org/ffc/dod/unified-facilities-criteria-ufc/ufc-3-410-01>

#### Step 4. Categorize spaces

- In accordance with UFC 3-410-01 create a table of all rooms and spaces in the project and identify the following for each:
  - Ventilation strategy
  - Net occupiable space
  - Occupancy category
  - Design occupancy
- It must be appropriate to group rooms or spaces into ventilation zones.

#### Step 5. For mechanically ventilated spaces, calculate required airflow in accordance with UFC 3-410-01

- Identify the following basic mechanical system features, which will affect the calculation of outdoor air required:
  - Single-zone, 100% outdoor air, or multiple-zone systems
  - Underfloor, overhead, or side air distribution and location of return grilles
  - Supply air temperature: cooling only or heating and cooling
  - Variable air volume (VAV) or constant volume (CV) supply
- Determine the minimum amount of outdoor air that must be supplied by each ventilation system. If applicable to project the Minimum Indoor Air Quality Performance Calculator available for download here <http://www.usgbc.org/resources/minimum-indoor-air-quality-performance-calculator>, can be used for projects to demonstrate compliance. This calculator accommodates all ventilation types (multiple zone, single-zone, 100% outside air) in one spreadsheet.
- Complete a separate ventilation rate procedure calculation for each ventilation system. Verify that the appropriate calculation method is selected.
  - Account for all occupied spaces and perform ventilation rate procedure calculations for worst-case conditions.
  - As applicable, evaluate and document assumptions for all variables.

#### Step 6. For naturally ventilated spaces, determine required design

- Collect the following information for each naturally ventilated space and add to the table of rooms and spaces:
  - Minimum ceiling height
  - Location of natural ventilation openings (on one side, two opposite sides, or two adjacent sides)
  - Size of the natural ventilation openings (openable area)
- Follow guidance in UFC 3-410-01 to determine the size of openings required in each space and the maximum distance from the openings that can be reviewed as naturally ventilated.

#### Step 7. Evaluate ventilation design against UFC 3-410-01 requirements

- If the UFC 3-410-01 mechanical or natural ventilation procedures indicate that the preliminary design does not provide enough outdoor air to meet the standard, revise the design and recalculate the minimum amount of outdoor air to confirm compliance.
- Verify that the project will have appropriate filters installed to remove particulate matter and ozone.



### Step 8. Airflow monitoring

- Implement airflow monitoring for project as specified by the UFC 3-410-01 Heating, Ventilating, and Air Conditioning Systems

### Documentation Requirements

#### Design Submittal

#### Path One:

- Provide a narrative of summary analysis showing compliance with the ventilation requirements as specified by UFC 3-410-01 Heating, Ventilating, and Air Conditioning Systems
  - Summarize operational procedures for building system. The analysis narrative must document a summary of all factors considered when making design choices regarding IAQ, including alternative ventilation solutions considered and reasons for the selection of the solution chosen. The analysis must also include a room-by-room breakdown of the anticipated or actual number of occupants, the amount of ventilation air required, and any applicable adjustments such as multiple spaces factor, intermittent or variable occupancy factor, the ventilation effectiveness factor, and any other factors such as high relative humidity
- Document the mechanical designer's basis of design; include design assumptions, including diversity considerations, and HVAC load calculations.
- Documentation (e.g. design plans, lists) of all registers and terminal units that includes the type and flow, or radiant value. Additionally, include any elements that significantly affect thermal comfort, indication of spaces outside comfort-controlled areas, and locations of all occupant-adjustable controls.

#### Path Two:

- Demonstrate compliance with [LEED v2009 BD+C EQp1 Minimum indoor air quality performance](#) when in accordance with the UFC 3-410-01
- OR
- Demonstrate compliance with [LEED v4 BD+C EQp Minimum indoor air quality performance](#) when in accordance with the UFC 3-410-01

#### Path Three:

- Not applicable to project. Provide written justification for missed targets as relates to mission, location, LCCA, non-applicable to scope, or other reason specific to requirement.

## 2-5.1 Part 2 Thermal Comfort

### Requirements

Comply with UFC 3-410-01 for thermal comfort criteria. Consider the use of passive (non-mechanical) thermal comfort methods as described in paragraph entitled, “Integrated Design” in this UFC.

Exception: For Medical Treatment Facilities, refer to UFC 4-510-01 Medical Military Facilities for ventilation and thermal comfort criteria

### Compliance

#### *Step-By-Step Implementation*

#### **Step 1. Evaluate project site characteristics**

- Investigate local outdoor air quality at the project location. Use the results of this analysis to inform decisions made in designing for thermal comfort.
- Determine whether the project is a candidate for natural conditioning. Understand the climate by season, including temperature, humidity, and air quality, to determine optimal times of the year for natural conditioning.
- Determine project is a medical treatment facility, if so see the UFC 4-510-01 Design: Medical Military Facilities<sup>29</sup> thermal comfort criteria. Work directly with GBCI to determine compliance path and Documentation Requirements.

#### **Step 2. Design to meet UFC 3-410-01 Heating, Ventilating, and Air Conditioning Systems**

- Utilize current version of UFC 3-410-01 Heating, Ventilating, and Air Conditioning Systems to design systems.
- Based on the thermal comfort goals of the project and opportunities/challenges presented by the project site, determine the best system conditioning approach.
- Determine the best thermal comfort controls for the conditioning system(s) selected, based on the type of the project and occupants’ activities.

#### **Step 3. Conduct a thermal comfort analysis**

- Select the appropriate methodology from UFC 3-410-01 and perform a thermal comfort analysis as described in the guidance.
- This analysis will be an iterative process in which thermal comfort conditions are revised or refined to meet UFC 3-410-01 requirements.

#### **Step 4. Design project’s conditioning systems**

- Based on the results of the thermal comfort analysis, design the project’s conditioning systems to provide the acceptable comfort conditions.
- UFC 3-410-01 requires the design to be within the acceptable comfort range at all combinations of conditions that are expected to occur, including variations in internal loads and the exterior environment, and at both full- and partial-load condition.

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<sup>29</sup> UFC 4-510-01 Design: Medical Military Facilities <http://www.wbdg.org/ffc/dod/unified-facilities-criteria-ufc/ufc-4-510-01>

## Documentation Requirements

### Design Submittal

#### Path One:

- Provide a narrative of summary analysis showing compliance with the thermal comfort requirements as specified by UFC 3-410-01 Heating, Ventilating, and Air Conditioning Systems. As applicable include the following:
  - Description of weather data used to determine operative temperatures, relative humidity, outdoor temperatures
  - Plots or calculation results verifying that design parameters meet the UFC 3-410-01
  - Document the owner's project requirements and intended comfort criteria for the building and state assumptions regarding activity level and occupant clothing.
  - Summarize operational procedures for building systems, including building controls and other environmental control systems and general information, regarding seasonal set point recommendations.
  - Document the mechanical designer's basis of design; include design assumptions, including diversity considerations, and HVAC load calculations.
  - Include any elements that significantly affect thermal comfort, indication of spaces outside comfort-controlled areas, and locations of occupant-adjustable controls.

#### Path Two:

- Demonstrate compliance with [LEED v2009 BD+C EQc7.1 Thermal comfort - design](#) when in accordance with the UFC 3-410-01
- OR**
- Demonstrate compliance with [LEED v4 BD+C EQc Thermal comfort](#) when in accordance with the UFC 3-410-01

#### Path Three:

- Not applicable to project. Provide written justification for missed targets as relates to mission, location, LCCA, non-applicable to scope, or other reason specific to requirement.

## 2-5.2 Daylighting and Lighting Controls.

### Requirements

Locate all regularly occupied spaces, such as classrooms and offices, on exterior walls or other locations where it is feasible to provide daylighting. Meet the requirements of ASHRAE 189.1 Section 8.4.1.2 (Minimum Sidelighting effective Aperture for Office Spaces and Classrooms) or Section 8.5.1.2 (Usable Daylight Illuminance in Office Spaces and Classrooms). Provide automated lighting controls in accordance with UFC 3-530-01.

Exception: For Medical Treatment Facilities, refer to UFC 4-510-01 Medical Military Facilities for additional daylighting criteria.

### Compliance

#### *Step-By-Step Implementation*

#### **Step 1. Establish design criteria**

- During predesign, work with the project owner to understand lighting and daylighting goals. Specify daylighting criteria in the owner's project requirements (OPR).

#### **Step 2. Examine site and massing**

- During schematic design, determine how to best orient the building to allow for passive solar strategies, and provide ways to improve daylight penetration and distribution.
- Use building orientation to minimize direct beam sunlight, for example, by putting the long axis of the building facing directly north and south. North- and south-facing windows provide the most consistent levels of light throughout the day.
- Be sure to weigh the effects of envelope design on energy efficiency. Review incorporating exterior shading to minimize solar heat gains and glare while admitting daylight, especially on the south side of the building.

#### **Step 3. Design to meet ASHRAE 189.1 Section 8.4.1.2**

- Meet requirements for ASHRAE 189.1 Section 8.4.1.2 Minimum Sidelighting Effective Aperture for Office Spaces and Classrooms.
- Meet minimum sidelighting effective aperture for all façades,
- Follow guidance for any opaque interior surfaces in daylight areas shall have
- See exceptions for spaces with tasks that requires dark conditions, daylight areas where the height of existing adjacent structures above the window is at least twice the distance between the window and the adjacent structures, measured from the top of the glazing.

#### **Step 4. Design to meet ASHRAE 189.1 Section 8.5.1.2**

- Meet requirements for ASHRAE 189.1 Section 8.5.1.2 Usable Daylight Illuminance in Office Spaces and Classrooms.
- Design such that the physical or computer model for the building project shall demonstrate that the required area has a calculated daylight illuminance as specified.
- The simulation need not include storage racks or internal obstructions other than walls and permanent partitions.

- Computer models shall use daylight simulation software based on the ray-tracing or radiosity methodology.
- Simulation and normalized physical model results shall be based on external daylight illuminance using either the CIE Overcast Sky Model or the CIE Clear Sky Model for the location of the project.
- See exceptions for spaces with tasks that requires dark conditions, daylight areas where the height of existing adjacent structures above the window is at least twice the distance between the window and the adjacent structures, measured from the top of the glazing.

## **Documentation Requirements**

### Design Submittal

#### Path One:

- Develop documentation—such as floor plans, sections, and elevations—showing the glare control methods used on the project.
- Maintain documentation—such as floor plans, sections, and elevations—showing the location of regularly occupied spaces with a qualifying amount of daylight.
- To account for changes in design, develop a spreadsheet documenting the daylight factors outlined in the Calculations section.
- If using daylight simulation, update the computer model as the design progresses

#### Path Two:

- Demonstrate compliance with [LEED v2009 BD+C EQc8.1 Daylight and views – daylight](#)  
*If and/or when in alignment requirements for ASHRAE 189.1 Section 8.4.1.2 Minimum Sidelighting Effective Aperture for Office Spaces and Classrooms and Section 8.5.1.2 Usable Daylight Illuminance in Office Spaces and Classrooms*  
**OR**
- Demonstrate compliance with [LEED v4 BD+C EQc Daylight](#), minimum of 2 points and/or 75% of regularly occupied areas  
*If and/or when in alignment requirements for ASHRAE 189.1 Section 8.4.1.2 Minimum Sidelighting Effective Aperture for Office Spaces and Classrooms and Section 8.5.1.2 Usable Daylight Illuminance in Office Spaces and Classrooms.*

#### Path Three:

- Not applicable to project. Provide written justification for missed targets as relates to mission, location, LCCA, non-applicable to scope, or other reason specific to requirement.

## 2-5.3.1 Indoor Air Quality - Moisture Control

### Requirements

Establish and implement a moisture control strategy for controlling moisture flows and condensation to prevent building damage, minimize mold contamination, and reduce health risks related to moisture. Meet the requirements of ASHRAE 189.1 Section 10.3.1.5 (Moisture Control) by including and implementing these requirements in the IAQ construction management plan; UFC 3-410-01, Chapter 3, Sections 3-2 and 3-3 (Ventilation Air); and UFC 3-101-01 Chapter 3 (Building Envelope Requirements). Refer to Appendix B “Protect Indoor Air Quality” for best practices.

### Compliance

#### *Step-By-Step Implementation*

#### **Step 1. Implement ventilation air design strategies that minimize moisture**

- Utilize the UFC 3-410-01<sup>30</sup>, Chapter 3, Sections 3-2 and 3-3 (Ventilation Air) section to determine requirements for:
  - addressing moisture control with dedicated outdoor air system (DOAS)
  - energy recovery devices
  - DOAS unit system controls & monitoring requirements

#### **Step 2. Design building envelope to meet requirements**

- Review the building envelope requirements contained in the UFC 3-101-01<sup>31</sup> Chapter 3, Building Envelope Requirements and incorporate these into the building design for the following:
  - CONTINUITY OF BARRIERS
  - FENESTRATION
  - INSULATION
  - MOISTURE BARRIER
  - AIR BARRIER REQUIREMENTS
  - ACOUSTICS - OUTSIDE TO INSIDE NOISE CONTROL

#### **Step 3. Protect materials during construction**

- Meet the requirements of ASHRAE 189.1 Section 10.3.1.5 (Moisture Control)
  - The following items to control moisture shall be implemented during construction:
    - a. Materials stored on-site or materials installed that are absorptive shall be protected from moisture damage.
    - b. Building construction materials that show visual evidence of biological growth due to the presence of moisture shall not be installed on the building project.

### Documentation Requirements

Construction Submittal

<sup>30</sup> <https://www.wbdg.org/ffc/dod/unified-facilities-criteria-ufc/ufc-3-101-01>

<sup>31</sup> <https://www.wbdg.org/ffc/dod/unified-facilities-criteria-ufc/ufc-3-101-01>

Path One:

- Narrative detailing how steps 1 through 3 within the compliance section above have been completed
- Moisture control plan documentation

Path Two:

- Not applicable to project. Provide written justification for missed targets as relates to mission, location, LCCA, non-applicable to scope, or other reason specific to requirement.

## 2-5.3.2 Reduce Volatile Organic Compounds (VOC) Low-Emitting Materials

### Requirements

Specify materials and products with low or no pollutant emissions, including composite wood products, adhesives, sealants, interior paints and finishes, carpet systems, and furnishings. Meeting the requirements of ASHRAE 189.1 Sections 8.4.2 (Prescriptive Option: Materials).

Exception: Exclude compliance with 8.4.2, first sentence

### Compliance

#### *Step-By-Step Implementation*

#### **Step 1. Conduct background**

- Review ASHRAE 189.1 Section 8.4.2 Prescriptive Option: Materials to understand requirements for low-emitting materials applicable to all composite wood, adhesives, sealants, interior paints and finishes, carpet systems, ceilings, wall systems, hard surface flooring and furnishings used on the project will meet the category-specific emissions and content thresholds enumerated in this section where feasible.

#### **Step 2. Specify low- or non-emitting materials and products**

- Utilize TABLE 3-1 Volatile Organic Compounds (VOC) (Low Emitting Materials) Requirements in UFGS 01 33 29<sup>32</sup> for minimum material specification requirements (For NAVY-ONLY FOR DESIGN-BUILD: UFGS 01 33 29.05 20<sup>33</sup>;
- Review project documents to identify all applicable products and specify them as low- or non-emitting.
- Specify any documentation needed by the design team to verify compliance, such as material safety data sheets (MSDS), third-party certificates, or test reports from subcontractors.

#### **Step 3. Perform construction submittal reviews to verify implementation**

- During construction, coordinate a review of the construction submittals to demonstrate that selected products meet the thresholds listed in the specifications.
- Any product substitutions must be carefully reviewed by the design team and contractor for compliance.
- Because meeting these requirements is not typical for all construction teams and suppliers, conducting a preconstruction meeting to review material and product needs in detail and stress their importance will aid in successful procurement.

### **Documentation Requirements**

Construction Submittal

<sup>32</sup> [http://www.wbdg.org/FFC/DOD/UFGS/UFGS\\_01\\_33\\_29.pdf](http://www.wbdg.org/FFC/DOD/UFGS/UFGS_01_33_29.pdf)

<sup>33</sup> [http://www.wbdg.org/FFC/NAVFAC/NDBM/UFGS/01\\_33\\_29.05\\_20.pdf](http://www.wbdg.org/FFC/NAVFAC/NDBM/UFGS/01_33_29.05_20.pdf)



#### Path One:

- Specifications demonstrating that products with low pollutant emissions are installed in the project for composite wood products, adhesives, sealants, interior paints and finishes carpet systems
- Product information (e.g., MSDS, third-party certifications, testing reports)

#### Path Two:

*While using the TABLE 3-1 Volatile Organic Compounds (VOC) (Low Emitting Materials) Requirements in UFGS 01 33 29<sup>34</sup> for minimum material specification requirements (For NAVY-ONLY FOR DESIGN-BUILD: UFGS 01 33 29.05 20<sup>35</sup>) demonstrate compliance with:*

- [LEED v2009 BD+C: NC EQ4.1 Low-emitting materials - adhesives and sealants](#)
- [LEED v2009 BD+C: NC EQ 4.2 - Low emitting materials - paints and coatings](#)
- [LEED v2009 BD+C: NC EQ4.3 Low-emitting materials - flooring system](#)
- [LEED BD+C: NC EQ4.4 Low -emitting materials - composite wood and agrifiber products](#)
- [LEED v2009 BD+C: Schools EQ4.5 Low-emitting materials - furniture and furnishings](#)
- [LEED BD+C: Schools EQ 4.6 Low-emitting materials - wall systems](#)

#### OR

*While using the TABLE 3-1 Volatile Organic Compounds (VOC) (Low Emitting Materials) Requirements in UFGS 01 33 29 for minimum material specification requirements (For NAVY-ONLY FOR DESIGN-BUILD: UFGS 01 33 29.05 20), demonstrate compliance with:*

- [LEED v4 BD+C EQc Low-emitting materials](#), Option 2 Budget Calculation Method

#### Path Three:

- Not applicable to project. Provide written justification for missed targets as relates to mission, location, LCCA, non-applicable to scope, or other reason specific to requirement.

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<sup>34</sup> [http://www.wbdg.org/FFC/DOD/UFGS/UFGS\\_01\\_33\\_29.pdf](http://www.wbdg.org/FFC/DOD/UFGS/UFGS_01_33_29.pdf)

<sup>35</sup> [http://www.wbdg.org/FFC/NAVFAC/NDBM/UFGS/01\\_33\\_29.05\\_20.pdf](http://www.wbdg.org/FFC/NAVFAC/NDBM/UFGS/01_33_29.05_20.pdf)

## 2-5.3.3 Protect Indoor Air Quality during Construction

### Requirements

For new construction and for renovation of unoccupied existing buildings, develop and implement an IAQ construction management plan that complies with ASHRAE 189.1 Section 10.3.1.4 (Indoor Air Quality (IAQ) Construction Management), with maximum outdoor air consistent with achieving relative humidity no greater than 60%.

For renovation of occupied existing buildings, comply with ANSI/SMACNA 008-2008, 2nd Edition, *SMACNA IAQ Guidelines for Occupied Buildings Under Construction*. Refer to Appendix B “Protect Indoor Air Quality” for best practices.

### Compliance

*Step-By-Step Implementation for New Construction/Renovation Unoccupied*

#### **Step 1. Manage indoor air quality post-construction, conduct flush-out or baseline indoor air quality testing**

##### ***For projects conducting a flush-out***

- Develop and implement an IAQ construction management plan to, after construction ends, prior to occupancy and with all interior finishes installed, conduct a postconstruction, preoccupancy building flush-out as described under Section 10.3.1.4(b)(1) steps include but are not limited to the following:
  - Determine the supply airflow rate to be used for the flush-out. Maintain relative humidity below 60%.
  - Refer to ASHRAE 189.1 Section 10.3.1.4, Equation 10.3.1.4 to calculate the total outdoor air quantity required.
  - Note that the minimum rate at which outdoor air must be supplied, per ASHRAE 189.1 Section 10.3.1.4, depends on whether the flush-out is being conducted pre- or post-occupancy.
  - Prior to beginning the flush-out or air quality testing, make sure that the following steps have been taken:
    - All finishes, furniture, and furnishing have been installed.
    - Filters and controls are in place and operating.

##### ***For projects conducting baseline indoor air quality testing***

- Develop and implement an IAQ construction management plan to, after construction ends, prior to occupancy and with all interior finishes installed, conduct a postconstruction, preoccupancy baseline IAQ monitoring as described under Section 10.3.1.4(b)(2) shall be performed steps include but are not limited to the following:
  - Prior to testing, operate the ventilation system within 10% of the design outdoor airflow rate for at least 24 hours.
  - Follow the testing protocol enumerated by USEPA Compendium of Methods for the Determination of Toxic Organic Pollutants in Ambient Air, TO-1, TO-11, TO-17 and ASTM Standard Method D 5197.

- Evaluate pollutant concentrations against the maximum allowable concentrations listed in ASHRAE 189.1 Table 10.3.1.4. When one or more pollutants exceed the maximum allowed, conduct additional flush-out with outdoor air and retest until the requirements are met.

### *Step-By-Step Implementation for Occupied*

#### **Step 1. Integrate indoor air quality control measures into project drawings and specifications**

- For renovation of occupied existing buildings, comply with ANSI/SMACNA 008-2008, 2nd Edition, SMACNA IAQ Guidelines for Occupied Buildings Under Construction, steps include but are not limited to the following:
  - Examine how the SMACNA requirements and guidelines affect design decisions, including finishes such as paints and coatings (e.g., it is best to install low-emitting materials). While SMACNA compliance is required only for occupied existing buildings undergoing a renovation, all buildings must review how and where indoor air quality control measures can be incorporated into the project design. The guidelines relevant to this guiding principle include:
    - HVAC protection
    - Source control
    - Pathway interruption
    - Housekeeping
    - Scheduling
  - Incorporate any indoor air quality requirements into the project specifications. For example, specify that air handlers and ducts be delivered to the site prewrapped in plastic to avoid having to protect equipment after delivery.
  - Review the indoor air quality guidelines in detail with all pertinent members of the design and construction team, specifically, the construction manager, general contractor, and mechanical subcontractor(s).

#### **Step 2. Develop indoor air quality plan**

- Before construction begins, as determined in Step 1 develop an IAQ management plan. The IAQ plan is typically prepared by the general contractor or construction manager. It includes IAQ management practices implemented during construction and preoccupancy phases and describes how indoor air quality requirements and guidelines will be addressed and managed on the job site, including but not limited to the following:
  - Establish a plan for keeping air conveyance materials protected and covered on the construction site.
  - Specify that permanent HVAC systems will not be operated during construction, except when start up or testing requires.

#### **Step 3. Implement indoor air quality plan**

- The IAQ management plan must be in place before starting above-ground construction, storing materials on site, or roughing in mechanical systems.
- The following best practices support successful implementation of the plan:

- Identify key players and designate someone responsible for implementing the plan, such as the HVAC installer and/or the general contractor. Make sure that they understand the requirements of the plan and help champion its goals.
- Include the IAQ management plan requirements in contract agreements with subcontractors.
- As subcontractors are selected and deployed on site, familiarize them with the plan and how it will affect their daily activities. Hold a subcontractors' orientation meeting to review the plan requirements as a group.
- Include construction IAQ progress check-ins as a regular item in weekly subcontractor and safety meetings.
- Provide a copy of the plan on site, preferably posted in an accessible area. Translate the plan into the languages spoken by subcontractors and their crews.
- General contractors, construction managers, and owners must verify that the IAQ management plan is being followed on job walks, ideally daily, so that issues can be addressed with subcontractors as necessary. Creating a checklist of major items for easy reference is often effective.

## Documentation Requirements

### Construction Submittal

#### Path One:

- Written construction IAQ management plan for use during demolition and construction.
- Detailed photo log of the construction IAQ management plan practices followed during construction.
- Maintain a written construction IAQ management plan.
- For projects completing a flush-out procedure, record dates, occupancy, outdoor air delivery rates, internal temperature, and humidity, as well as any special considerations.
- For projects conducting baseline indoor air quality testing provide a copy of the report

#### Path Two:

- Demonstrate compliance with [LEED v2009 BD+C IEQc3.1 Construction IAQ management plan - during construction](#)
- [LEED v2009 BD+C IEQc3.2 Construction IAQ management plan - before occupancy](#)
- OR
- Demonstrate compliance with [LEED v4 BD+C EQc Construction indoor air quality management plan](#)
- [LEED v4 BD+C EQc Indoor air quality assessment](#)

#### Path Three:

Not applicable to project. Provide written justification for missed targets as relates to mission, location, LCCA, non-applicable to scope, or other reason specific to requirement.

### 2-5.3.4 Environmental Tobacco Smoke Control.

Prohibit smoking\* within the building and within a minimum of 50 feet (15.24 meters) of all building entrances, operable windows, and building ventilation intakes. Verify if more stringent facility criteria or Installation policy applies.

\* Refer to Service-specific policies:

Army: [http://www.army.mil/usapa/epubs/pdf/r600\\_63.pdf](http://www.army.mil/usapa/epubs/pdf/r600_63.pdf)

Navy: <https://doni.daps.dla.mil/Directives/05000%20General%20Management%20Security%20and%20Safety%20Services/05-100%20Safety%20and%20Occupational%20Health%20Services/5100.13E.pdf>

Air Force: [http://static.e-publishing.af.mil/production/1/af\\_sg/publication/afi40-102/afi40-102.pdf](http://static.e-publishing.af.mil/production/1/af_sg/publication/afi40-102/afi40-102.pdf)

The environment tobacco smoke control requirement is not reviewed by GBCI as this requirement is covered by general DOD policy.

## 2-5.4 Occupant Health and Wellness

### Requirements

Promote opportunities for occupants to voluntarily increase physical activity, as part of the Integrated Design Process.

### Compliance

#### Step-By-Step Implementation

##### Step 1. Occupant Health & Wellness and Integrated Design

- During the Integrated Design and Charrette Process discuss options for Occupant Health & Wellness
- Following are occupant health and wellness strategies to consider:

#### Circulation strategies to consider:

- Design stairwells as desirable option for circulation to support active occupants
- Include at least one primary staircase that enables occupants to travel between the building entrance floor(s), occupant's own destination floor and common use floors. Access to floors may be restricted by use of security devices, such as card keys, codes or other access devices.
- For primary staircase(s):
  - Classify all regularly occupied floors for re-entry, allowing all building users to have access to and from these floors. Service floors do not need access for all users.
  - Make accessible staircases visible from the corridor by providing one of the following:
    - transparent glazing at stair doors or at a side light
    - magnetic door holds on all doors leading to the stairs
    - unenclosed stairs
  - Locate a main staircase to be visible from main building lobby and within 25-foot (7.5 meters) walking distance from any edge of the lobby. Ensure that no turns or obstacles prevent visibility of or accessibility to the qualifying staircase from the lobby.
  - Locate a main staircase to be visible before an occupant visually encounters any motorized vertical circulation (elevator/escalator). The staircase must be visible from the principal point of entry at each building floor.
  - Install architectural light fixtures that provide a level of lighting in the staircase(s) consistent with or better than what is provided in the building corridor.
  - Provide daylighting at each floor/roof level of the stair(s) using either windows and/or skylights of at least 8 square feet (1 square meter) in size.
- Place signage encouraging stair use for health and other benefits at all elevator call areas, next to escalators and outside stairwells on each floor.
- Use inviting sensory stimulation such as artwork and/or music in stairwells.

#### Active workstations for consideration:

- Provide exercise equipment or exercise opportunities for at least 5% of FTE occupants that can be used at employee workstations to allow workers opportunities for physical activity while working at their desks. Examples of appropriate exercise equipment include but are not limited to tread-desks, desk stationary bicycles, exercise ball chairs, desk stepper and others. A checkout system can be put in place to allow employees to check out equipment.

#### **Fitness center strategies for consideration:**

- Provide a dedicated or multi-use space to act as an on-site exercise room, which includes a variety of exercise equipment, for use by at least 5% of FTE occupants.

#### **Options for bicycle commuter facilities:**

- Identify bicycle network and eligible destinations
- Select bike-friendly project location
- Gather occupant count information
- Determine number of bicycle storage spaces required
- Determine number of shower and changing facilities required
- Install bicycle storage
- Ensure safe access to school buildings
- Institute programs to support bicycling use

#### **Strategies that support occupant health:**

- Considering options such as providing convenient access to
  - healthy dining options
  - ensure project provides access to potable water, conduct periodic water quality testing & filter systems as needed
  - plants

### ***Documentation Requirements***

#### **Design Submittal**

##### **Path One:**

- Copy of the section of the charrette report of that addresses consideration of these requirements
- Narrative regarding if the Occupant Health and Wellness elements were incorporated into project design and if which ones.

##### **Path Two:**

- Demonstrate compliance with one of the following LEED credits at a minimum:
  - [LEED v2009 SSc.4.2 Alternative transportation – bicycle storage and changing rooms](#)
  - [LEEDv4 BD+C LTc Bicycle facilities](#)
  - [LEEDv4 BD+C Innovation credit - Walkable project site](#)
  - [LEEDv4 BD+C Innovation credit - Design for active occupants](#)

Path Three:

- Not applicable to project. Provide written justification for missed targets as relates to mission, location, LCCA, non-applicable to scope, or other reason specific to requirement.



## 2-6. REDUCE ENVIRONMENTAL IMPACT OF MATERIALS

### 2-6.1 Environmentally Preferable Products

The following requirements require procurement of construction materials and building supplies that have a lesser or reduced effect on human health and the environment over their lifecycle, when compared with competing products or services that serve the same purpose.

**Environmentally Preferable Products:** Products or services having a lesser or reduced effect on human health and the environment when compared with competing products or services serving the same purpose. This comparison may consider raw materials acquisition, production, manufacturing, packaging, distribution, reuse, operation, maintenance, or product or service disposal.

#### 2-6.1.1 Recycled Content

##### Requirements

Use RCRA Section 6002, compliant products that meet or exceed EPA's recycled content recommendations, available on EPA's Comprehensive Procurement Guideline web site at <https://www.epa.gov/smm/comprehensive-procurement-guideline-cpg-program>

##### Compliance

##### *Step-By-Step Implementation*

##### Step 1. Conduct background research

- Postconsumer recycled content is derived from materials that can no longer be used for their original purpose, and preconsumer recycled content consists of raw material diverted from the waste stream during the manufacturing process. Although the use of both types of recycled content is encouraged, postconsumer recycled content is more highly valued environmentally because of its increased environmental benefit over the life cycle of the product.
- Review project documents to identify all applicable products.
- Review the EPA's Comprehensive Procurement Guidelines (CPG) for recycled content. The CPG is a good source for understanding the minimum amount of recycled content to specify for a particular building material or product.
- Research specific products by looking at product cut sheets and manufacturers' data to see if they contain recycled content. The EPA also provides a product directory listing products that meet the above minimum recycled content percentages.
- Many commonly used products are available with recycled content, including metals, concrete, masonry, gypsum wallboard, acoustic tile, carpet, ceramic tile, rubber flooring, wall base and insulation.
- Generate report with results of background research, inclusive of print screens vetting CPG site, plus other products not on website and how addressing recycled content.

##### Step 2. Specify materials with recycled content

- Specify materials with recycled content based on the project's overall goals and the minimum thresholds recommended by the EPA, establish a target percent recycled content for each material

category included on the project with the involvement of the full project team, ideally, including the contractor. For materials not included in the CPG, set minimum thresholds as high as practicable.

- When a cost estimate for the project is available, evaluate the feasibility of meeting the recycled content targets and revise these targets as necessary. Projects are exempt from meeting the minimum percentages specified by the EPA when:
  - Cost is prohibitive
  - Products are not available in a reasonable time frame
  - Products hinder performance
  - There is little competition

### **Step 3. Perform construction submittal reviews to verify implementation**

- During construction, coordinate a review of the construction submittals to demonstrate that the selected products meet the thresholds listed in the specifications.
- Any product substitutions must be carefully reviewed by the design team and contractor for compliance.
- Conduct a preconstruction meeting to review material and product needs in detail, to stress their importance will aid in successful procurement. Track progress towards goals on a regular basis.

### **Step 4. Verify that minimum percent recycled content is met**

- For each material with recycled content used on the project, calculate its recycled content value according to the following equation. It is recommended that project teams use the LEED NC v2009 BD+C Material and Resource Calculator:
- Recycled content value (\$) = (% Postconsumer recycled content \* Material cost) + 0.5 \* (% Preconsumer recycled content \* Material cost)
- Then, perform the following calculation to determine the overall percentage of recycled content used on the project. The resulting value must be at least 10% for the project to comply with the guiding principle requirements:
  - Percentage recycled content = (Total recycled content value / Total materials cost) \* 100

## **Documentation Requirements**

### Construction Submittal

#### Path One:

- Report of research conducted
- Record of product names, manufacturers' names, costs, percentage postconsumer content, and percentage preconsumer content.
- Cut sheets or manufacturers' letters to document the listed products' recycled content.
- Where appropriate, maintain a list of actual materials costs, excluding labor and equipment for CSI Division 03–10, 31 (Section 31.60.00 Foundations) and 32 (Sections 32.10.00 Paving, 32.30.00 Site Improvements, and 32.90.00 Planting) only; including Division 12 is optional.

**Path Two:**

- Demonstrate compliance [LEED NC v2009 MRc4 Recycled content](#), 1 point (must use EPA-designated products to meet credit requirement)
  - Narrative that demonstrates EPA-designated products were utilized
- OR**
- Demonstrate compliance [LEED NC v4 MRc Building product disclosure and optimization - environmental product declarations](#) (must use EPA-designated products to meet credit requirement)
  - Narrative that demonstrates EPA-designated products were utilized

**Path Three:**

- Not applicable to project. Provide written justification for missed targets as relates to mission, location, LCCA, non-applicable to scope, or other reason specific to requirement.

## 2-6.1.2 Biologically-Based Products

### Requirements

Per Section 9002 of the Farm Security and Rural Investment Act, specify products composed of the highest percentage of biobased content consistent with the USDA BioPreferred Program, if products meet performance requirements and are available at reasonable cost. Exceptions taken to biobased product procurement must be documented. A preference for purchasing products with the highest biobased content per USDA recommendations for designated product categories must be included in all applicable solicitations. USDA's biobased product designations and biobased content (which includes certified sustainably-harvested and rapidly renewable resources) recommendations are available on USDA's BioPreferred web site at <http://www.biopreferred.gov/>.

### Compliance

#### Step-By-Step Implementation

#### Step 1. Conduct background research

- Review the required minimum thresholds for biobased content, as listed on USDA's BioPreferred website. The USDA has identified 97 product categories (e.g., carpets, cleaners, paints), each of which has an identified minimum threshold. All materials and products used on the project will meet the category-specific minimum thresholds for biobased content, where cost feasible.
- Review project documents to identify all applicable products.
- Research specific products by looking at product cut sheets and manufacturing data to see if they contain biobased content. The USDA also provides a product directory listing products that meet the above minimum biobased content percentages (<http://www.biopreferred.gov/BioPreferred/faces/catalog/Catalog.xhtml>) and information on BioPreferred suppliers.
  - Utilize print screens to document results of searches that result in decision to not include BioPreferred products. Include print screens in narrative that will be submitted for review if needing to explain why available products didn't meet project requirements.
- To quickly identify biobased products that comply with the guiding principle requirements, look for products with the USDA Certified Biobased Product label. These products have been third-party certified to verify that they meet the USDA's minimum thresholds.
- Biobased content includes plant, renewable agricultural, marine, and forestry material. It does not include food, animal feed, fuel, or leather.
- Common products with biobased content include wheatboard, wool, cotton, bamboo, soy oil, and cork

#### Step 2. If back ground research does not yield positive results generate a report

- If appropriate biobased products are not discovered generate a report indicative of reason not including in project design (lack of availability, price, performance etc.). Report needs to include results of background research, inclusive of print screens vetting BioPreferred website.

#### Step 3. If research yields positive results specify biobased products

- If research generated positive results specify the biobased products and incorporate into project.

#### Step 4. Perform construction submittal reviews to verify implementation

- During construction, coordinate a review of the construction submittals to verify that selected products meet the thresholds listed in the specifications.
- Any product substitutions must be carefully reviewed by the design team and contractor for compliance.
- Conduct a preconstruction meeting to review material and product needs in detail, to stress their importance will aid in successful procurement. Track progress towards goals on a regular basis.

### Documentation Requirements

#### Construction Submittal

##### Path One:

- Summary list and cutsheets for biologically-based products included in project if applicable
- Report of background research; If not able to include BioPreferred in products as part of project design, explaining why available products didn't meet project requirements with relevant print screens that document results of searches.

##### Path Two:

- Demonstrate compliance with [LEED v2009 BD+C NC MRc6 Rapidly renewable materials](#) (must use USDA BioPreferred Designated products to meet credit requirement)
  - Plus, demonstrate use of USDA BioPreferred Designated products to help meet credit requirement if possible
- OR**
- Demonstrate compliance with [LEED v4 BD+C MRc Building product disclosure and optimization - sourcing of raw materials](#) (must use BioPreferred USDA Designated products to meet credit requirement)
  - Plus, demonstrate use of USDA BioPreferred Designated products to help meet credit requirement if possible

##### Path Three:

- Not applicable to project. Provide written justification for missed targets as relates to mission, location, LCCA, non-applicable to scope, or other reason specific to requirement.

## 2-6.1.3 Ozone Depleting Substances

### Requirements

Meet the requirements of ASHRAE 189.1 Section 9.3.3 (Refrigerants), if equipment or systems using ozone depleting substances are included in the project. Do not use ozone depleting substances (ODS) or high Global Warming Potential (GWP) chemicals where EPAs Significant New Alternative Policy (SNAP) has identified acceptable substitutes or where other environmentally preferable products are available for use in construction, repair or end-of-life replacements: [www.epa.gov/snap](http://www.epa.gov/snap).

Exceptions: Refer to UFC 3-600-01 for fire system requirements.

### Compliance

#### Step-By-Step Implementation

#### Step 1. Determine eligibility

- Determine if project equipment or systems will include ozone depleting substances. If yes review the following guidance. If project does not include generate a narrative documenting to provide during project review.

#### Step 2. Review and design to meet requirements of ASHRAE 189.1 Section 9.3.3

- Do not use Chlorofluorocarbon (CFC) based refrigerants in HVAC&R systems
- For fire suppression systems are review exceptions in the UFC 3-600-01.

#### Step 3. EPA SNAP acceptable substitutes to CFCs and HCFCs

- Under the Significant New Alternatives Policy (SNAP), which is designed to implement section 612 of the amended Clean Air Act of 1990, the EPA provides a list of substitutes for ozone-depleting substances. These are organized into the following categories: acceptable, acceptable subject to narrow use, acceptable subject to use, and unacceptable. Review the requirements of this list, available at <http://www.epa.gov/ozone/snap/lists/index.html>.

#### Step 4. Inventory existing HVAC&R equipment (for major renovations)

- For projects that are major renovations, inventory all existing HVAC&R equipment in the project and determine whether any items use CFC or 'unacceptable' HCFC refrigerants.
- Older or retrofit equipment with higher efficiency ratings are the most likely to have CFCs, but it is important to check the refrigerant type for all new equipment.
- Any equipment using compounds designated as 'unacceptable' under SNAP must be replaced or retrofitted before the project's completion.
- Note: For the fire suppression equipment see UFC 3-600-01 for fire system requirements.

#### Step 5. Select new equipment that minimizes the use of ozone-depleting substances

- To the maximum extent feasible, use acceptable substitutes for ozone-depleting substances according to the SNAP program. Where substances fall into the 'acceptable subject to narrow use' and 'acceptable subject to use' categories, comply with SNAP requirements.
- Do not use any compounds designated as 'unacceptable' under SNAP.
- The installation of new Halon 1301 fire suppression systems is prohibited except in cases where special approval has been granted by the Authority Having Jurisdiction (AHJ).

- In addition to the SNAP list, project teams will also take into account considerations such as cost, compatibility with equipment system components, possibilities for recycling and/or reclamation, flammability, availability, and other environmental effects (such as global warming potential).
- Note that the mechanical engineer is typically responsible for specifying this equipment.

## Documentation Requirements

### Construction Submittal

#### Path One:

- List base building systems containing refrigerants and the associated type of refrigerant.
- Retain manufacturer's documentation, indicating the type and quantity of refrigerant used.

#### Path Two:

- Demonstrate compliance with [LEED v2009 BC+C EAp3 Fundamental refrigerant management](#)
  - [LEED v2009 BC+C EAc4 Enhanced refrigeration management](#)
  - Demonstrate using the calculator in the credit form that the ODP is zero
- OR**
- Demonstrate compliance with [LEED v4 BD+C EAp Fundamental refrigerant management](#)
  - [LEED v4 BD+C EAc Enhanced refrigerant management](#)
  - Demonstrate using the calculator in the credit form that the ODP is zero

#### Path Three:

- Not applicable to project. Provide written justification for missed targets as relates to mission, location, LCCA, non-applicable to scope, or other reason specific to requirement.

## 2-6.2.1 Storage and Collection of Recyclables

### Requirements

Meet the requirements of ASHRAE 189.1 Section 9.3.4.1 (Storage and Collection of Recyclables – Recyclables), where markets or onsite recycling exist.

### Compliance

#### Step-By-Step Implementation

#### Step 1. Determine if recycling services are available

- Determine if the installation provides recycling services

#### Step 2. Design appropriately sized disposal areas

- Determine method for which recycled materials will be removed from the building
- Provide a central collection and storage space with sufficient capacity for all non-hazardous recyclables, include the area project design documents.
- The following material types must be accommodated by recycling services:
  - Paper
  - Corrugated cardboard
  - Glass
  - Plastics
  - Metals

### Documentation Requirements

#### Design Submittal

#### Path One:

- If the installation provides recycling services, generate narrative confirming status of storage areas dedicated to nonhazardous materials for recycling, including paper, corrugated cardboard, glass, plastics, and metals. Include relevant excerpt of documentation such as floor plans and site plans that highlight recycling storage areas.
- If the installation does not provide recycling services or only provides services for select nonhazardous materials, provide a statement from base civil engineering office or public works office confirming.

#### Path Two:

- Demonstrate compliance with [LEED v2009 BD+C MRp1 Storage and collection of recyclables](#)
- OR**
- Demonstrate compliance with [LEED v4 BD+C MRp Storage and collection of recyclables](#)

#### Path Three:

- Not applicable to project. Provide written justification for missed targets as relates to mission, location, LCCA, non-applicable to scope, or other reason specific to requirement.



## 2-6.2.2 Waste Diversion

### Requirements

Divert minimum 60% of nonhazardous construction and demolition waste material from landfills.

### Compliance

#### Step-By-Step Implementation

#### Step 1. Implement UFGS-01 74 19 Construction and Demolition Waste Management

- Review and verify that the guidance in the UFGS-01 74 19 Construction and Demolition Waste Management<sup>36</sup> is adhered to during the project delivery cycle.

#### Step 2. Verify that diversion rate is at least 60%

- Use the following calculation to determine the construction and demolition waste diversion rate. To verify that the 60% threshold will be met, project teams will calculate the diversion rate periodically (e.g., monthly or bimonthly) so that adjustments can be made, if necessary.
- Diversion rate can be calculated by either weight or volume.  $\text{Diversion rate} = (\text{Total waste diverted from landfill} / \text{Total waste produced by the project}) * 100$

### Documentation Requirements

Construction Submittal

#### Path One:

- Waste Management Plan
- Total percentage of waste diverted from landfill disposal during construction
- Haul tickets

#### Path Two:

- Demonstrate compliance with [LEED v2009 BD+C MRc2 Construction waste management](#), minimum 1 point with at least a 60% diversion rate

OR

- Demonstrate compliance with [LEED v4 BD+C MRc Construction and demolition waste management](#), Option 1 – minimum 1 point with at least a 60% diversion rate

#### Path Three:

- Not applicable to project. Provide written justification for missed targets as relates to mission, location, LCCA, non-applicable to scope, or other reason specific to requirement.

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<sup>36</sup> <https://www.wbdg.org/FFC/DOD/UFGS/UFGS%2001%2074%2019.pdf>

## 2-7 ADDRESS CLIMATE CHANGE RISK

### 2-7 Address Climate Change Risk

Provide building design solutions responsive to any Government-provided projections of climate change projection and determination of acceptable risk.

For a building located in a floodplain of concern, provide design solutions which mitigate both impact on the floodplain, and impact of the design flood event on building function and occupants, consistent with mission criticality.

**Climate Change:** *Per DOD Directive 4715.2, variations in average weather conditions that persist over multiple decades or longer that encompass increases and decreases in temperature, shifts in precipitation, and changing risk of certain types of severe weather events.*

**Climate Resiliency:** *Per E.O 13963, "...prepare for, withstand, respond to, or quickly recover from disruptions due to severe weather events and climate change for the intended life of the asset."*

#### **Compliance**

##### *Step-By-Step Implementation*

##### **Step 1. Review DD1391**

- Determine if project DD1391 contains scope for identified risk. If not, the requirement is "N/A" due to "not applicable to scope" and select Path Two.

##### **Step 2. Design to address the DD1391 requirements**

- If risks are identified in the DD1391, incorporate into project design and delivery.

##### **Step 3. Document**

- Provide design analysis that indicates design elements were incorporated for identified risks.

#### **Documentation Requirements**

##### Design Submittal

##### **Path One:**

- Copy of DD 1391
- Narrative regarding steps taken to meet requirements.

##### **Path Two:**

- Not applicable to project. Provide written justification for missed targets as relates to mission, location, LCCA, non-applicable to scope, or other reason specific to requirement.



# Guiding Principles Assessment Handbook

FOR USE WITH THE FEDERAL HIGH PERFORMANCE AND SUSTAINABLE BUILDINGS POLICIES

January 2019

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## OVERVIEW

From the EPA to NASA, federal agencies work to abide by the Guiding Principles for Federal Leadership in High Performance and Sustainable Buildings<sup>1</sup>, a set of policies set by Executive Order 13423<sup>2</sup> and 13514<sup>3</sup> for building, renovating, and operating optimal, efficient buildings – as replaced by the Executive Order 13693<sup>4</sup>: Planning for Federal Sustainability in the next Decade<sup>5&6</sup>.

In complying with the Guiding Principles, each agency may provide additional guidance to their projects. For example, the Department of Defense (DoD) has incorporated the Guiding Principles requirements into their Unified Facilities Criteria High Performance and Sustainable Building Requirements (UFC 1-200-02<sup>7</sup>) The DoD initiated the Unified Facilities Criteria (UFC) program to unify

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<sup>1</sup><https://www.wbdg.org/FFC/FED/HPSB-MOU.pdf>

<sup>2</sup>[http://www.wbdg.org/FFC/FED/EO/eo13423\\_instructions.pdf](http://www.wbdg.org/FFC/FED/EO/eo13423_instructions.pdf)

<sup>3</sup><http://www.wbdg.org/FFC/FED/EO/eo13514.pdf>

<sup>4</sup>[https://obamawhitehouse.archives.gov/sites/default/files/docs/eo\\_13693\\_implementing\\_instructions\\_june\\_10\\_2015.pdf](https://obamawhitehouse.archives.gov/sites/default/files/docs/eo_13693_implementing_instructions_june_10_2015.pdf)

<sup>5</sup>[https://sftool.gov/Content/attachments/guiding\\_principles\\_for\\_sustainable\\_federal\\_buildings\\_and\\_associated\\_instructions\\_february\\_2016.pdf](https://sftool.gov/Content/attachments/guiding_principles_for_sustainable_federal_buildings_and_associated_instructions_february_2016.pdf)

<sup>6</sup>[https://sftool.gov/Content/attachments/determining\\_compliance\\_with\\_the\\_guiding\\_principles\\_for\\_sustainable\\_federal\\_buildings\\_february\\_2016.pdf](https://sftool.gov/Content/attachments/determining_compliance_with_the_guiding_principles_for_sustainable_federal_buildings_february_2016.pdf)

<sup>7</sup><http://www.wbdg.org/ffc/dod/unified-facilities-criteria-ufc/ufc-1-200-02>

all technical criteria and standards pertaining to planning, design, construction, and operation and maintenance of real property facilities.

The Green Business Certification Inc. ([GBCI](http://www.gbci.org)) has more than 300 full time technical experts and consultants specializing in architecture, engineering and building management is the premiere organization for third-party verification. GBCI has been working with these federal agencies and the Department of Defense to offer third-party assessments of each agency's work to meet the Guiding Principles. GBCI will evaluate your compliance with the Guiding Principles and provide support for your project.

This handbook coupled with the relevant Technical Guide published by GBCI will take you through the steps to show your projects' compliance with the following:

### Federal Agencies

- Guiding Principles for Sustainable Federal Buildings published February 2016<sup>8</sup> specifically for New Construction and Modernizations
  - [Technical Guide: New Construction and Modernizations – Guiding Principles for Sustainable Federal Buildings \(February 2016\)](#)

### Department of Defense

- UFC 1-200-02 High Performance and Sustainable Building Requirements<sup>9</sup>.
  - [Technical Guide: New Construction and Renovations – Guiding Principles Implemented by UFC 1-200-02 \(December 2016\)](#)

For simplicity the Guiding Principles and the UFC criteria will be referenced as the “Requirements” of the High Performance & Sustainable Buildings Guiding Principles.

## ELIGIBILITY

Before beginning, make sure that your project meets all of the minimum requirements to pursue the assessment. To clarify the correct offering for your project, contact us at [GuidingPrinciplesAssessment@gbci.org](mailto:GuidingPrinciplesAssessment@gbci.org).

As specified in *Guiding Principles for Sustainable Federal Buildings and Associated Instructions* by the Council on Environmental Quality for Federal Agencies, a new building or modernization in which project design was complete after February 2016 should follow the 2016 Guiding Principles for New Construction or Modernization.

For Department of Defense, the UFC 1-200-01 DoD Building Code (General Building Requirements)<sup>10</sup> document provides clarification for projects eligible for assessment through the current version of the UFC 1-200-02 High Performance and Sustainable Building Requirements.

In order to be eligible to participate, the project building, all other real property within the project boundary, and all project work must comply with applicable federal, state, and local building-related

<sup>8</sup> <https://www.energy.gov/eere/femp/guiding-principles-sustainable-federal-buildings>

<sup>9</sup> <http://www.wbdg.org/ffc/dod/unified-facilities-criteria-ufc/ufc-1-200-02>

<sup>10</sup> <http://www.wbdg.org/ffc/dod/unified-facilities-criteria-ufc/ufc-1-200-01>

environmental laws and regulations in place where the project is located. This condition must be satisfied from the date of project registration or the commencement of schematic design, whichever comes first, up and until the date that the building receives a certificate of occupancy or similar official indication that it is fit and ready for use.<sup>11</sup>

All projects must be designed for, constructed on, and operated on a permanent location on already existing land. Projects shall not consist of mobile structures, equipment, or vehicles. No building or space that is designed to move at any point in its lifetime is eligible. Projects must include the new, ground-up design and construction, or major renovation, of at least one federal building in its entirety.

If questions arise as it relates to interpretation of the eligibility of the project, GBCI will work with the appropriate agency and the agency will determine if any waivers are applicable.

### Project Boundary

The project boundary must include all contiguous land that is associated with the project and supports its typical operations. This includes land altered as a result of construction and features used primarily by the project's occupants, such as hardscape (parking and sidewalks), septic or stormwater treatment equipment, and landscaping. The boundary may not unreasonably exclude portions of the building-or site to give the project an advantage in complying with requirements. The project must accurately communicate the scope of the project being assessed in all promotional and descriptive materials and distinguish it from any non-assessed space.

## REGISTER

### *Guiding Principles Assessment Handbook*

Teams review this document, *The Guiding Principles Assessment Handbook*, to learn about the review process, fees, team member roles, project directory, and more. A copy of this document must be distributed to the project administrator and project owner. During the registration process teams will be asked to confirm receipt of this document.

### *Register your project*

To register a project, your first step is to complete the [Registration Form](#). In order to optimize an integrated design process, which is a core part of meeting the requirements, we encourage you to register as early as possible – ideally, prior to the design phase.

### Project Team Roles

During registration you will need to identify project team members. The Guiding Principles Assessment project team usually includes the owner, primary contact, and project administrator defined for Guiding Principles Assessment projects as follows:

*Owner Organization:* Also known as the Building Owner Organization, the department that will own and occupy after construction, for example: US Army, US Air Force, US Navy, US Marine Corps, Federal Agency, GSA, DOE, etc.

<sup>11</sup> A lapse in a project's compliance with a building-related environmental law or regulation that results from an unforeseen and unavoidable circumstance shall not necessarily result in non-compliance with this requirement. Such lapses shall be excused so long as they are remediated as soon as feasibly possible.

*Primary Contact Organization:* Also known as the Project Owner Organization, the department that owns the project and is executing in accordance with the Owner Organization/Building Owner specifications: US Army, US Air Force, US Navy, US Marine Corps, Federal Agency, GSA, DOE, etc.

*Project Administrator Organization:* Often the non-DOD organization hired to manage project execution for the US Army, US Air Force, US Navy, US Marine Corps, Federal Agency, GSA, DOE, etc. The project administrator acts as a project manager, overseeing the project as well as which team members are responsible for certain tasks and measures.

## Fees

Registration, review, and other project fees are listed on the Guiding Principles Assessment [fee table](#). Projects pursuing both LEED certification and Guiding Principles Assessment do not incur Guiding Principles Assessment fees if the two applications are submitted concurrently.

Once a project is registered and the registration payment is received, the team will have access to various tools including a dedicated contact from GBCI who will reach out to set up a conference call. Your GBCI contact will be available throughout the process to provide clarification and answer questions.

## APPLY

### *Demonstrate Compliance and Document Your Project*

The Project Information Form is used to indicate the documentation path selected for each Requirement.

All projects must submit the following: Project Information Form, general project narrative (brief description of building use, occupancy, site conditions, modernization or renovation scope, special circumstances, or other information that will provide a holistic understanding of the project), and a concise narrative for any Requirement with special circumstances. See each Requirement in the relevant Technical Guide for documentation options and specifics. A few guidelines for applications are as follows:

- Ensure the relevant information is clearly highlighted within the submission documents
- Clearly and intuitively label all documents
- Submit only required information (if only a few pages of a large report are needed to provide the required information, highlight the relevant sections only)

Teams must demonstrate compliance with the Guiding Principles Requirements. A portion of the requirements have more than one path available for documentation, such as paths to use a LEED credit. When using a LEED credit, the LEED credit form and all supporting documentation is required as specified by the LEED documentation requirements. Each Requirement includes a path to indicate that a requirement is not applicable for the project. If Requirements are only partially applicable, (i.e. Daylighting not permitted in select secure areas of the building), it is expected that the project comply in other portions of the project and provide documentation delineating the portions of the project that are in compliance versus those that are not applicable.

### ***Application to GBCI***

Prior to submitting for review, confirm that your registration and review fees have been paid. When your application is ready to be submitted, contact GBCI and you will be granted access to a folder specific to your project in the file sharing platform where your application will be saved and submitted.

Upload general documents, such as project drawings, plans, and narratives (that may apply to multiple requirements) to the “General Submittals” folder. Upload other required documentation within the appropriate folders for each requirement.

Contact GBCI when your application is complete and ready for review. For many federal agencies data security is an issue; if you need an alternative submission process, contact GBCI as early in the process as possible. Additional fees apply.

## **REVIEW**

### ***Participate In the Review of Your Application & Assessment Report***

After the **review fee has been paid**, GBCI will conduct the review. Note that if the submission is concurrent with a LEED project review, any issues hindering the LEED review would also affect this review’s timeline and vice versa.

Guiding Principles Assessment projects are encouraged to utilize the split review process. To do this, you’ll submit part of your application at the conclusion of the project’s design phase (design requirements), and the rest at the conclusion of construction (construction requirements), completing two phases of reviews. The split review is designed to help your team determine if your project is on track early in the process. Please note that only requirements identified as design requirements can be submitted during the design review. The Technical Guide identifies whether each requirement is a design or construction requirement.

If any changes occur to the project after the design review that might affect compliance, those changes must be re-reviewed by GBCI. In these cases, documentation for the affected requirements must be updated and submitted for one additional round of review during the construction phase.

Contact GBCI to request an exception if the project is better suited to submit the entire application (design and construction requirements) once the project is completed.

### **Review Process for both the Design Review and the Construction Review**

#### ***Part 1: Preliminary Review***

- Once all application materials are finalized and uploaded to the project folders, contact GBCI and indicate that the application is ready for preliminary design review.
- GBCI conducts a technical review of the project application, checking your application for completeness and compliance. Throughout this and subsequent reviews GBCI may request clarifications.
- GBCI will contact the project administrator with its preliminary review report within 20-25 business days of receiving the assessment fee. The assessment report will indicate those aspects of the Guiding Principles that are compliant, as well as those that are pending with a request for more information.
- Your team can accept the preliminary review results as final if you are satisfied, prepare new or revised documentation, or attempt additional requirements before submitting for final design review.



### *Part 2: Final Review (optional)*

- The final review stage allows you to submit supplementary information requested by GBCI during the preliminary review or amend the application. GBCI suggests you submit these clarifications within 25 business days after receiving the preliminary review results. GBCI will review revised or newly submitted information.
- GBCI will respond with a final review report for the assessment within 20-25 business days, marking requirements as either compliant or not compliant.
- Like the preliminary review, you can either accept the review results as final, or revise your application and resubmit for a supplemental (appeal) review.

### *Part 3: Supplemental (appeal) Review (optional, fees apply)*

- The supplemental (appeal) review stage provides an additional round of review and allows you to submit additional information, amend the application, or address requirements not previously submitted. GBCI will review the previously not compliant or newly submitted requirements, and any information that has changed since the return of the final review. The fee associated with supplemental (appeal) reviews varies depending on the level of complexity.
- Appeals are specific to each Guiding Principle requirement and multiple appeals may be submitted concurrently; a separate fee is required for each appeal.
- GBCI will respond with an updated assessment report within 20-25 business days, indicating which requirements have been either compliant or not compliant.
- Like the final review, you can either accept the supplemental (appeal) review results as final, or submit for additional supplemental (appeal) reviews. There is no cap on the number of supplemental (appeal) reviews you may submit.
- After the appeal review is completed, contact GBCI to accept the results.

## COMPLIANCE

### *Assessment Report*

Once the assessment is complete, the project team will receive the assessment report that indicates the final outcome for the project. The project can be either Compliant or Not Compliant. Guiding Principles for Federal Leadership in High Performance and Sustainable Buildings require that each requirement is assessed and determined to either meet or not meet the guidelines in the Executive Orders. Requirements deemed not applicable will not impede compliance<sup>12</sup>. Projects cannot be partially compliant.

Compliant projects will receive an official GBCI certificate.

### *Celebrate and Communicate*

Your work toward demonstrating compliance with the High Performance & Sustainable Buildings, Guiding Principles is something to be celebrated and communicated. All projects are, by default, considered “public” projects, and thereby included in the public project directory. A listing in this directory allows the general public and members of the media to look up your project listing and its

<sup>12</sup> To learn more (1) DoD projects see the [UFC 1-200-02](#) Section 4-2 COMPLIANCE WITH FEDERAL REQUIREMENTS (2) Federal Agencies see the [Guiding Principles for Sustainable Federal Buildings and Associated Instructions](#) Section III. Agency Determination of a Building’s Compliance with the Guiding Principles



related details. Neither the public directory or the public opportunities will disclose the underlying information from the High Performance & Sustainable Buildings, Guiding Principles review application. You are free to opt-out of the project directory and publicity opportunities as a “private” project at the time of registration or any time thereafter.

### **Project directory**

The public project directory provides the opportunity to share your success, educate and motivate. Here’s a full list of the data and project elements that may be listed in the project directory:

- Location
- Size of the project
- Identity of the agency that occupies the building
- Identity of the agency that built the project
- The project is registered
- The project has been reviewed against the Guiding Principles

By submitting information to GBCI you grant GBCI a license to access, view, publish and display the above project information.

### **Publicity opportunities**

Successfully meeting the Guiding Principles gives you the opportunity to share your project strategies, photos and insight, and play a pivotal role in educating other project teams. All “public” projects also benefit from publicity opportunities: we may utilize your project data to create case studies highlighting your project’s features, reference your project on our website or to the media, or create other derivative works. Information that may be used for articles, project profiles, other features:

- Service providers
- Project team members
- Promotional or other project photographs
- Project strategies for compliance
- Quotations from team members

### **Trademarks**

Note that if a project chooses to remain “private”, it must not be marketed or represented to the general public as a Guiding Principles project. These projects aren't entitled to use or display any intellectual property, including the GBCI trademarks and logos. These projects may communicate their status as a Guiding Principles project to government entities for the limited purposes of complying with building and tax laws, and administrative proceedings related to land use entitlements.

### **How is your project data utilized?**

We use your project data for the greater good: to educate and provide resources for project teams and others around the world, showcase your strategies, and share the size and power of the green building movement. Whether or not you elect for your project to be private, you confer the right to GBCI, and GBCI’s affiliates to publish, display and exploit the project information only in aggregated, anonymized and non-identifying form, the aggregated project information.

### **Disclaimer of warranties**

Neither GBCI nor any of GBCI's representatives make any (and GBCI and GBCI's representatives do hereby disclaim, to the greatest extent allowed by law, any and all) warranties, representations, and conditions, whether written, oral, express, implied or statutory, including any warranties of accuracy, completeness, title, against infringement, merchantability or fitness for a particular purpose, with respect to the program, the application, GBCI's assessment, and any optional services provided by or on behalf of GBCI. GBCI explicitly disclaims any and all liability arising from client's use of the application for any purpose other than for the facilitation of GBCI's assessment.

By submitting information to GBCI, you acknowledge that certain aspects of the Guiding Principles are conceptual, qualitative, and open to broad interpretation. GBCI'S interpretation of the Guiding Principles may differ from that of OM and/or other Federal Agencies tasked with evaluation or enforcement of your compliance. The results of GBCI's assessment are to be used for your internal purposes only and neither constitute an official determination of conformance, nor does it guaranteed any such determination by an applicable governing authority.

Except as expressly set forth herein, GBCI owns and retains all rights and interests to GBCI Intellectual Property and Marks. All GBCI Intellectual Property and Marks are commercial items in accordance with and as such "commercial items" term is used in the Federal Acquisition Regulation (FAR) 12, 27.405-2, 27.405-3 and Defense FAR Supplement (DFARS) 227.7105.

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## SECTION 01 33 39.00 10

ADVANCED MODELING (BIM/CIM/GIS/CAD) REQUIREMENTS  
12/17

## PART 1 GENERAL

This project requires delivery of BIM, CIM, GIS, and CAD deliverables during the Design and Construction phases of the project. This specification defines the content and formatting standards by which those deliverables shall conform.

While this specification is not intended to identify all required advanced modeling submittals or deliverables, it defines the content and formatting standards by which those items must conform. See Section 01 78 24.00 10 FACILITY DATA REQUIREMENTS, and Section 01 78 39.00 24 AS-BUILT DRAWINGS for deliverable requirements.

All advanced modeling products and deliverables required by this contract shall comply with the applicable provisions herein.

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

## INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

ISO 19005-3	(2012) Document Management -- Electronic Document File Format for Long-Term Preservation -- Part 3: Use of ISO 32000-1 with Support for Embedded Files (PDF/A-3)
ISO 19115-1	(2014) Geographic Information -- Metadata -- Part 1: Fundamentals
ISO 32000-1	(2008) Document management - Portable document format - Part 1: PDF 1.7

## NATIONAL INSTITUTE OF BUILDING SCIENCE (NIBS)

NBIMS-US	(V3) National BIM Standard - United States
NCS	(V6) United States National CAD Standard

## U.S. AIR FORCE

AF BIM Reqs	(2015) Air Force Minimum BIM Requirements, v2.1
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## U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 1110-1-2909	(2012) Geospatial Data and Systems
ERDC/ITL TR-12-1	(2015) A/E/C Graphics Standard, Release 2.0

ERDC/ITL TR-12-6

(2015) A/E/C CAD Standard - Release 6.0

## 1.2 DEFINITIONS

### 1.2.1 Advanced Modeling

A subset of geospatial technologies as defined EM 1110-1-2909 GEOSPATIAL DATA AND SYSTEMS to include BIM, CIM, GIS, and CAD. Models and drawings that form a digital representation of the project, or part thereof, comprised of "Model Elements" with "Facility/Site Data."

### 1.2.2 Facility/Site Data

The non-graphical information attached to objects in the Model that defines various characteristics of the object. Facility/Site Data can include properties such as parametric values that drive physical sizes, material definitions and characteristics (e.g. wood, metal), manufacturer data, industry standards (e.g. AISC steel properties), and project identification numbers. Facility/Site Data can also define supplementary physical entities that are not shown graphically in the Model, such as the system of a duct, hardware on a door, content of conduit, or transformer properties.

### 1.2.3 Model

A digital, graphical or non-graphical, representation of a facility to be used during that facility's lifecycle. A model is composed of model elements and other supporting data to address the intended "model use" or uses.

### 1.2.4 Model Element

A self-contained element with a unique identification, whose behavior and properties are defined by Facility/Site Data and software processes. Model Elements can represent a physical entity, such as a pump, a concrete wall, or a utility vault and range from the simple to the complex.

### 1.2.5 Model Uses

Reference NBIMS-US. A Model Use is a method or strategy of applying modeling during a facility's life cycle to achieve one or more specific objectives.

### 1.2.6 Record Model

A model reflecting all approved changes during construction including red-lines, requests for information (RFIs), and contract modifications. Includes updated construction phase facility/site data for all components.

### 1.2.7 USACE BIM/CIM Platform Configuration Standards - Templates, Workspaces, Catalogs, and Environments

#### a. USACE Revit Templates:

The USACE has developed Revit Templates specific to USACE BIM standards; these templates are Revit version specific. The USACE Revit templates are discipline specific and include family content pertinent to that discipline. The Templates share standard

symbology such as annotation families, line styles, and text styles. The Templates include pre-defined shared parameters.

#### 1.2.8 USACE CAD/BIM Technology Center

The USACE CAD/BIM Technology Center hosts all standard advanced modeling content for USACE. This content can be accessed through the CAD/BIM Technology Center website, <https://cadbimcenter.erdcdren.mil/>.

#### 1.2.9 Working Construction Model

Working model created and updated during construction which incorporate the changes received during construction to including red-lines, requests for information (RFIs), and contract modifications at intervals during the construction process. These include updated construction phase facility/site data for installed components.

### 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

#### SD-01 Preconstruction Submittals

Advanced Modeling Project Execution Plan (PxP); G, AO

PxP Demonstration; G, AO

### 1.4 QUALITY ASSURANCE

#### 1.4.1 Advanced Modeling Project Execution Plan (PxP)

Develop an Advanced Modeling Project Execution Plan ("Plan" or "PxP") documenting mandatory and Contractor-elected BIM Uses, analysis technologies, and workflows.

Submit the PxP within forty-five (45) days after Notice to Proceed.

Contractors shall use the USACE ADVANCED MODELING (BIM) PROJECT EXECUTION PLAN (PxP) Template located at the USACE CAD/BIM Technology Center website to develop an acceptable plan to include platforms and processes.

##### 1.4.1.1 Minimum Modeling Matrix (M3)

The USACE Minimum Modeling Matrix (M3) describes the minimum modeling and data requirements by defining the Level of Development ("LOD") and Element Grade. Contractors shall use the M3 Template located at <https://cadbimcenter.erdcdren.mil/> and submit as part of the PxP.

Per instructions in the M3, Contractor is to identify elements included in the project scope and provide any applicable comments

##### 1.4.1.2 Advanced Modeling PxP as Living Document

The Contractor shall maintain the PxP to reflect advanced modeling practices, procedures, and methods of compliance throughout the duration

of the Project. Resubmit the PxP to the Government for approval if changes alter method of contract compliance. Updates and revisions to the PxP that do not significantly alter contents and/or method of compliance need not be submitted for approval.

#### 1.4.1.3 Model Uses

Include all of the following Model Uses in the PxP.

##### 1.4.1.3.1 Mandatory Model Uses

The following Model Uses are mandatory:

###### 1.4.1.3.1.1 Design Phase Mandatory Model Uses

- a. Design Authoring
- b. 3D Coordination
- c. Progress Review

###### 1.4.1.3.1.2 Construction Phase Mandatory Model Uses

- a. 3D Coordination
- b. Record Modeling

##### 1.4.1.3.2 Optional Model Uses

Contractor may use or pursue other Model Uses as desired. Also document these uses in the PxP.

#### 1.4.2 PxP Demonstration

See PxP Demonstration meeting requirements described in "Meetings" paragraph below.

#### 1.4.3 Meetings

##### 1.4.3.1 Post-Award Kickoff Meeting

At minimum discuss the following during the meeting:

- a. The requirement for Advanced Modeling deliverables under this Contract.
- b. Primary roles and responsibilities associated with the development and delivery of the Advanced Modeling submittals under this Contract.
- c. Identify and agree upon a date and attendance list for the meetings described below:

##### 1.4.3.2 Advanced Modeling Kick-Off Meeting

Conduct an Advanced Modeling Kick-Off Meeting prior to submission of the PxP, within forty-five (45) days after Notice to Proceed. This meeting must include, at a minimum, the Contractor and the Geographic District BIM Manager or delegate.

The intent of this meeting is to coordinate the Government's and the Contractor's expectations for the Advanced Modeling PxP.



#### 1.4.3.3 PxP Demonstration Meeting

Within thirty (30) days after the acceptance of the PxP and M3, conduct a demonstration to review the Plan for clarification, and to verify the functionality of planned Model technology workflow and processes. If modifications are required, the Contractor shall complete the modifications and resubmit the PxP performing a subsequent demonstration for Government acceptance. There will be no payment for design or construction until the PxP is completed and accepted by the Government. The Government may also withhold payment for unacceptable performance in executing the accepted PxP.

#### 1.5 OWNERSHIP AND RIGHTS OF DATA

The Government has ownership of and rights at the date of Closeout Submittal to all CAD files, BIM/CIM Model(s), and Facility/Site Data developed for the Project in accordance with FAR Part 27, clauses incorporated in GENERAL CONDITIONS (Contract Clauses) and Special Contract Requirement GOVERNMENT RE-USE OF DESIGN. The Government may make use of this data following any deliverable.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

Deliver Advanced Modeling submittals in an organized and legible manner. Provide submittals adhering to the requirements described below.

##### 1.6.1 Advanced Modeling Submittal Packaging

When a project specification requires advanced modeling deliverables, provide the following documents and files in support of those advanced modeling deliverables. Submission of items listed below shall not limit compliance with deliverable and submittal requirements in those respective specifications. Submit all advanced modeling deliverables electronically, media and/or method as indicated in this Contract. Provide number of copies of electronic media (if required) as described below:

##### 1.6.1.1 Approved PxP

Provide an electronic copy of the most current approved version of the project Advanced Modeling PxP.

##### 1.6.1.2 List of Submitted Files

Provide an electronic list (.txt file or similar) of all submitted electronic files including a description, directory, and file name for each file submitted. Identify which files have been produced from the Model and Facility Data. For all Sheet files, include a list of the sheet titles and sheet numbers.

##### 1.6.1.3 Advanced Modeling Submittal Checklist

Complete the USACE BIM/CIM Advanced Modeling Submittal Checklist and include with each submittal. Download the Checklist from the USACE CAD/BIM Technology Center website.

##### 1.6.1.4 Advanced Modeling Electronic Files

Provide all native advanced modeling files associated with the production of the advanced modeling deliverable. Update and maintain in compliance

with the advanced modeling formatting, content requirements, and standards as defined by this specification, in order to yield a complete and coordinated document set.

#### 1.6.1.5 Facility Data Deliverables

Provide all electronic facility data (BUILDER) deliverables in the format(s) described in this and referenced specification(s).

#### 1.6.1.6 CAD Exports of BIM-Generated Sheets and Drawings

Provide supplemental 2D CAD exports of all contract drawing sheets from the project BIM model. Export all contract drawing sheets to the CAD format(s) defined in this specification.

#### 1.6.1.7 GeoDataBase Files

Provide a SDSFIE/FGDC GeoReferenced personal GeoDataBase.

For all information outside of the building walls, the Contractor shall provide a personal GeoDatabase in .mdb format using the latest version of Spatial Data Standards for Facilities, Infrastructure, and Environment (SDSFIE) as the database structure. Provide a shell database to define the projection and database structure.

For all drawings within and including the exterior walls, the Contractor shall utilize the advanced modeling formats described and referenced herein.

Provide a short GeoDataBase read-me file explaining the deliverable. The read-me file shall include a description of the software used to create the data, projection, and include the attribute tables used.

#### 1.6.1.8 QC Reports

Provide electronic PDFs of all QC reports and checks utilized to ensure full compliance with the contract requirements and standards:

##### 1.6.1.8.1 Model Standards Checks and Reports

Provide QC checks demonstrating adherence to the NCS "BIM Implementation" section. Verify that the Project Facility/Site Data set has no undefined, incorrectly defined or duplicated elements. Identify and report non-compliant elements and submit a corrective action plan. Provide the Government with detailed justification and request Government acceptance for any non-compliant element that the Contractor proposes to be allowed to remain in the Model.

- a. No errors when opening.
- b. No broken Links, References, or X-References.
- c. Minimized extraneous information.
- d. Content uses the coordinate system defined in the approved PXP.
- e. Models share a common alignment point.

f. Each discipline identified in the approved PxP is represented.

#### 1.6.1.8.2 Graphics Standards Checks and Report

Provide QC checks on all graphic deliverables demonstrating that the fonts, dimensions, symbology and other construction document formatting are compliant with the requirements of this specification. Identify and report non-compliant content.

#### 1.6.1.8.3 CAD Standards Checks and Report

Provide QC checks on CAD Output demonstrating that filenames, sheet borders, layer/level names, and symbology are compliant with the requirements of this specification. Identify and report non-compliant content. Identify and report non-compliant content.

#### 1.6.1.8.4 Other Parameters

Develop such other QC parameters as Contractor deems appropriate for the Project and provide to the Government for acceptance

#### 1.6.1.9 PDF Documents

Provide one PDF file of design documents per discipline and one additional PDF file combining all disciplines, following the A/E/C CAD Standard discipline and drawing order. Bookmark PDF files in compliance with bookmarking requirements described in 01 78 24.00 10 FACILITY DATA REQUIREMENTS.

#### 1.6.1.10 Advanced Modeling Re-Submittals

If components of an as-built submittal are rejected, provide the following for each re-submittal, in addition to information required by 01 33 00 SUBMITTAL PROCEDURES:

- a. Re-submit all components required under paragraph ADVANCED MODELING SUBMITTAL PACKAGING, including a new Advanced Modeling Checklist and updated content in response to Government comments.
- b. Provide a copy of all Government review comments.
- c. Provide a response to each Government review comment for back check.

#### 1.6.2 Number of Copies

Provide three identical copies of disks for approval, for each submittal and each facility required. Provide on approved electronic media (one copy per disk or set of disks) as defined below. Provide submittal files on electronic storage media in compliance with the quality requirements identified in this specification.

#### 1.6.3 Malicious Content

Scan all files for malicious viruses using commercially available scanning program that is routinely updated to identify and remove current virus

threats.

#### 1.6.4 Storage Media

Provide facility data on disk-based (DVD-R/RW) media. Any deviations from the required storage media must be approved by the Government. Select and apply technology used for electronic data transmission to ensure that the full submittal is provided on one single disk, whenever possible. When separation of the submittal is required separate the each site or facility onto separate media. Any further divisions must be documented in the PxP and approved by the Government.

##### 1.6.4.1 Disk-Based Media

a. Apply a label directly printed to storage media. Do not provide adhesive, paper-based labels. List the name of the facility, project, project location, Contract number, Designer of Record firm/Prime Contractor company's name, title of submission, and security classification (in accordance with the appropriate security classification labeling regulations) on the label. If multiple disks are provided, clearly document the contents of each disk on the label.

b. Include the name and contact information of the individual who produced the final data disk to ensure that any problems with the data or media can be easily resolved.

c. When browsed on any computer, the disk must display the following folders and their associated content:

- (1) Submittal XXXXXX-X.X (Containing all submittal data)
- (2) PxP (Containing 1 PxP per contract)
- (3) Readme (Containing 1 TXT, PDF, or HTML file with general use information, organizational instructions, and basic preparer contact information. Include all information included on the storage media label.

#### 1.6.5 Encryption

Encrypt deliverable data as directed by Area Office Engineer. Document the encryption to be used in the PxP.

#### 1.6.6 Protection of GIS Data

GIS source data and product data remain the property of the US Government. The contractor may be required to explain and demonstrate the company's process for protecting all geospatial data, including but not limited to geometry, attributes, metadata, topologies, and relational database schemas and operations used in association with this contract. The contractor may be required to sign a non-disclosure agreement attesting to the same before source data are released. Further information about security and nondisclosure requirements should be obtained from the COR. Some installation map data, source and/or product, may be considered by the government to be "Controlled Unclassified Information" (CUI) also known as "Sensitive but Unclassified" (SBU). The contractor is not authorized to release this information to any third party without the explicit consent of the COR. All source information must be returned to the Government or destroyed upon completion of this contract.

## PART 2 PRODUCTS

### 2.1 GOVERNMENT FURNISHED MATERIALS

The Government will provide advanced modeling bridging files for the Contractor's use in developing the project Design. Such Government Furnished Material (GFM) is conceptual and is issued for information only. Quality of GFM shall not limit compliance with deliverable and quality requirements described herein.

The Contractor has the option of preparing their own BIM/CIM models and CAD drawings in lieu of utilizing GFM. Such drawings and models will also be held to the deliverable and quality requirements described herein.

#### 2.1.1 GFM Handover

The Government will provide the GFM, upon request, after contract award. Proposing contractors may request access to the GFM (without amendments) during solicitation, for evaluation and assessment. If issued prior to award, files are for information only, and do not serve as contract documents.

The Contractor is responsible for reviewing the GFM and, if the Contractor chooses to use the GFM, updating the files to meet the standards required by this specification.

#### 2.1.2 GFM File Formats

GFM will be provided in the following file formats:

##### 2.1.2.1 Government Furnished GIS

Government will provide Installation's most current Standard GIS Database Template to the Contractor. Documentation of the required attributes and schema definitions will be provided with the Standard GIS Database Template.

##### 2.1.2.2 Government Furnished CAD

The GFM will include Autodesk Civil 3D 2021 and Autodesk AutoCad 2021 .dwg files.

##### 2.1.3 Variation with Contract Drawings

The Government makes no claim or warranty that any of the GFM are complete or fully consistent with the contract drawings. The digital files provided are not part of the contract documents. If there is any discrepancy between the BIM/CIM models, the CAD drawings, and the contract drawings, the contract drawings shall govern. The Government has no responsibility to modify any GFMs due to changes in the design that occur after award, and the Government shall assume no liability for the contents of the files provided.

Evaluate the content and quality of the GFM upon receipt. If major discrepancies or omissions occur in the GFM, notify the Contracting Officer and indicate the nature of such variation(s).

#### 2.1.4 Model Completion and Quality for Bridging Files

The Government makes no guarantee that the bridging GFM files are developed to the level of completeness or quality required for submittals described herein. It is the Contractor's responsibility to develop the design design (and associated files) in compliance with requirements described herein.

#### 2.1.5 Data Loss, Corruption, and Error

Transfer of GFM files to the Contractor may result in corrupted files resulting in data loss and/or errors. Use of GFM files is at the Contractor's risk. Verify data integrity upon receipt and request a replacement if necessary.

Any adjustment of file structure, format, or software version required to make GFM compatible with the Contractor's computer systems and/or software is the responsibility of the Contractor.

### 2.2 SYSTEM PLATFORM AND FILE FORMATS

The Contractor shall use the BIM, CIM, GIS, and CAD application(s), software(s), and file format(s) described below:

#### 2.2.1 BIM

The BIM submittal format shall be Autodesk Revit 2022. The BIM submittals shall be fully operable, compatible, and editable within the native BIM/CIM tools.

#### 2.2.2 CAD Exports of BIM-Generated Sheets and Drawings

Provide supplemental 2D CAD exports from the project BIM model. Export all contract drawing sheets in Autodesk AutoCAD 2020 (.dwg) format.

#### 2.2.3 CIM

The CIM submittal format shall be Autodesk Civil 3D 2022. The CIM submittals shall be fully operable, compatible, and editable within the native BIM/CIM tools.

#### 2.2.4 GIS

All GIS databases shall be submitted in Environment Systems Research Institute's(ESRI) ArcGIS compatible file formats.

#### 2.2.5 CAD

The CAD submittal format shall be Autodesk AutoCAD 2022 (.dwg) format.

#### 2.2.6 Facility Data Requirements

This contract contains requirements for collection, organization, and turnover of electronic Facility Data deliverables. Provide Facility Data under the the following content and formatting standards:

##### 2.2.6.1 BUILDER Data

Provide complete BUILDER Data in compliance with 01 78 24.00 10 FACILITY

## DATA REQUIREMENTS (BUILDER).

## 2.2.7 Other Formats

## 2.2.7.1 PDF

Utilize PDF file format in accordance with ISO 32000-1 and ISO 19005-3. Provide files from original sources, text-searchable, and saved in "Standard" (uncompressed) resolution whenever possible.

## PART 3 EXECUTION

## 3.1 ADVANCED MODELING REQUIREMENTS

## 3.1.1 BIM and CIM

All BIM and CIM content authoring, model coordination, content delivery and all other activities and products shall comply with the NCS BIM Implementation section, part "3.0 Basic BIM Guidelines."

All CAD content produced within the BIM and CIM authoring platforms shall comply with the NCS BIM Implementation section, part "2.0 Clarifications."

## 3.1.1.1 Minimum Modeling Requirements

Model to the requirements of the USACE Minimum Modeling Matrix(M3).

## 3.1.1.2 USACE Software Configuration Standards

a. Develop the project using USACE Bentley Workspace (version contained in GFM).

b. Develop the project using USACE Revit Templates (version contained in GFM).

## 3.1.1.3 Classification

All modeled elements shall include Facility/Site Data referencing one or more classification system(s) identified in the M3.

## 3.1.1.4 Space/Room Data

The Model shall include spatial data defining actual net square footage and data to develop the room finish schedule, including room names and numbers. Include program information to verify design space against programmed space, using this information to validate area quantities.

## 3.1.1.5 CIM Coordinate System

a. State Plane Coordinate System: Colorado Central Plane Coordinate System

b. Zone: 0502

b. Units: Imperial Survey Feet

c. Horizontal Datum: NAD 83

d. Vertical Datum: NAVD 88

## 3.1.1.6 Schedules

Schedules shall comply with the NCS BIM Implementation section, part "2.4

Schedules." Schedules shall be produced from, and remain linked to, the Facility/Site Data within the Model. Any exceptions must be documented in the PxP and submitted to the Geographic BIM Manager, or delegate, for review.

#### 3.1.1.7 Details and Enlarged Sections

Details and enlarged sections shall comply with the NCS BIM Implementation section, part "3.2 Model Coordination and Delivery." All details and enlarged sections necessary for construction shall be derived from the Model when possible. For those details and enlarged sections not derived directly from the Model, Contractor must verify that geometry and data depicting the details and enlarged sections are consistent with Model elements. Details with significant drafted content such as 'standard' and 'typical' details shall not contradict the model and shall utilize the model as an underlay when possible for the purposes of verification and coordination. Three dimensional, isometric, and section isometric details derived from the model are preferred. Details and enlarged sections that are not derived from the Model must be created using native authoring tools within the Model or be embedded within the Model.

#### 3.1.1.8 Drawing Indices

Drawing indices shall comply with the NCS BIM Implementation section, part "2.3 Sheet Organization." Where BIM authoring platform supports it, drawing indices should be derived from a model-driven schedule.

#### 3.1.1.9 CAD Export

CAD content exported from a BIM or CIM modeling platform shall comply with the NCS BIM Implementation section, part "2.0 Clarifications."

CAD file format and version shall be as indicated in the "CAD" paragraph below.

### 3.1.2 GIS

#### 3.1.2.1 Minimum Modeling Requirements

Provide final geo-referenced GIS database of the new building footprint, and site surface and subsurface features that exist outside the building footprint(s) out to the project extents.

Contractor shall collect GIS geo-referenced data pertaining to location and attribute data of subsurface utilities obtained at the time of project site excavation. All data collection for underground utilities shall include the collection of elevation (Z) values.

#### 3.1.2.2 Standard GIS Database Template

The Contractor must use the Standard GIS Database Template provided by Installation Geospatial Support Office to produce the GIS deliverables required under this contract.

### 3.1.3 CAD

All CAD content produced through native CAD authoring software outside of any BIM or CIM platform shall be compliant with ERDC/ITL TR-12-6 A/E/C CAD Standard and ERDC/ITL TR-12-1 A/E/C Graphic Standard.



### 3.1.3.1 USACE Software Standards

a. Autodesk AutoCAD Template Files Most recent version at the time of Contract award. Download form the CAD/BIM Technology Center website as part of the A/E/C Work Structure.

### 3.2 FINAL DESIGN AND FINAL RECORD SUBMITTAL REQUIREMENTS

Follow requirements for Content Delivery from the NCS BIM Implementation section, part "3.0 Basic BIM Guidelines."

### 3.3 DESIGN ADVANCED MODELING REQUIREMENTS

See Section 01 33 00.32 DESIGN AND CONSTRUCTION DELIVERABLES/PROCEDURES for additional requirements. Deliverable requirements listed in that specification shall not preclude development of the project in BIM/CIM/GIS/CAD through design as required herein.

### 3.4 AS-BUILT ADVANCED MODELING REQUIREMENTS

See Section 01 78 39.00.24 AS-BUILT DRAWINGS for additional as-built and record model quality and deliverable requirements. Deliverable requirements listed in that specification shall not preclude development of the project in BIM/CIM/GIS/CAD through construction as required herein.

### 3.5 Waivers of Specific Requirements

If a requirement contained in this document can not be achieved, or can not be achieved at a cost commensurate with the value of the requirement, the Contractor may request, in writing, that the requirement be withdrawn or modified. The request must certify that the Contractor has diligently attempted to meet the requirement, that the requirement can not reasonably be met, and that alternative approaches meet the intent of the requirement. The request must be supported by evidence of the Contractor's research and documentation that the alternative approach meets the function and interoperability requirements of this document. The Government, in its sole discretion, may waive requirements found to be currently unachievable or not commercially practicable.

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## SECTION 01 35 26

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**11/20, CHG 2: 11/21**

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## SECTION 01 35 26

## GOVERNMENTAL SAFETY REQUIREMENTS

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## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

## AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B30.3	(2020) Tower Cranes
ASME B30.5	(2018) Mobile and Locomotive Cranes
ASME B30.7	(2016) Winches
ASME B30.8	(2020) Floating Cranes and Floating Derricks
ASME B30.9	(2018) Slings
ASME B30.20	(2018) Below-the-Hook Lifting Devices
ASME B30.22	(2016) Articulating Boom Cranes
ASME B30.23	(2016) Personnel Lifting Systems Safety Standard for Cableways, Cranes, Derricks, Hoists, Hooks, Jacks, and Slings
ASME B30.26	(2015; R 2020) Rigging Hardware

## AMERICAN SOCIETY OF SAFETY PROFESSIONALS (ASSP)

ASSP A10.22	(2007; R 2017) Safety Requirements for Rope-Guided and Non-Guided Workers' Hoists
ASSP A10.34	(2021) Protection of the Public on or Adjacent to Construction Sites
ASSP A10.44	(2020) Control of Energy Sources (Lockout/Tagout) for Construction and Demolition Operations
ASSP Z244.1	(2016) The Control of Hazardous Energy Lockout, Tagout and Alternative Methods
ASSP Z359.0	(2018) Definitions and Nomenclature Used for Fall Protection and Fall Arrest
ASSP Z359.1	(2020) The Fall Protection Code
ASSP Z359.2	(2017) Minimum Requirements for a

## Comprehensive Managed Fall Protection Program

ASSP Z359.3	(2019) Safety Requirements for Lanyards and Positioning Lanyards
ASSP Z359.4	(2013) Safety Requirements for Assisted-Rescue and Self-Rescue Systems, Subsystems and Components
ASSP Z359.6	(2016) Specifications and Design Requirements for Active Fall Protection Systems
ASSP Z359.7	(2019) Qualification and Verification Testing of Fall Protection Products
ASSP Z359.11	(2014) Safety Requirements for Full Body Harnesses
ASSP Z359.12	(2019) Connecting Components for Personal Fall Arrest Systems
ASSP Z359.13	(2013) Personal Energy Absorbers and Energy Absorbing Lanyards
ASSP Z359.14	(2014) Safety Requirements for Self-Retracting Devices for Personal Fall Arrest and Rescue Systems
ASSP Z359.15	(2014) Safety Requirements for Single Anchor Lifelines and Fall Arresters for Personal Fall Arrest Systems
ASSP Z359.16	(2016) Safety Requirements for Climbing Ladder Fall Arrest Systems
ASSP Z359.18	(2017) Safety Requirements for Anchorage Connectors for Active Fall Protection Systems
ASSP Z490.1	(2016) Criteria for Accepted Practices in Safety, Health, and Environmental Training

## ASTM INTERNATIONAL (ASTM)

ASTM F855	(2019) Standard Specifications for Temporary Protective Grounds to Be Used on De-energized Electric Power Lines and Equipment
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## INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE 1048	(2016) Guide for Protective Grounding of Power Lines
IEEE C2	(2017; Errata 1-2 2017; INT 1 2017) National Electrical Safety Code



## NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA)

NASA NPR 8621.1 (2020d) NASA Procedural Requirements for Mishap and Close Call Reporting, Investigating, and Recordkeeping

NASA NPR 8715.3 (2017d; Change 1) NASA General Safety Program Requirements

NASA-STD 8719.12 (2021a; Change 2) Safety Standard for Explosives, Propellants, and Pyrotechnics

## NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA Z535.2 (2011; R 2017) Environmental and Facility Safety Signs

## NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 10 (2018; ERTA 1-2 2018) Standard for Portable Fire Extinguishers

NFPA 51B (2019; TIA 20-1) Standard for Fire Prevention During Welding, Cutting, and Other Hot Work

NFPA 70 (2020; ERTA 20-1 2020; ERTA 20-2 2020; TIA 20-1; TIA 20-2; TIA 20-3; TIA 20-4) National Electrical Code

NFPA 70E (2021) Standard for Electrical Safety in the Workplace

NFPA 241 (2019) Standard for Safeguarding Construction, Alteration, and Demolition Operations

NFPA 306 (2019) Standard for the Control of Gas Hazards on Vessels

## TELECOMMUNICATIONS INDUSTRY ASSOCIATION (TIA)

TIA-222 (2018H; Add 1 2019) Structural Standard for Antenna Supporting Structures and Antennas and Small Wind Turbine Support Structures

TIA-1019 (2012; R 2016) Standard for Installation, Alteration and Maintenance of Antenna Supporting Structures and Antennas

## U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1 (2014) Safety and Health Requirements Manual

## U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

10 CFR 20 Standards for Protection Against Radiation

29 CFR 1910	Occupational Safety and Health Standards
29 CFR 1910.146	Permit-required Confined Spaces
29 CFR 1910.147	The Control of Hazardous Energy (Lock Out/Tag Out)
29 CFR 1910.333	Selection and Use of Work Practices
29 CFR 1910.1000	Air Contaminants
29 CFR 1915	Confined and Enclosed Spaces and Other Dangerous Atmospheres in Shipyard Employment
29 CFR 1915.89	Control of Hazardous Energy (Lockout/Tags-Plus)
29 CFR 1919	Gear Certification
29 CFR 1926	Safety and Health Regulations for Construction
29 CFR 1926.16	Rules of Construction
29 CFR 1926.450	Scaffolds
29 CFR 1926.500	Fall Protection
29 CFR 1926.552	Material Hoists, Personal Hoists, and Elevators
29 CFR 1926.553	Base-Mounted Drum Hoists
29 CFR 1926.1400	Cranes and Derricks in Construction
49 CFR 173	Shippers - General Requirements for Shipments and Packagings
CPL 02-01-056	(2014) Inspection Procedures for Accessing Communication Towers by Hoist
CPL 2.100	(1995) Application of the Permit-Required Confined Spaces (PRCS) Standards, 29 CFR 1910.146

## 1.2 DEFINITIONS

### 1.2.1 Competent Person (CP)

The CP is a person designated in writing, who, through training, knowledge and experience, is capable of identifying, evaluating, and addressing existing and predictable hazards in the working environment or working conditions that are dangerous to personnel, and who has authorization to take prompt corrective measures with regards to such hazards.

#### 1.2.2 Competent Person, Confined Space

The CP, Confined Space, is a person meeting the competent person requirements as defined EM 385-1-1 Appendix Q, with thorough knowledge of OSHA's Confined Space Standard, 29 CFR 1910.146, and designated in writing to be responsible for the immediate supervision, implementation and monitoring of the confined space program, who through training, knowledge and experience in confined space entry is capable of identifying, evaluating and addressing existing and potential confined space hazards and, who has the authority to take prompt corrective measures with regard to such hazards.

#### 1.2.3 Competent Person, Cranes and Rigging

The CP, Cranes and Rigging, as defined in EM 385-1-1 Appendix Q, is a person meeting the competent person requirements, who has been designated in writing to be responsible for the immediate supervision, implementation and monitoring of the Crane and Rigging Program, who through training, knowledge and experience in crane and rigging is capable of identifying, evaluating and addressing existing and potential hazards and, who has the authority to take prompt corrective measures with regard to such hazards.

#### 1.2.4 Competent Person, Excavation/Trenching

A CP, Excavation/Trenching, is a person meeting the competent person requirements as defined in EM 385-1-1 Appendix Q and 29 CFR 1926, who has been designated in writing to be responsible for the immediate supervision, implementation and monitoring of the excavation/trenching program, who through training, knowledge and experience in excavation/trenching is capable of identifying, evaluating and addressing existing and potential hazards and, who has the authority to take prompt corrective measures with regard to such hazards.

#### 1.2.5 Competent Person, Fall Protection

The CP, Fall Protection, is a person meeting the competent person requirements as defined in EM 385-1-1 Appendix Q and in accordance with ASSP Z359.0, who has been designated in writing by the employer to be responsible for immediate supervising, implementing and monitoring of the fall protection program, who through training, knowledge and experience in fall protection and rescue systems and equipment, is capable of identifying, evaluating and addressing existing and potential fall hazards and, who has the authority to take prompt corrective measures with regard to such hazards.

#### 1.2.6 Competent Person, Scaffolding

The CP, Scaffolding is a person meeting the competent person requirements in EM 385-1-1 Appendix Q, and designated in writing by the employer to be responsible for immediate supervising, implementing and monitoring of the scaffolding program. The CP for Scaffolding has enough training, knowledge and experience in scaffolding to correctly identify, evaluate and address existing and potential hazards and also has the authority to take prompt corrective measures with regard to these hazards. CP qualifications must be documented including experience on the specific scaffolding systems/types being used, assessment of the base material that the scaffold will be erected upon, load calculations for materials and personnel, and erection and dismantling. The CP for scaffolding must have a documented minimum of 8-hours of scaffold training to include training

on the specific type of scaffold being used (e.g. mast-climbing, adjustable, tubular frame), in accordance with EM 385-1-1 Section 22.B.02.

#### 1.2.7 Competent Person (CP) Trainer

A competent person trainer as defined in EM 385-1-1 Appendix Q, who is qualified in the training material presented, and who possesses a working knowledge of applicable technical regulations, standards, equipment and systems related to the subject matter on which they are training Competent Persons. A competent person trainer must be familiar with the typical hazards and the equipment used in the industry they are instructing. The training provided by the competent person trainer must be appropriate to that specific industry. The competent person trainer must evaluate the knowledge and skills of the competent persons as part of the training process.

#### 1.2.8 High Risk Activities

High Risk Activities are activities that involve work at heights, crane and rigging, excavations and trenching, scaffolding, electrical work, and confined space entry.

#### 1.2.9 High Visibility Accident

A High Visibility Accident is any mishap which may generate publicity or high visibility.

#### 1.2.10 Load Handling Equipment (LHE)

LHE is a term used to describe cranes, hoists and all other hoisting equipment (hoisting equipment means equipment, including crane, derricks, hoists and power operated equipment used with rigging to raise, lower or horizontally move a load).

#### 1.2.11 Medical Treatment

Medical Treatment is treatment administered by a physician or by registered professional personnel under the standing orders of a physician. Medical treatment does not include first aid treatment even when provided by a physician or registered personnel.

#### 1.2.12 Near Miss

A Near Miss is a mishap resulting in no personal injury and zero property damage, but given a shift in time or position, damage or injury may have occurred (e.g., a worker falls off a scaffold and is not injured; a crane swings around to move the load and narrowly misses a parked vehicle).

#### 1.2.13 Operating Envelope

The Operating Envelope is the area surrounding any crane or load handling equipment. Inside this "envelope" is the crane, the operator, riggers and crane walkers, other personnel involved in the operation, rigging gear between the hook, the load, the crane's supporting structure (i.e. ground or rail), the load's rigging path, the lift and rigging procedure.

#### 1.2.14 Qualified Person (QP)

The QP is a person designated in writing, who, by possession of a

recognized degree, certificate, or professional standing, or extensive knowledge, training, and experience, has successfully demonstrated their ability to solve or resolve problems related to the subject matter, the work, or the project.

#### 1.2.15 Qualified Person, Fall Protection (QP for FP)

A QP for FP is a person meeting the definition requirements of EM 385-1-1 Appendix Q, and ASSP Z359.2 standard, having a recognized degree or professional certificate and with extensive knowledge, training and experience in the fall protection and rescue field who is capable of designing, analyzing, and evaluating and specifying fall protection and rescue systems.

#### 1.2.16 Recordable Injuries or Illnesses

Recordable Injuries or Illnesses are any work-related injury or illness that results in:

- a. Death, regardless of the time between the injury and death, or the length of the illness;
- b. Days away from work (any time lost after day of injury/illness onset);
- c. Restricted work;
- d. Transfer to another job;
- e. Medical treatment beyond first aid;
- f. Loss of consciousness; or
- g. A significant injury or illness diagnosed by a physician or other licensed health care professional, even if it did not result in (a) through (f) above

#### 1.2.17 Government Property and Equipment

Interpret "USACE" property and equipment specified in USACE EM 385-1-1 as Government property and equipment.

#### 1.2.18 Load Handling Equipment (LHE) Accident or Load Handling Equipment Mishap

A LHE accident occurs when any one or more of the eight elements in the operating envelope fails to perform correctly during operation, including operation during maintenance or testing resulting in personnel injury or death; material or equipment damage; dropped load; derailment; two-blocking; overload; or collision, including unplanned contact between the load, crane, or other objects. A dropped load, derailment, two-blocking, overload and collision are considered accidents, even though no material damage or injury occurs. A component failure (e.g., motor burnout, gear tooth failure, bearing failure) is not considered an accident solely due to material or equipment damage unless the component failure results in damage to other components (e.g., dropped boom, dropped load, or roll over). Document an LHE mishap using the Crane High Hazard working group mishap reporting form (Available at local USACE Safety Office).

### 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

#### SD-01 Preconstruction Submittals

Accident Prevention Plan (APP); G, RO

#### SD-06 Test Reports

Monthly Exposure Reports

Notifications and Reports

Accident Reports; G, RO

LHE Inspection Reports

#### SD-07 Certificates

Crane Operators/Riggers

Standard Lift Plan; G, RO

Critical Lift Plan; G, RO

Activity Hazard Analysis (AHA)

Confined Space Entry Permit

Hot Work Permit

Certificate of Compliance

License Certificates

### 1.4 MONTHLY EXPOSURE REPORTS

Provide a Monthly Exposure Report and attach to the monthly billing request. This report is a compilation of employee-hours worked each month for all site workers, both Prime and subcontractor. Failure to submit the report may result in retention of up to 10 percent of the voucher.

### 1.5 REGULATORY REQUIREMENTS

In addition to the detailed requirements included in the provisions of this Contract, comply with the most recent edition of USACE EM 385-1-1, and the following federal, state, and local laws, ordinances, criteria, rules and regulations. Submit matters of interpretation of standards to the appropriate administrative agency for resolution before starting work. Where the requirements of this specification, applicable laws, criteria, ordinances, regulations, and referenced documents vary, the most stringent requirements govern.

## 1.6 SITE QUALIFICATIONS, DUTIES, AND MEETINGS

### 1.6.1 Personnel Qualifications

#### 1.6.1.1 Site Safety and Health Officer (SSHO)

Provide an SSHO that meets the requirements of EM 385-1-1 Section 1. The SSHO must ensure that the requirements of 29 CFR 1926.16 are met for the project. Provide a Safety oversight team that includes a minimum of one person at each project site to function as the Site Safety and Health Officer (SSHO). The SSHO or an equally-qualified Alternate SSHO must be at the work site at all times to implement and administer the Contractor's safety program and Government-accepted Accident Prevention Plan. The SSHO and Alternate SSHO must have the required training, experience, and qualifications in accordance with EM 385-1-1 Section 01.A.17, and all associated sub-paragraphs.

If the SSHO is off-site for a period longer than 24 hours, an equally-qualified alternate SSHO must be provided and must fulfill the same roles and responsibilities as the primary SSHO. When the SSHO is temporarily (up to 24 hours) off-site, a Designated Representative (DR), as identified in the AHA may be used in lieu of an Alternate SSHO, and must be on the project site at all times when work is being performed. Note that the DR is a collateral duty safety position, with safety duties in addition to their full time occupation.

##### 1.6.1.1.1 Additional Site Safety and Health Officer (SSHO) Requirements and Duties

The SSHO may not serve as the Quality Control Manager. The SSHO may not serve as the Superintendent.

#### 1.6.1.2 Competent Person Qualifications

Provide Competent Persons in accordance with EM 385-1-1, Appendix Q and herein. Competent Persons for high risk activities include confined space, cranes and rigging, excavation/trenching, fall protection, and electrical work. The CP for these activities must be designated in writing, and meet the requirements for the specific activity (i.e. competent person, fall protection).

The Competent Person identified in the Contractor's Safety and Health Program and accepted Accident Prevention Plan, must be on-site at all times when the work that presents the hazards associated with their professional expertise is being performed. Provide the credentials of the Competent Persons(s) to the Contracting Officer for information in consultation with the Safety Office.

##### 1.6.1.2.1 Competent Person for Confined Space Entry

Provide a Confined Space (CP) Competent Person who meets the requirements of EM 385-1-1, Appendix Q, and herein. The CP for Confined Space Entry must supervise the entry into each confined space in accordance with EM 385-1-1, Section 34.

##### 1.6.1.2.2 Competent Person for Scaffolding

Provide a Competent Person for Scaffolding who meets the requirements of EM 385-1-1, Section 22.B.02 and herein.

#### 1.6.1.2.3 Competent Person for Fall Protection

Provide a Competent Person for Fall Protection who meets the requirements of EM 385-1-1, Section 21.C.04, 21.B.03, and herein.

#### 1.6.1.3 Qualified Trainer Requirements

Individuals qualified to instruct the 40 hour contract safety awareness course, or portions thereof, must meet the definition of a Competent Person Trainer, and, at a minimum, possess a working knowledge of the following subject areas: EM 385-1-1, Electrical Standards, Lockout/Tagout, Fall Protection, Confined Space Entry for Construction; Excavation, Trenching and Soil Mechanics, and Scaffolds in accordance with 29 CFR 1926.450, Subpart L.

Instructors are required to:

- a. Prepare class presentations that cover construction-related safety requirements.
- b. Ensure that all attendees attend all sessions by using a class roster signed daily by each attendee. Maintain copies of the roster for at least five years. This is a certification class and must be attended 100 percent. In cases of emergency where an attendee cannot make it to a session, the attendee can make it up in another class session for the same subject.
- c. Update training course materials whenever an update of the EM 385-1-1 becomes available.
- d. Provide a written exam of at least 50 questions. Students are required to answer 80 percent correctly to pass.
- e. Request, review and incorporate student feedback into a continuous course improvement program.

#### 1.6.1.4 Crane Operators/Riggers

Provide Operators, Signal Persons, and Riggers meeting the requirements in EM 385-1-1, Section 15.B for Riggers and Section 16.B for Crane Operators and Signal Persons. In addition, for mobile cranes with Original Equipment Manufacturer (OEM) rated capacities of 50,000 pounds or greater, designate crane operators qualified by a source that qualifies crane operators (i.e., union, a Government agency, or an organization that tests and qualifies crane operators). Provide proof of current qualification.

#### 1.6.2 Personnel Duties

##### 1.6.2.1 Duties of the Site Safety and Health Officer (SSHO)

The SSHO must:

- a. Conduct daily safety and health inspections and maintain a written log which includes area/operation inspected, date of inspection, identified hazards, recommended corrective actions, estimated and actual dates of corrections. Attach safety inspection logs to the Contractors' daily production report.



- b. Conduct mishap investigations and complete required accident reports. Report mishaps and near misses.
- c. Use and maintain OSHA's Form 300 to log work-related injuries and illnesses occurring on the project site for Prime Contractors and subcontractors, and make available to the Contracting Officer upon request. Post and maintain the Form 300A on the site Safety Bulletin Board.
- d. Maintain applicable safety reference material on the job site.
- e. Attend the pre-construction conference, pre-work meetings including preparatory meetings, and periodic in-progress meetings.
- f. Review the APP and AHAs for compliance with EM 385-1-1, and approve, sign, implement and enforce them.
- g. Establish a Safety and Occupational Health (SOH) Deficiency Tracking System that lists and monitors outstanding deficiencies until resolution.
- h. Ensure subcontractor compliance with safety and health requirements.
- i. Maintain a list of hazardous chemicals on site and their material Safety Data Sheets (SDS).
- j. Maintain a weekly list of high hazard activities involving energy, equipment, excavation, entry into confined space, and elevation, and be prepared to discuss details during QC Meetings.
- k. Provide and keep a record of site safety orientation and indoctrination for Contractor employees, subcontractor employees, and site visitors.

Superintendent, QC Manager, and SSHO are subject to dismissal if the above or any other required duties are not being effectively carried out. If either the Superintendent, QC Manager, or SSHO is dismissed, project work will be stopped and will not be allowed to resume until a suitable replacement is approved and the above duties are again being effectively carried out.

### 1.6.3 Meetings

#### 1.6.3.1 Preconstruction Conference

- a. Contractor representatives who have a responsibility or significant role in accident prevention on the project must attend the preconstruction conference. This includes the project superintendent, Site Safety and Occupational Health Officer, quality control manager, or any other assigned safety and health professionals who participated in the development of the APP (including the Activity Hazard Analyses (AHAs) and special plans, program and procedures associated with it).
- b. Discuss the details of the submitted APP to include incorporated plans, programs, procedures and a listing of anticipated AHAs that will be developed and implemented during the performance of the Contract. This list of proposed AHAs will be reviewed and an agreement will be reached between the Contractor and the Contracting Officer as to which phases will require an analysis. In addition,

establish a schedule for the preparation, submittal, and Government review of AHAs to preclude project delays.

- c. Deficiencies in the submitted APP, identified during the Contracting Officer's review, must be corrected, and the APP re-submitted for review prior to the start of construction. Work is not permitted to begin until an APP is established that is acceptable to the Contracting Officer.

#### 1.6.3.2 Safety Meetings

Conduct safety meetings to review past activities, plan for new or changed operations, review pertinent aspects of appropriate AHA (by trade), establish safe working procedures for anticipated hazards, and provide pertinent Safety and Occupational Health (SOH) training and motivation. Conduct meetings at least once a month for all supervisors at the project location. The SSHO, supervisors, foremen, or CDSOs must conduct meetings at least once a week for the trade workers. Document meeting minutes to include the date, persons in attendance, subjects discussed, and names of individual(s) who conducted the meeting. Maintain documentation on-site and furnish copies to the Contracting Officer on request. Notify the Contracting Officer of all scheduled meetings 7 calendar days in advance.

#### 1.7 ACCIDENT PREVENTION PLAN (APP)

Provide a site-specific Accident Prevention Plan (APP), including Activity Hazard Analyses (AHA), in accordance with EM 385-1-1 Appendix A, for the design team to follow during site visits and investigations. For subsequent visits, update the plan if there are changes in the personnel who will be attending, or the tasks to be performed. Submit the APP for review and acceptance by the Government at least 15 calendar days prior to the start of the design field work. Field work may not begin until the design APP is accepted by the Contracting Officer.

If the design scope includes borings or other subsurface investigations, include in the APP the type of field investigation and verification techniques, such as visual, local utility locating service scanning and third party/subcontractor scanning, potholing, or hand digging within two feet of a known utility that will be required. Mark underground utilities before starting any ground-disturbing actions. Notify the Contracting Officer 15 days prior to the start of soil borings or sub-surface investigations.

Prior to the start of construction incorporate the Design APP into the Construction APP so that one site specific APP exists for the project and submit to the Contracting Officer for acceptance.

##### 1.7.1 ACCIDENT PREVENTION PLAN (APP)

A qualified person must prepare the written site-specific APP. Prepare the APP in accordance with the format and requirements of EM 385-1-1, Appendix A, and as supplemented herein. Cover all paragraph and subparagraph elements in EM 385-1-1, Appendix A. The APP must be job-specific and address any unusual or unique aspects of the project or activity for which it is written. The APP must interface with the Contractor's overall safety and health program referenced in the APP in the applicable APP element, and made site-specific. Describe the methods to evaluate past safety performance of potential subcontractors in the selection process. Also, describe innovative methods used to ensure and

monitor safe work practices of subcontractors. The Government considers the Prime Contractor to be the "controlling authority" for all work site safety and health of the subcontractors. Contractors are responsible for informing their subcontractors of the safety provisions under the terms of the Contract and the penalties for noncompliance, coordinating the work to prevent one craft from interfering with or creating hazardous working conditions for other crafts, and inspecting subcontractor operations to ensure that accident prevention responsibilities are being carried out. The APP must be signed by an officer of the firm (Prime Contractor senior person), the individual preparing the APP, the on-site superintendent, the designated SSHO, the Contractor Quality Control Manager, and any designated Certified Safety Professional (CSP) or Certified Health Physicist (CIH). The SSHO must provide and maintain the APP and a log of signatures by each subcontractor foreman, attesting that they have read and understand the APP, and make the APP and log available on-site to the Contracting Officer. If English is not the foreman's primary language, the Prime Contractor must provide an interpreter.

Submit the APP to the Contracting Officer 15 calendar days prior to the date of the preconstruction conference for acceptance. Work cannot proceed without an accepted APP. Once reviewed and accepted by the Contracting Officer, the APP and attachments will be enforced as part of the Contract. Disregarding the provisions of this Contract or the accepted APP is cause for stopping of work, at the discretion of the Contracting Officer, until the matter has been rectified. Continuously review and amend the APP, as necessary, throughout the life of the Contract. Changes to the accepted APP must be made with the knowledge and concurrence of the Contracting Officer, project superintendent, SSHO and Quality Control Manager. Incorporate unusual or high-hazard activities not identified in the original APP as they are discovered. Should any severe hazard exposure (i.e. imminent danger) become evident, stop work in the area, secure the area, and develop a plan to remove the exposure and control the hazard. Notify the Contracting Officer within 24 hours of discovery. Eliminate and remove the hazard. In the interim, take all necessary action to restore and maintain safe working conditions in order to safeguard onsite personnel, visitors, the public (as defined by ASSP A10.34), and the environment.

#### 1.7.2 Names and Qualifications

Provide plans in accordance with the requirements outlined in Appendix A of EM 385-1-1, including the following:

- a. Names and qualifications (resumes including education, training, experience and certifications) of site safety and health personnel designated to perform work on this project to include the designated Site Safety and Health Officer and other competent and qualified personnel to be used. Specify the duties of each position.
- b. Qualifications of competent and of qualified persons. As a minimum, designate and submit qualifications of competent persons for each of the following major areas: excavation; scaffolding; fall protection; hazardous energy; confined space; health hazard recognition, evaluation and control of chemical, physical and biological agents; and personal protective equipment and clothing to include selection, use and maintenance.

### 1.7.3 Plans

Provide plans in the APP in accordance with the requirements outlined in Appendix A of EM 385-1-1, including the following:

#### 1.7.3.1 Confined Space Entry Plan

Develop a confined or enclosed space entry plan in accordance with EM 385-1-1, applicable OSHA standards 29 CFR 1910, 29 CFR 1915, and 29 CFR 1926, OSHA Directive CPL 2.100, and any other federal, state and local regulatory requirements identified in this Contract. Identify the qualified person's name and qualifications, training, and experience. Delineate the qualified person's authority to direct work stoppage in the event of hazardous conditions. Include procedure for rescue by Contractor personnel and the coordination with emergency responders. (If there is no confined space work, include a statement that no confined space work exists and none will be created.)

#### 1.7.3.2 Standard Lift Plan (SLP)

Plan lifts to avoid situations where the operator cannot maintain safe control of the lift. Prepare a written SLP in accordance with EM 385-1-1, Section 16.A.03, using Form 16-2 for every lift or series of lifts (if duty cycle or routine lifts are being performed). The SLP must be developed, reviewed and accepted by all personnel involved in the lift in conjunction with the associated AHA. Signature on the AHA constitutes acceptance of the plan. Maintain the SLP on the LHE for the current lift(s) being made. Maintain historical SLPs for a minimum of three months.

#### 1.7.3.3 Critical Lift Plan - Crane or Load Handling Equipment

Provide a Critical Lift Plan as required by EM 385-1-1, Section 16.H.01, using Form 16-3. In addition, Critical Lift Plans are required for the following:

- a. Lifts over 50 percent of the capacity of barge mounted mobile crane's hoist.
- b. When working around energized power lines where the work will get closer than the minimum clearance distance in EM 385-1-1 Table 16-1.
- c. For lifts with anticipated binding conditions.
- d. When erecting cranes.

##### 1.7.3.3.1 Critical Lift Plan Planning and Schedule

Critical lifts require detailed planning and additional or unusual safety precautions. Develop and submit a critical lift plan to the Contracting Officer 30 calendar days prior to critical lift. Comply with load testing requirements in accordance with EM 385-1-1, Section 16.F.03.

##### 1.7.3.3.2 Lifts of Personnel

In addition to the requirements of EM 385-1-1, Section 16.H.02, for lifts of personnel, demonstrate compliance with the requirements of 29 CFR 1926.1400 and EM 385-1-1, Section 16.T.

#### 1.7.3.4 Multi-Purpose Machines, Material Handling Equipment, and Construction Equipment Lift Plan

Multi-purpose machines, material handling equipment, and construction equipment used to lift loads that are suspended by rigging gear, require proof of authorization from the machine OEM that the machine is capable of making lifts of loads suspended by rigging equipment. Written approval from a qualified registered professional engineer, after a safety analysis is performed, is allowed in lieu of the OEM's approval. Demonstrate that the operator is properly trained and that the equipment is properly configured to make such lifts and is equipped with a load chart.

#### 1.7.3.5 Fall Protection and Prevention (FP&P) Plan

The plan must be in accordance with the requirements of EM 385-1-1, Section 21.D and ASSP Z359.2, be site specific, and address all fall hazards in the work place and during different phases of construction. Address how to protect and prevent workers from falling to lower levels when they are exposed to fall hazards above 6 feet. A competent person or qualified person for fall protection must prepare and sign the plan documentation. Include fall protection and prevention systems, equipment and methods employed for every phase of work, roles and responsibilities, assisted rescue, self-rescue and evacuation procedures, training requirements, and monitoring methods. Review and revise, as necessary, the Fall Protection and Prevention Plan documentation as conditions change, but at a minimum every six months, for lengthy projects, reflecting any changes during the course of construction due to changes in personnel, equipment, systems or work habits. Keep and maintain the accepted Fall Protection and Prevention Plan documentation at the job site for the duration of the project. Include the Fall Protection and Prevention Plan documentation in the Accident Prevention Plan (APP).

#### 1.7.3.6 Rescue and Evacuation Plan

Provide a Rescue and Evacuation Plan in accordance with EM 385-1-1 Section 21.N and ASSP Z359.2, and include in the FP&P Plan and as part of the APP. Include a detailed discussion of the following: methods of rescue; methods of self-rescue; equipment used; training requirement; specialized training for the rescuers; procedures for requesting rescue and medical assistance; and transportation routes to a medical facility.

#### 1.7.3.7 Hazardous Energy Control Program (HECP)

Develop a HECP in accordance with EM 385-1-1 Section 12, 29 CFR 1910.147, 29 CFR 1910.333, 29 CFR 1915.89, ASSP Z244.1, and ASSP A10.44. Submit this HECP as part of the Accident Prevention Plan (APP). Conduct a preparatory meeting and inspection with all effected personnel to coordinate all HECP activities. Document this meeting and inspection in accordance with EM 385-1-1, Section 12.A.02. Ensure that each employee is familiar with and complies with these procedures.

#### 1.7.3.8 Excavation Plan

Identify the safety and health aspects of excavation, and provide and prepare the plan in accordance with EM 385-1-1, Section 25.A and Section 31 00 00 EARTHWORK (as provided by the designer of record).

#### 1.7.3.9 Site Demolition Plan

Identify the safety and health aspects, and prepare in accordance with Section 02 41 00 DEMOLITION and referenced sources.

### 1.8 ACTIVITY HAZARD ANALYSIS (AHA)

Before beginning each activity, task or Definable Feature of Work (DFOW) involving a type of work presenting hazards not experienced in previous project operations, or where a new work crew or subcontractor is to perform the work, the Contractor(s) performing that work activity must prepare an AHA. AHAs must be developed by the Prime Contractor, subcontractor, or supplier performing the work, and provided for Prime Contractor review and approval before submitting to the Contracting Officer. AHAs must be signed by the SSHO, Superintendent, QC Manager and the subcontractor Foreman performing the work. Format the AHA in accordance with EM 385-1-1, Section 1 or as directed by the Contracting Officer. Submit the AHA for review at least 15 working days prior to the start of each activity task, or DFOW. The Government reserves the right to require the Contractor to revise and resubmit the AHA if it fails to effectively identify the work sequences, specific anticipated hazards, site conditions, equipment, materials, personnel and the control measures to be implemented.

AHAs must identify competent persons required for phases involving high risk activities, including confined entry, crane and rigging, excavations, trenching, electrical work, fall protection, and scaffolding.

#### 1.8.1 AHA Management

Review the AHA list periodically (at least monthly) at the Contractor supervisory safety meeting, and update as necessary when procedures, scheduling, or hazards change. Use the AHA during daily inspections by the SSHO to ensure the implementation and effectiveness of the required safety and health controls for that work activity.

#### 1.8.2 AHA Signature Log

Each employee performing work as part of an activity, task or DFOW must review the AHA for that work and sign a signature log specifically maintained for that AHA prior to starting work on that activity. The SSHO must maintain a signature log on site for every AHA. Provide employees whose primary language is other than English, with an interpreter to ensure a clear understanding of the AHA and its contents.

### 1.9 DISPLAY OF SAFETY INFORMATION

#### 1.9.1 Safety Bulletin Board

Prior to commencement of work, erect a safety bulletin board at the job site. Where size, duration, or logistics of project do not facilitate a bulletin board, an alternative method, acceptable to the Contracting Officer, that is accessible and includes all mandatory information for employee and visitor review, may be deemed as meeting the requirement for a bulletin board. Include and maintain information on safety bulletin board as required by EM 385-1-1, Section 01.A.07. Additional items required to be posted include:

- a. Confined space entry permit.

- b. Hot work permit.

#### 1.9.2 Safety and Occupational Health (SOH) Deficiency Tracking System

Establish a SOH deficiency tracking system that lists and monitors the status of SOH deficiencies in chronological order. Use the tracking system to evaluate the effectiveness of the APP. A monthly evaluation of the data must be discussed in the QC or SOH meeting with everyone on the project. The list must be posted on the project bulletin board and updated daily, and provide the following information:

- a. Date deficiency identified;
- b. Description of deficiency;
- c. Name of person responsible for correcting deficiency;
- d. Projected resolution date;
- e. Date actually resolved.

#### 1.10 SITE SAFETY REFERENCE MATERIALS

Maintain safety-related references applicable to the project, including those listed in paragraph REFERENCES. Maintain applicable equipment manufacturer's manuals.

#### 1.11 EMERGENCY MEDICAL TREATMENT

Contractors must arrange for their own emergency medical treatment in accordance with EM 385-1-1. Government has no responsibility to provide emergency medical treatment.

#### 1.12 NOTIFICATIONS and REPORTS

##### 1.12.1 Mishap Notification

Notify the Contracting Officer as soon as practical, but no more than twenty-four hours, after any mishaps, including recordable accidents, incidents, and near misses, as defined in EM 385-1-1 Appendix Q, any report of injury, illness, or any property damage. For LHE or rigging mishaps, notify the Contracting Officer as soon as practical but not more than four hours after mishap. The Contractor is responsible for obtaining appropriate medical and emergency assistance and for notifying fire, law enforcement, and regulatory agencies. Immediate reporting is required for electrical mishaps, to include Arc Flash; shock; uncontrolled release of hazardous energy (includes electrical and non-electrical); load handling equipment or rigging; fall from height (any level other than same surface); and underwater diving. These mishaps must be investigated in depth to identify all causes and to recommend hazard control measures.

Within notification include Contractor name; Contract title; type of Contract; name of activity, installation or location where accident occurred; date and time of accident; names of personnel injured; extent of property damage, if any; extent of injury, if known, and brief description of accident (for example, type of construction equipment used and PPE used). Preserve the conditions and evidence on the accident site until the Government investigation team arrives on-site and Government

investigation is conducted. Assist and cooperate fully with the Government's investigation(s) of any mishap.

#### 1.12.2 Accident Reports

- a. Conduct an accident investigation for recordable injuries and illnesses, property damage, and near misses as defined in EM 385-1-1, to establish the root cause(s) of the accident. Complete the applicable USACE Accident Report ENG Form 3394, and provide the report to the Contracting Officer within 5 calendar days of the accident. The Contracting Officer will provide copies of any required or special forms.
- b. Near Misses: For Army projects, report all "Near Misses" to the GDA, using local mishap reporting procedures, within 24 hrs. The Contracting Officer will provide the Contractor the required forms. Near miss reports are considered positive and proactive Contractor safety management actions.
- c. Conduct an accident investigation for any load handling equipment accident (including rigging accidents) to establish the root cause(s) of the accident. Complete the LHE Accident Report (Crane and Rigging Accident Report) form and provide the report to the Contracting Officer within 30 calendar days of the accident. Do not proceed with crane operations until cause is determined and corrective actions have been implemented to the satisfaction of the Contracting Officer. The Contracting Officer will provide a blank copy of the accident report form.

#### 1.12.3 LHE Inspection Reports

Submit LHE inspection reports required in accordance with EM 385-1-1 and as specified herein with Daily Reports of Inspections.

#### 1.12.4 Certificate of Compliance and Pre-lift Plan/Checklist for LHE and Rigging

Provide a FORM 16-1 Certificate of Compliance for LHE entering an activity under this Contract and in accordance with EM 385-1-1. Post certifications on the crane.

Develop a Standard Lift Plan (SLP) in accordance with EM 385-1-1, Section 16.H.03 using Form 16-2 Standard Pre-Lift Crane Plan/Checklist for each lift planned. Submit SLP to the Contracting Officer for approval within 15 calendar days in advance of planned lift.

#### 1.13 HOT WORK

##### 1.13.1 Permit and Personnel Requirements

Submit and obtain a written permit prior to performing "Hot Work" (i.e. welding or cutting) or operating other flame-producing/spark producing devices, from the Contracting Officer's representative. A permit is required from the Explosives Safety Office for work in and around where explosives are processed, stored, or handled. CONTRACTORS ARE REQUIRED TO MEET ALL CRITERIA BEFORE A PERMIT IS ISSUED. Provide at least two 20 pound 4A:20 BC rated extinguishers for normal "Hot Work". The extinguishers must be current inspection tagged, and contain an approved safety pin and tamper resistant seal. It is also mandatory to have a designated FIRE



WATCH for any "Hot Work" done at this activity. The Fire Watch must be trained in accordance with NFPA 51B and remain on-site for a minimum of one hour after completion of the task or as specified on the hot work permit.

When starting work in the facility, require personnel to familiarize themselves with the location of the nearest fire alarm boxes and knowledge of emergency response plan and emergency phone numbers/contacts. REPORT ANY FIRE, NO MATTER HOW SMALL, TO THE RESPONSIBLE FIRE DEPARTMENT OR CONTRACTING OFFICER IMMEDIATELY.

#### 1.13.2 Work Around Flammable Materials

Obtain permit approval from a NFPA Certified Marine Chemist, or Certified Industrial Hygienist for "HOT WORK" within or around flammable materials (such as fuel systems or welding/cutting on fuel pipes) or confined spaces (such as sewer wet wells, manholes, or vaults) that have the potential for flammable or explosive atmospheres.

Whenever these materials, except beryllium and chromium (VI), are encountered in indoor operations, local mechanical exhaust ventilation systems that are sufficient to reduce and maintain personal exposures to within acceptable limits must be used and maintained in accordance with manufacturer's instruction and supplemented by exceptions noted in EM 385-1-1, Section 06.H

#### 1.14 RADIATION SAFETY REQUIREMENTS

Submit License Certificates, employee training records, and Leak Test Reports for radiation materials and equipment to the Contracting Officer and Radiation Safety Office (RSO) for all specialized and licensed material and equipment proposed for use on the construction project (excludes portable machine sources of ionizing radiation including moisture density and X-Ray Fluorescence (XRF)). Maintain on-site records whenever licensed radiological materials or ionizing equipment are on Government property.

Protect workers from radiation exposure in accordance with 10 CFR 20, ensuring any personnel exposures are maintained As Low As Reasonably Achievable.

#### 1.15 CONFINED SPACE ENTRY REQUIREMENTS

Confined space entry must comply with Section 34 of EM 385-1-1, OSHA 29 CFR 1926, OSHA 29 CFR 1910, OSHA 29 CFR 1910.146, and OSHA Directive CPL 2.100. Any potential for a hazard in the confined space requires a permit system to be used.

##### 1.15.1 Entry Procedures

Prohibit entry into a confined space by personnel for any purpose, including hot work, until the qualified person has conducted appropriate tests to ensure the confined or enclosed space is safe for the work intended and that all potential hazards are controlled or eliminated and documented. Comply with EM 385-1-1, Section 34 for entry procedures. Hazards pertaining to the space must be reviewed with each employee during review of the AHA.

### 1.15.2 Forced Air Ventilation

Forced air ventilation is required for all confined space entry operations and the minimum air exchange requirements must be maintained to ensure exposure to any hazardous atmosphere is kept below its action level.

### 1.15.3 Sewer Wet Wells

Sewer wet wells require continuous atmosphere monitoring with audible alarm for toxic gas detection.

### 1.15.4 Rescue Procedures and Coordination with Local Emergency Responders

Develop and implement an on-site rescue and recovery plan and procedures. The rescue plan must not rely on local emergency responders for rescue from a confined space.

## 1.16 SEVERE STORM PLAN

In the event of a severe storm warning, the Contractor must comply with the applicable Storm Plan and:

- a. Secure outside equipment and materials and place materials that could be damaged in protected areas.
- b. Check surrounding area, including roof, for loose material, equipment, debris, and other objects that could be blown away or against existing facilities.
- c. Ensure that temporary erosion controls are adequate.

## PART 2 PRODUCTS

Not Used

## PART 3 EXECUTION

### 3.1 CONSTRUCTION AND OTHER WORK

Comply with EM 385-1-1, NFPA 70, NFPA 70E, NFPA 241, the APP, the AHA, Federal and State OSHA regulations, and other related submittals and activity fire and safety regulations. The most stringent standard prevails.

PPE is governed in all areas by the nature of the work the employee is performing. Use personal hearing protection at all times in designated noise hazardous areas or when performing noise hazardous tasks. Safety glasses must be worn or carried/available on each person. Mandatory PPE includes:

- a. Hard Hat
- b. Long Pants
- c. Appropriate Safety Shoes
- d. Appropriate Class Reflective Vests

### 3.1.1 Worksite Communication

Employees working alone in a remote location or away from other workers must be provided an effective means of emergency communications (i.e., cellular phone, two-way radios, land-line telephones or other acceptable means). The selected communication must be readily available (easily within the immediate reach) of the employee and must be tested prior to the start of work to verify that it effectively operates in the area/environment. Develop an employee check-in/check-out communication procedure to ensure employee safety.

### 3.1.2 Hazardous Material Exclusions

Notwithstanding any other hazardous material used in this Contract, radioactive materials or instruments capable of producing ionizing/non-ionizing radiation (with the exception of radioactive material and devices used in accordance with EM 385-1-1 such as nuclear density meters for compaction testing and laboratory equipment with radioactive sources) as well as materials which contain asbestos, mercury or polychlorinated biphenyls, di-isocyanates, lead-based paint, and hexavalent chromium, are prohibited. The Contracting Officer, upon written request by the Contractor, may consider exceptions to the use of any of the above excluded materials. Low mercury lamps used within fluorescent lighting fixtures are allowed as an exception without further Contracting Officer approval. Notify the Radiation Safety Officer (RSO) prior to excepted items of radioactive material and devices being brought on base.

### 3.1.3 Unforeseen Hazardous Material

Contract documents identify materials such as PCB, lead paint, and friable and non-friable asbestos and other OSHA regulated chemicals (i.e. 29 CFR 1910.1000). If material(s) that may be hazardous to human health upon disturbance are encountered during construction operations, stop that portion of work, notify the Contracting Officer immediately and determine if the material is hazardous. If material is not hazardous or poses no danger, the Government will direct the Contractor to proceed without change. If material is hazardous and handling of the material is necessary to accomplish the work, the Government will issue a modification pursuant to FAR 52.243-4 Changes and FAR 52.236-2 Differing Site Conditions.

## 3.2 UTILITY OUTAGE REQUIREMENTS

Apply for utility outages per Section 01 30 00.24 OTHER ADMINISTRATIVE AND SPECIAL REQUIREMENTS. At a minimum, the written request must include the location of the outage, utilities being affected, duration of outage, any necessary sketches, and a description of the means to fulfill energy isolation requirements in accordance with EM 385-1-1, Section 11.A.02 (Isolation). Some examples of energy isolation devices and procedures are highlighted in EM 385-1-1, Section 12.D. In accordance with EM 385-1-1, Section 12.A.01, where outages involve Government or Utility personnel, coordinate with the Government on all activities involving the control of hazardous energy.

These activities include, but are not limited to, a review of HECF and HEC procedures, as well as applicable Activity Hazard Analyses (AHAs). In accordance with EM 385-1-1, Section 11.A.02 and NFPA 70E, work on energized electrical circuits must not be performed without prior

Government authorization. Government permission is considered through the permit process and submission of a detailed AHA. Energized work permits are considered only when de-energizing introduces additional or increased hazard or when de-energizing is infeasible.

### 3.3 OUTAGE COORDINATION MEETING

After the utility outage request is approved and prior to beginning work on the utility system requiring shut-down, conduct a pre-outage coordination meeting in accordance with EM 385-1-1, Section 12.A. This meeting must include the Prime Contractor, the Prime and subcontractors performing the work, the Contracting Officer, and the Installation or Public Utilities representative. All parties must fully coordinate HEC activities with one another. During the coordination meeting, all parties must discuss and coordinate on the scope of work, HEC procedures (specifically, the lock-out/tag-out procedures for worker and utility protection), the AHA, assurance of trade personnel qualifications, identification of competent persons, and compliance with HECP training in accordance with EM 385-1-1, Section 12.C. Clarify when personal protective equipment is required during switching operations, inspection, and verification.

### 3.4 CONTROL OF HAZARDOUS ENERGY (LOCKOUT/TAGOUT)

Provide and operate a Hazardous Energy Control Program (HECP) in accordance with EM 385-1-1 Section 12, 29 CFR 1910.333, 29 CFR 1915.89, ASSP A10.44, NFPA 70E, and paragraph HAZARDOUS ENERGY CONTROL PROGRAM (HECP).

#### 3.4.1 Safety Preparatory Inspection Coordination Meeting with the Government or Utility

For electrical distribution equipment that is to be operated by Government or Utility personnel, the Prime Contractor and the subcontractor performing the work must attend the safety preparatory inspection coordination meeting, which will also be attended by the Contracting Officer's Representative, and required by EM 385-1-1, Section 12.A.02. The meeting will occur immediately preceding the start of work and following the completion of the outage coordination meeting. Both the safety preparatory inspection coordination meeting and the outage coordination meeting must occur prior to conducting the outage and commencing with lockout/tagout procedures.

#### 3.4.2 Lockout/Tagout Isolation

Where the Government or Utility performs equipment isolation and lockout/tagout, the Contractor must place their own locks and tags on each energy-isolating device and proceed in accordance with the HECP. Before any work begins, both the Contractor and the Government or Utility must perform energy isolation verification testing while wearing required PPE detailed in the Contractor's AHA and required by EM 385-1-1, Sections 05.I and 11.B. Install personal protective grounds, with tags, to eliminate the potential for induced voltage in accordance with EM 385-1-1, Section 12.E.06.

#### 3.4.3 Lockout/Tagout Removal

Upon completion of work, conduct lockout/tagout removal procedure in accordance with the HECP. In accordance with EM 385-1-1, Section 12.E.08,

each lock and tag must be removed from each energy isolating device by the authorized individual or systems operator who applied the device. Provide formal notification to the Government (by completing the Government form if provided by Contracting Officer's Representative), confirming that steps of de-energization and lockout/tagout removal procedure have been conducted and certified through inspection and verification. Government or Utility locks and tags used to support the Contractor's work will not be removed until the authorized Government employee receives the formal notification.

### 3.5 FALL PROTECTION PROGRAM

Establish a fall protection program, for the protection of all employees exposed to fall hazards. Within the program include company policy, identify roles and responsibilities, education and training requirements, fall hazard identification, prevention and control measures, inspection, storage, care and maintenance of fall protection equipment and rescue and evacuation procedures in accordance with ASSP Z359.2 and EM 385-1-1, Sections 21.A and 21.D.

#### 3.5.1 Training

Institute a fall protection training program. As part of the Fall Protection Program, provide training for each employee who might be exposed to fall hazards and using personal fall protection equipment. Provide training by a competent person for fall protection in accordance with EM 385-1-1, Section 21.C. Document training and practical application of the competent person in accordance with EM 385-1-1, Section 21.C.04 and ASSP Z359.2 in the AHA.

#### 3.5.2 Fall Protection Equipment and Systems

Enforce use of personal fall protection equipment and systems designated (to include fall arrest, restraint, and positioning) for each specific work activity in the Site Specific Fall Protection and Prevention Plan and AHA at all times when an employee is exposed to a fall hazard. Protect employees from fall hazards as specified in EM 385-1-1, Section 21.

Provide personal fall protection equipment, systems, subsystems, and components that comply with EM 385-1-1 Section 21.I, 29 CFR 1926.500 Subpart M, ASSP Z359.0, ASSP Z359.1, ASSP Z359.2, ASSP Z359.3, ASSP Z359.4, ASSP Z359.6, ASSP Z359.7, ASSP Z359.11, ASSP Z359.12, ASSP Z359.13, ASSP Z359.14, ASSP Z359.15, ASSP Z359.16 and ASSP Z359.18.

##### 3.5.2.1 Additional Personal Fall Protection Measures

In addition to the required fall protection systems, other protective measures such as safety skiffs, personal floatation devices, and life rings, are required when working above or next to water in accordance with EM 385-1-1, Sections 21.O through 21.O.06. Personal fall protection systems and equipment are required when working from an articulating or extendible boom, swing stages, or suspended platform. In addition, personal fall protection systems are required when operating other equipment such as scissor lifts. The need for tying-off in such equipment is to prevent ejection of the employee from the equipment during raising, lowering, travel, or while performing work.

### 3.5.2.2 Personal Fall Protection Equipment

Only a full-body harness with a shock-absorbing lanyard or self-retracting lanyard is an acceptable personal fall arrest body support device. The use of body belts is not acceptable. Harnesses must have a fall arrest attachment affixed to the body support (usually a Dorsal D-ring) and specifically designated for attachment to the rest of the system. Snap hooks and carabineers must be self-closing and self-locking, capable of being opened only by at least two consecutive deliberate actions and have a minimum gate strength of 3,600 lbs in all directions. Use webbing, straps, and ropes made of synthetic fiber. The maximum free fall distance when using fall arrest equipment must not exceed 6 feet, unless the proper energy absorbing lanyard is used. Always take into consideration the total fall distance and any swinging of the worker (pendulum-like motion), that can occur during a fall, when attaching a person to a fall arrest system. Equip all full body harnesses with Suspension Trauma Preventers such as stirrups, relief steps, or similar in order to provide short-term relief from the effects of orthostatic intolerance in accordance with EM 385-1-1, Section 21.I.06.

### 3.5.3 Fall Protection for Roofing Work

Implement fall protection controls based on the type of roof being constructed and work being performed. Evaluate the roof area to be accessed for its structural integrity including weight-bearing capabilities for the projected loading.

#### a. Low Sloped Roofs:

- (1) For work within 6 feet from unprotected edge of a roof having a slope less than or equal to 4:12 (vertical to horizontal), protect personnel from falling by the use of conventional fall protection systems (personal fall arrest/restraint systems, guardrails, or safety nets) in accordance with EM 385-1-1, Section 21 and 29 CFR 1926.500. A safety monitoring system is not adequate fall protection and is not authorized.
- (2) For work greater than 6 feet from the unprotected roof edge, addition to the use of conventional fall protection systems the use of a warning line system is also permitted, in accordance with 29 CFR 1926.500 and EM 385-1-1, Section 21.L.

#### b. Steep-Sloped Roofs: Work on a roof having a slope greater than 4:12 (vertical to horizontal) requires a personal fall arrest system, guardrails with toe-boards, or safety nets. This requirement also applies to residential or housing type construction.

### 3.5.4 Horizontal Lifelines (HLL)

Provide HLL in accordance with EM 385-1-1, Section 21.I.08.d.2. Commercially manufactured horizontal lifelines (HLL) must be designed, installed, certified and used, under the supervision of a qualified person, for fall protection as part of a complete fall arrest system which maintains a safety factor of 2 (29 CFR 1926.500). The competent person for fall protection may (if deemed appropriate by the qualified person) supervise the assembly, disassembly, use and inspection of the HLL system under the direction of the qualified person. Locally manufactured HLLs are not acceptable unless they are custom designed for limited or site specific applications by a Registered Professional Engineer who is

qualified in designing HLL systems.

### 3.5.5 Guardrails and Safety Nets

Design, install and use guardrails and safety nets in accordance with EM 385-1-1, Section 21.F.01 and 29 CFR 1926 Subpart M.

### 3.5.6 Rescue and Evacuation Plan and Procedures

When personal fall arrest systems are used, ensure that the mishap victim can self-rescue or can be rescued promptly should a fall occur. Prepare a Rescue and Evacuation Plan and include a detailed discussion of the following: methods of rescue; methods of self-rescue or assisted-rescue; equipment used; training requirement; specialized training for the rescuers; procedures for requesting rescue and medical assistance; and transportation routes to a medical facility. Include the Rescue and Evacuation Plan within the Activity Hazard Analysis (AHA) for the phase of work, in the Fall Protection and Prevention (FP&P) Plan, and the Accident Prevention Plan (APP). The plan must be in accordance with the requirements of EM 385-1-1, ASSP Z359.2, and ASSP Z359.4.

## 3.6 WORK PLATFORMS

### 3.6.1 Scaffolding

Provide employees with a safe means of access to the work area on the scaffold. Climbing of any scaffold braces or supports not specifically designed for access is prohibited. Comply with the following requirements:

- a. Scaffold platforms greater than 20 feet in height must be accessed by use of a scaffold stair system.
- b. Ladders commonly provided by scaffold system manufacturers are prohibited for accessing scaffold platforms greater than 20 feet maximum in height.
- c. An adequate gate is required.
- d. Employees performing scaffold erection and dismantling must be qualified.
- e. Scaffold must be capable of supporting at least four times the maximum intended load, and provide appropriate fall protection as delineated in the accepted fall protection and prevention plan.
- f. Stationary scaffolds must be attached to structural building components to safeguard against tipping forward or backward.
- g. Special care must be given to ensure scaffold systems are not overloaded.
- h. Side brackets used to extend scaffold platforms on self-supported scaffold systems for the storage of material are prohibited. The first tie-in must be at the height equal to 4 times the width of the smallest dimension of the scaffold base.
- i. Scaffolding other than suspended types must bear on base plates upon wood mudsills (2 in x 10 in x 8 in minimum) or other adequate firm foundation.

- j. Scaffold or work platform erectors must have fall protection during the erection and dismantling of scaffolding or work platforms that are more than 6 feet.
- k. Delineate fall protection requirements when working above 6 feet or above dangerous operations in the Fall Protection and Prevention (FP&P) Plan and Activity Hazard Analysis (AHA) for the phase of work.

### 3.6.2 Elevated Aerial Work Platforms (AWPs)

Workers must be anchored to the basket or bucket in accordance with manufacturer's specifications and instructions (anchoring to the boom may only be used when allowed by the manufacturer and permitted by the CP). Lanyards used must be sufficiently short to prohibit worker from climbing out of basket. The climbing of rails is prohibited. Lanyards with built-in shock absorbers are acceptable. Self-retracting devices are not acceptable. Tying off to an adjacent pole or structure is not permitted unless a safe device for 100 percent tie-off is used for the transfer.

Use of AWP's must be operated, inspected, and maintained as specified in the operating manual for the equipment and delineated in the AHA. Operators of AWP's must be designated as qualified operators by the Prime Contractor. Maintain proof of qualifications on site for review and include in the AHA.

## 3.7 EQUIPMENT

### 3.7.1 Material Handling Equipment (MHE)

- a. Material handling equipment such as forklifts must not be modified with work platform attachments for supporting employees unless specifically delineated in the manufacturer's printed operating instructions. Material handling equipment fitted with personnel work platform attachments are prohibited from traveling or positioning while personnel are working on the platform.
- b. The use of hooks on equipment for lifting of material must be in accordance with manufacturer's printed instructions. Material Handling Equipment Operators must be trained in accordance with OSHA 29 CFR 1910, Subpart N.
- c. Operators of forklifts or power industrial trucks must be licensed in accordance with OSHA.

### 3.7.2 Load Handling Equipment (LHE)

The following requirements apply. In exception, these requirements do not apply to commercial truck mounted and articulating boom cranes used solely to deliver material and supplies (not prefabricated components, structural steel, or components of a systems-engineered metal building) where the lift consists of moving materials and supplies from a truck or trailer to the ground; to cranes installed on mechanics trucks that are used solely in the repair of shore-based equipment; to crane that enter the activity but are not used for lifting; nor to other machines not used to lift loads suspended by rigging equipment. However, LHE accidents occurring during such operations must be reported.

- a. Equip cranes and derricks as specified in EM 385-1-1, Section 16.



- b. Notify the Contracting Officer 15 working days in advance of any LHE entering the activity, in accordance with EM 385-1-1, Section 16.A.02, so that necessary quality assurance spot checks can be coordinated. Contractor's operator must remain with the crane during the spot check. Rigging gear must be in accordance with OSHA, ASME B30.9 Standards and federal, state, and local safety standards.
- c. Comply with the LHE manufacturer's specifications and limitations for erection and operation of cranes and hoists used in support of the work. Perform erection under the supervision of a designated person (as defined in ASME B30.5). Perform all testing in accordance with the manufacturer's recommended procedures.
- d. As applicable, comply with ASME B30.5 for mobile and locomotive cranes, ASME B30.22 for articulating boom cranes, ASME B30.3 for construction tower cranes, ASME B30.8 for floating cranes and floating derricks, ASME B30.9 for slings, ASME B30.20 for below the hook lifting devices and ASME B30.26 for rigging hardware.
- e. As applicable, when operating in the vicinity of overhead transmission lines, operators and riggers must be alert to this special hazard and follow the requirements of EM 385-1-1 Section 11, and ASME B30.5 or ASME B30.22 as applicable.
- f. Do not use crane suspended personnel work platforms (baskets) unless the Contractor proves that using any other access to the work location would provide a greater hazard to the workers or is impossible. Do not lift personnel with a line hoist or friction crane. Additionally, submit a specific AHA for this work to the Contracting Officer. Ensure the activity and AHA are thoroughly reviewed by all involved personnel.
- g. Inspect, maintain, and recharge portable fire extinguishers as specified in NFPA 10, Standard for Portable Fire Extinguishers.
- h. All employees must keep clear of loads about to be lifted and of suspended loads, except for employees required to handle the load.
- i. Use cribbing when performing lifts on outriggers.
- j. The crane hook/block must be positioned directly over the load. Side loading of the crane is prohibited.
- k. A physical barricade must be positioned to prevent personnel access where accessible areas of the LHE's rotating superstructure poses a risk of striking, pinching or crushing personnel.
- l. Maintain inspection records in accordance by EM 385-1-1, Section 16.D, including shift, monthly, and annual inspections, the signature of the person performing the inspection, and the serial number or other identifier of the LHE that was inspected. Records must be available for review by the Contracting Officer.
- m. Maintain written reports of operational and load testing in accordance with EM 385-1-1, Section 16.F, listing the load test procedures used along with any repairs or alterations performed on the LHE. Reports must be available for review by the Contracting Officer.

- n. Certify that all LHE operators have been trained in proper use of all safety devices (e.g. anti-two block devices).
- o. Take steps to ensure that wind speed does not contribute to loss of control of the load during lifting operations. At wind speeds greater than 20 mph, the operator, rigger and lift supervisor must cease all crane operations, evaluate conditions and determine if the lift may proceed. Base the determination to proceed or not on wind calculations per the manufacturer and a reduction in LHE rated capacity if applicable. Include this maximum wind speed determination as part of the activity hazard analysis plan for that operation.
- q. Follow FAA guidelines when required based on project location.

### 3.7.3 Machinery and Mechanized Equipment

- a. Proof of qualifications for operator must be kept on the project site for review.
- b. Manufacture specifications or owner's manual for the equipment must be on-site and reviewed for additional safety precautions or requirements that are sometimes not identified by OSHA or USACE EM 385-1-1. Incorporate such additional safety precautions or requirements into the AHAs.

### 3.7.4 Base Mounted Drum Hoists

- a. Operation of base mounted drum hoists must be in accordance with EM 385-1-1 and ASSP A10.22.
- b. Rigging gear must be in accordance with applicable ASME/OSHA standards.
- c. When used on telecommunication towers, base mounted drum hoists must be in accordance with TIA-1019, TIA-222, ASME B30.7, 29 CFR 1926.552, and 29 CFR 1926.553.
- d. When used to hoist personnel, the AHA must include a written standard operating procedure. Operators must have a physical examination in accordance with EM 385-1-1 Section 16.B.05 and trained, at a minimum, in accordance with EM 385-1-1 Section 16.U and 16.T. The base mounted drum hoist must also comply with OSHA Instruction CPL 02-01-056 and ASME B30.23.
- e. Material and personnel must not be hoisted simultaneously.
- f. Personnel cage must be marked with the capacity (in number of persons) and load limit in pounds.
- g. Construction equipment must not be used for hoisting material or personnel or with trolley/tag lines. Construction equipment may be used for towing and assisting with anchoring guy lines.

### 3.7.5 Use of Explosives

Explosives must not be used or brought to the project site without prior written approval from the Contracting Officer. Such approval does not relieve the Contractor of responsibility for injury to persons or for damage to property due to blasting operations.

Storage of explosives, when permitted on Government property, must be only where directed and in approved storage facilities. These facilities must be kept locked at all times except for inspection, delivery, and withdrawal of explosives.

### 3.8 EXCAVATIONS

Soil classification must be performed by a competent person in accordance with 29 CFR 1926 and EM 385-1-1.

#### 3.8.1 Utility Locations

Provide a third party, independent, private utility locating company to positively identify underground utilities in the work area.

#### 3.8.2 Utility Location Verification

Physically verify all underground utility locations, including utility depth, by potholing using water, air with non-conductive ends and can include hand digging using wood or fiberglass handled tools when any adjacent construction work is expected to come within 3 feet of the underground system.

De-energize the circuit for medium voltage cable or direct buried medium voltage cables prior to performing any construction activities within 3 feet of the circuit. If the circuit is reenergized while still exposed, a barrier with danger signs must be provided to limit the approach boundary to 10 feet. De-energize the circuit prior to reentering the 10 feet boundary.

When the excavation will expose and undermine a concrete encased duct bank, submit a concrete encased duct bank electrical support plan for government acceptance prior to undermining the duct bank.

#### 3.8.3 Utilities Within and Under Concrete, Bituminous Asphalt, and Other Impervious Surfaces

Utilities located within and under concrete slabs or pier structures, bridges, parking areas, and the like, are extremely difficult to identify. Whenever Contract work involves chipping, saw cutting, or core drilling through concrete, bituminous asphalt or other impervious surfaces, the existing utility location must be coordinated with station utility departments in addition to location and depth verification by a third party, independent, private locating company. The third party, independent, private locating company must locate utility depth by use of Ground Penetrating Radar (GPR), X-ray, bore scope, or ultrasound prior to the start of demolition and construction. Outages to isolate utility systems must be used in circumstances where utilities are unable to be positively identified. The use of historical drawings does not alleviate the Contractor from meeting this requirement.

### 3.9 ELECTRICAL

Perform electrical work in accordance with EM 385-1-1, Sections 11 and 12.

#### 3.9.1 Conduct of Electrical Work

As delineated in EM 385-1-1, electrical work is to be conducted in a de-energized state unless there is no alternative method for accomplishing

the work. In those cases obtain an energized work permit from the Contracting Officer. The energized work permit application must be accompanied by the AHA and a summary of why the equipment/circuit needs to be worked energized. Underground electrical spaces must be certified safe for entry before entering to conduct work. Cables that will be cut must be positively identified and de-energized prior to performing each cut. Attach temporary grounds in accordance with ASTM F855 and IEEE 1048. Perform all high voltage cable cutting remotely using hydraulic cutting tool. When racking in or live switching of circuit breakers, no additional person other than the switch operator is allowed in the space during the actual operation. Plan so that work near energized parts is minimized to the fullest extent possible. Use of electrical outages clear of any energized electrical sources is the preferred method.

When working in energized substations, only qualified electrical workers are permitted to enter. When work requires work near energized circuits as defined by NFPA 70, high voltage personnel must use personal protective equipment that includes, as a minimum, electrical hard hat, safety shoes, insulating gloves and electrical arc flash protection for personnel as required by NFPA 70E. Insulating blankets, hearing protection, and switching suits may also be required, depending on the specific job and as delineated in the Contractor's AHA. Ensure that each employee is familiar with and complies with these procedures and 29 CFR 1910.147.

### 3.9.2 Qualifications

Electrical work must be performed by QP with verifiable credentials who are familiar with applicable code requirements. Verifiable credentials consist of State, National and Local Certifications or Licenses that a Master or Journeyman Electrician may hold, depending on work being performed, and must be identified in the appropriate AHA. Journeyman/Apprentice ratio must be in accordance with State, Local requirements applicable to where work is being performed.

### 3.9.3 Arc Flash

Conduct a hazard analysis/arc flash hazard analysis whenever work on or near energized parts greater than 50 volts is necessary, in accordance with NFPA 70E.

All personnel entering the identified arc flash protection boundary must be QPs and properly trained in NFPA 70E requirements and procedures. Unless permitted by NFPA 70E, no Unqualified Person is permitted to approach nearer than the Limited Approach Boundary of energized conductors and circuit parts. Training must be administered by an electrically qualified source and documented.

### 3.9.4 Grounding

Ground electrical circuits, equipment and enclosures in accordance with NFPA 70 and IEEE C2 to provide a permanent, continuous and effective path to ground unless otherwise noted by EM 385-1-1.

Check grounding circuits to ensure that the circuit between the ground and a grounded power conductor has a resistance low enough to permit sufficient current flow to allow the fuse or circuit breaker to interrupt the current.

### 3.9.5 Testing

Temporary electrical distribution systems and devices must be inspected, tested and found acceptable for Ground-Fault Circuit Interrupter (GFCI) protection, polarity, ground continuity, and ground resistance before initial use, before use after modification and at least monthly. Monthly inspections and tests must be maintained for each temporary electrical distribution system, and signed by the electrical CP or QP.

### 3.10 AIRFIELD SAFETY PRECAUTIONS (DEC 1991)

#### 3.10.1 Definitions

As used in this clause-

a. "Landing areas" means:

(1) The primary surfaces, comprising the surface of the runway, runway shoulders, and lateral safety zones. The length of each primary surface is the same as the runway length. The width of each primary surface is 2,000 feet (1,000 feet on each side of the runway centerline);

(2) The "clear zone" beyond the ends of each runway, i.e., the extension of the primary surface for a distance of 1,000 feet beyond each end of each runway.

(3) All taxiways, plus the lateral clearance zones along each side for the length of the taxiways (the outer edge of each lateral clearance zone is laterally 250 feet from the far or opposite edge of the taxiway, e.g., a 75-foot-wide taxiway would have a combined width of taxiway and lateral clearance zones of 425 feet); and

(4) All aircraft parking aprons, plus the area 125 feet in width extending beyond each edge all around the aprons.

b. "Safety precaution areas" means those portions of approach-departure clearance zones and transitional zones where placement of objects incident to contract performance might result in vertical projections at or above the approach-departure clearance, or the transitional surface.

(1) The "approach-departure clearance surface" is an extension of the primary surface and the clear zone at each end of each runway, for a distance of 50,000 feet, first along an inclined (glide angle) and then along a horizontal plane, both flaring symmetrically about the runway centerline extended.

(a) The inclined plane (glide angle) begins in the clear zone 200 feet past the end of the runway (and primary surface) at the same elevation as the end of the runway. It continues upward at a slope of 50:1 (1 foot vertically for each 50 feet horizontally) to an elevation of 500 feet above the established airfield elevation. At that point the plane become horizontal, continuing at that same uniform elevation to a point 50,000 feet longitudinally from the beginning of the inclined plane (glide angle) and ending there.

(b) The width of the surface at the beginning of the inclined plane (glide angle) is the same as the width of the clear zone.

It then flares uniformly, reaching the maximum width of 16,000 feet at the end.

(2) The "approach-departure clearance zone" is the ground area under the approach-departure clearance surface.

(3) The "transitional surface" is a sideways extension of all primary surfaces, clear zones, and approach-departure clearance surfaces along inclined planes.

(a) The inclined plane in each case begins at the edge of the surface.

(b) The slope of the incline plane is 7:1 (1 foot vertically for each 7 feet horizontally). It continues to the point of intersection with the-

(i) Inner horizontal surface (which is the horizontal plane 500 feet above the established airfield elevation); or

(ii) Outer horizontal surface (which is the horizontal plane 500 feet above the established airfield elevation), whichever is applicable.

(4) The "transitional zone" is the ground area under the transitional surface. (It adjoins the primary surface, clear zone, and approach-departure clearance zone.)

### 3.10.2 General

a. The Contractor shall comply with the requirements of this clause while-

- (1) Operating all ground equipment (mobile or stationary);
- (2) Placing all materials; and
- (3) Performing all work, upon and around all airfields.

b. The requirements of this clause are in addition to any other safety requirements of this contract.

### 3.10.3 Contractor Reporting, Notifications, and Operations Requirements

The Contractor shall:

- a. Report to the Contracting Officer before initiating any work;
- b. Notify the Contracting Officer of proposed changes to locations and operations;
- c. Not permit either its equipment or personnel to use any runway for purposes other than aircraft operation without permission of the Contracting Officer, unless the runway is-
  - (1) Closed by order of the Contracting Officer; and
  - (2) Marked as provided in paragraph 3.11.4 b. of this clause;

d. Keep all paved surfaces, such as runways, taxiways, and hardstands, clean at all times and, specifically, free from small stones which might damage aircraft propellers or jet aircraft;

e. Operate mobile equipment according to the safety provisions of this clause, while actually performing work on the airfield. At all other times, the Contractor shall remove all mobile equipment to locations-

(1) Approved by the Contracting Officer;

(2) At a distance of at least 750 feet from the runway centerline, plus any additional distance, and

(3) Necessary to ensure compliance with the other provisions of this clause; and

f. Not open a trench unless material is on hand and ready for placing in the trench. As soon as practicable after material has been placed and work approved, the Contractor shall backfill and compact trenches as required by the contract. Meanwhile, all hazardous conditions shall be marked and lighted in accordance with the other provisions of this clause.

#### 3.10.4 Landing Areas

The Contractor shall:

a. Place nothing upon the landing areas without the authorization of the Contracting Officer;

b. Outline those landing areas hazardous to aircraft, using (unless otherwise authorized by the Contracting Officer) red flags by day, and electric, battery-operated low-intensity red flasher lights by night;

c. Obtain, at an airfield where flying is controlled, additional permission from the control tower operator every time before entering any land area, unless the landing area is marked as hazardous in accordance with paragraph 3.11.4 b. of this clause;

d. Identify all vehicles it operates in landing areas by means of a flag on a staff attached to, and flying above, the vehicle. The flag shall be three feet square, and consist of a checkered pattern of international orange and white squares of 1 foot on each side (except that the flag may vary up to ten percent from each of these dimensions);

e. Mark all other equipment and materials in the landing areas, using the same marking devices as in paragraph 3.11.4 b. of this clause; and

f. Perform work so as to leave that portion of the landing area which is available to aircraft free from hazards, holes, piles of material, and projecting shoulders that might damage an airplane tire.

#### 3.10.5 Safety Precaution Areas

The Contractor shall:

a. Place nothing upon the safety precaution areas without authorization of the Contracting Officer.

b. Mark all equipment and materials in safety precaution areas, using (unless otherwise authorized by the Contracting Officer) red flags by day, and electric, battery-operated, low-intensity red flasher lights by night.

c. Provide all objects placed in safety precaution areas with a red light or red lantern at night, if the objects project above the approach-departure clearance surface or above the transitional surface. (DFARS 252.236-7005)

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## SECTION 01 41 26.05 24

(FEDERAL FACILITIES COLORADO) NPDES PERMIT REQUIREMENTS FOR STORM WATER  
DISCHARGES FROM CONSTRUCTION SITES

10/20

## PART 1 GENERAL

## 1.1 REFERENCES (Not Applicable)

## 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

## SD-01 Preconstruction Submittals

## Inspector Qualifications

Name and qualifications of all personnel who will be performing inspections on the site.

## PART 2 PRODUCTS (Not Applicable)

## PART 3 EXECUTION

## 3.1 GENERAL

The Contractor shall be responsible for implementing the terms and requirements of the National Pollutant Discharge Elimination System General Permit for Discharges from Construction Activities (Permit No. COR17000F, hereinafter called "the permit") as specified below. The Contractor shall have day-to-day operational control of those activities which are necessary to ensure compliance with the requirements specified herein. The Contractor shall be responsible for all submissions to the EPA and shall retain the official copy of all documents pertaining to compliance with the permit during construction. The project site is not located in designated critical habitat and there are no known "listed species" located in the project area.

## 3.2 IMPLEMENTATION

## 3.2.1 Notice of Intent

The Contractor shall electronically complete and sign a Notice of Intent (NOI) in accordance with the Permit. The Contractor shall notify the Contracting Officer's Representative within 24 hours after submitting his NOI. The Contractor shall not submit his NOI to the EPA until his Storm Water Pollution Prevention Plan has been accepted by the Government. After completion of the electronic NOI, a 14-day waiting period begins.

The EPA will give the Contractor authorization that his NOI is in effect after the 14-day waiting period. The Contractor may not begin land disturbance activities until authorized by the Contracting Officer.

### 3.2.2 Storm Water Pollution Prevention Plan

#### 3.2.2.1 General

The Contractor shall each prepare a Stormwater Pollution Prevention Plan (SWPPP) for the project. The SWPPP describe the Contractor's responsibilities to include all other requirements described in the general permit. The Government will provide the Contractor with a SWPPP template to use if he chooses. The Contractor shall include appropriate controls and measures for any off-site support activities covered under the permit. The SWPPP shall describe the nature and location of the activity and a location map and site map shall be included in accordance with the permit. The Contractor shall be responsible for implementing, maintaining and updating the SWPPP (including Site Map) during construction. Unless otherwise indicated, the Contractor shall be responsible for implementing all measures described in the SWPPP. The Contractor shall maintain the following records and attach to the SWPPP: the dates when major grading activities occur; the dates when construction activities temporarily or permanently cease on a portion of the site; and the dates when stabilization measures are initiated. The SWPPP shall be signed by the Contractor. A copy of the written authorization shall be attached to the SWPPP for any person signing the SWPPP or Inspection Reports other than the person described in the permit. If major changes to the SWPPP are required during construction, the SWPPP shall be recertified by the Contractor.

#### 3.2.2.2 Acceptance of SWPPP

Acceptance of the SWPPP is required prior to the start of construction. Acceptance is conditional and will be predicated on satisfactory performance during the construction. The Government reserves the right to require the Contractor to make changes to the SWPPP if the Contracting Officer determines that environmental protection requirements are not being met.

#### 3.2.2.3 Notification of Changes

After acceptance of the SWPPP, the Contractor shall notify the Contracting Officer in writing of any proposed change. Proposed changes are subject to acceptance by the Contracting Officer.

#### 3.2.3 Posting Notice

The Contractor shall post copies of each of the NOI's electronically submitted to the EPA Storm Water Notice Processing Center. The NOI shall be posted conspicuously near the main entrance of the construction site.

#### 3.2.4 Inspections and Reporting

The Contractor shall be responsible for all inspections required by the general permit. The Contractor shall also prepare and sign all reports summarizing the inspections as required by the general permit. Copies of inspection reports shall be attached to the Contractor's SWPPP and provided to the Contracting Officer's Representative within 24 hours after

completion of each inspection. The Contractor shall notify the Contracting Officer within 24 hours if an inspection identifies any incidents of non-compliance with the SWPPP and the general permit.

#### 3.2.4.1 Inspector Qualifications

Contractor personnel performing inspections shall be knowledgeable in the principles and practice of erosion and sediment controls and possess the skills to assess conditions at the construction site that could impact storm water quality and to assess the effectiveness of any sediment and erosion control measures selected to control the quality of storm water discharges from the construction site. The Contractor shall submit the name and qualifications of all personnel who will be performing inspections on the site.

#### 3.2.5 Maintenance

The Contractor shall be responsible for maintaining all erosion and sediment control measures and other protective measures identified in the SWPPP in an effective operating condition. The Government reserves the right to require the Contractor to perform maintenance on erosion and sediment control measures and other protective measures if the Contracting Officer determines that environmental protection requirements are not being met.

#### 3.2.6 Notice of Termination

The Contractor shall establish a stand of grass in all disturbed areas of the project not otherwise surfaced and shall meet the requirements for "Final Stabilization" as defined in the permit prior to terminating permit coverage. The Contractor shall notify the Contracting Officer within 2 working days after final stabilization on all portions of the site has been achieved in accordance the permit. The Contractor shall electronically complete and sign a Notice of Termination (NOT) in accordance with the permit. A copy of the Contractor's NOT and the updated SWPPP shall be furnished to the Contracting Officer within 5 calendar days after final stabilization has been achieved on all portions of the site.

#### 3.2.7 Retention of Records

After the Contractor submits his NOT, the Government shall be responsible for retaining copies of the SWPPP and all reports in accordance with the permit.

#### 3.2.8 Continuation of Expired Permit

If the current permit expires prior to completion of construction, the Contractor shall comply with the conditions of the new permit.

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## SECTION 01 45 00.00 10

QUALITY CONTROL  
11/16, CHG 2: 11/21

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

## ASTM INTERNATIONAL (ASTM)

ASTM D3740 (2019) Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction

ASTM E329 (2021) Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection

## U.S. ARMY CORPS OF ENGINEERS (USACE)

ER 1110-1-12 (2006; Change 1) Engineering and Design -- Quality Management

## 1.2 PAYMENT

Separate payment will not be made for providing and maintaining an effective Quality Control program. Include all associated costs in the applicable Pricing Schedule item.

## 1.3 SUBMITTALS

Government approval is required for submittals with a "G" classifications; submittals not having a "G" classification are for information only. When used, a code following the "G" classifications identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

## SD-01 Preconstruction Submittals

Contractor Quality Control (CQC) Plan; G, RO

Additional Requirements for Design Quality Control (DQC) Plan; G, DO

## SD-05 Design Data

Discipline-Specific Checklists

Design Quality Control

## SD-06 Test Reports

## Verification Statement

## PART 2 PRODUCTS

Not Used

## PART 3 EXECUTION

## 3.1 GENERAL REQUIREMENTS

Submit Quality Control Personnel experience as submitted per the requirements of Section 00 22 00. If, because of reasons beyond the control of the Contractor, the named individuals are not able to fulfill this obligation, present replacement personnel with equal or better skills and experience for acceptance by the Contracting Officer. Obtain the Contracting Officer's written consent before making any substitution for these designated personnel.

Establish and maintain an effective quality control (QC) system that complies with FAR 52.246-12 "Inspection of Construction." QC consist of plans, procedures, and organization necessary to produce an end product which complies with the Contract requirements. The QC system covers all design and construction operations, both onsite and offsite, and must be keyed to the proposed design and construction sequence. The project superintendent will be held responsible for the quality of work and is subject to removal by the Contracting Officer for non-compliance with the quality requirements specified in the Contract. In this context the highest level manager responsible for the overall construction activities at the site, including quality and production is the project superintendent. The project superintendent must maintain a physical presence at the site at all times and is responsible for all construction and related activities at the site, except as otherwise acceptable to the Contracting Officer.

## 3.2 CONTRACTOR QUALITY CONTROL (CQC) PLAN

Submit no later than 15 calendar days after receipt of notice to proceed, the Contractor Quality Control (CQC) Plan proposed to implement the requirements of FAR 52.246-12 "Inspection of Construction." The Government will consider an interim plan for the first 30 days of operation. Design and Construction will be permitted to begin only after acceptance of the CQC Plan or acceptance of an interim plan applicable to the particular feature of work to be started. Work outside of the accepted interim plan will not be permitted to begin until acceptance of a CQC Plan or another interim plan containing the additional work.

## 3.2.1 Content of the CQC Plan

Include, as a minimum, the following to cover all design and construction operations, both onsite and offsite, including work by subcontractors, designers of record, consultants, architect/engineers (AE), fabricators, suppliers, and purchasing agents:

- a. A description of the quality control organization, including a chart showing lines of authority and acknowledgment that the CQC staff will implement the three phase control system for all aspects of the work specified.

- b. The name, qualifications (in resume format), duties, responsibilities, and authorities of each person assigned a CQC function.
- c. A copy of the letter to the CQC System Manager signed by an authorized official of the firm which describes the responsibilities and delegates sufficient authorities to adequately perform the functions of the CQC System Manager, including authority to stop work which is not in compliance with the Contract. Letters of direction to all other various quality control representatives outlining duties, authorities, and responsibilities will be issued by the CQC System Manager. Furnish copies of these letters to the Contracting Officer.
- d. Procedures for scheduling, reviewing, certifying, and managing submittals, including those of subcontractors, designers of record, consultants, architect engineers (AE), offsite fabricators, suppliers, and purchasing agents. These procedures must be in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.
- e. Control, verification, and acceptance testing procedures for each specific test to include the test name, specification paragraph requiring test, feature of work to be tested, test frequency, and person responsible for each test. (Laboratory facilities approved by the Contracting Officer are required to be used.)
- f. Procedures for tracking preparatory, initial, and follow-up control phases and control, verification, and acceptance tests including documentation.
- g. Procedures for tracking design and construction deficiencies from identification through acceptable corrective action. Establish verification procedures that identified deficiencies have been corrected.
- h. Reporting procedures, including proposed reporting formats.
- i. A list of the definable features of work. A definable feature of work is a task which is separate and distinct from other tasks, has separate control requirements, and is identified by different trades or disciplines, or it is work by the same trade in a different environment. Although each section of the specifications can generally be considered as a definable feature of work, there are frequently more than one definable features under a particular section. This list will be agreed upon during the coordination meeting.
- j. Coordinate scheduled work with Special Inspections required by Section 01 45 35 SPECIAL INSPECTIONS (as provided by the DOR), the Statement of Special Inspections and the Schedule of Special Inspections. Where the applicable Code issue by the International Code Council (ICC) calls for inspections by the Building Official, the Contractor must include the inspections in the Quality Control Plan and must perform the inspections required by the applicable ICC. The Contractor must perform these inspections using independent qualified inspectors. Include the Special Inspection Plan requirements in the QC Plan.

### 3.2.2 Additional Requirements for Design Quality Control (DQC) Plan

The following additional requirements apply to the Design Quality Control

(DQC) plan:

- a. Submit and maintain a Design Quality Control (DQC) Plan as an effective quality control program which assures that all services required by this contract are performed and provided in a manner that meets professional architectural and engineering quality standards. As a minimum, all documents must be technically reviewed by competent, independent reviewers identified in the DQC Plan. The same element that produced the product may not perform the independent technical review (ITR). Correct errors and deficiencies in the design documents prior to submitting them to the Government.
  - b. Include the design schedule in the master project schedule, showing the sequence of events involved in carrying out the project design tasks within the specific Contract period. This should be at a detailed level of scheduling sufficient to identify all major design tasks, including those that control the flow of work. Include review and correction periods associated with each item. This should be a forward planning as well as a project monitoring tool. The schedule reflects calendar days and not dates for each activity. If the schedule is changed, submit a revised schedule reflecting the change within 7 calendar days. Include in the DQC Plan the discipline-specific checklists to be used during the design and quality control of each submittal. Submit at each design phase as part of the project documentation these completed discipline-specific checklists. ER 1110-1-12 provides some useful information in developing checklists.
  - c. Implement the DQC Plan by a Design Quality Control Manager who has the responsibility of being cognizant of and assuring that all documents on the project have been coordinated. This individual must be a person who has verifiable engineering or architectural design experience and is a registered professional engineer or architect. Notify the Contracting Officer, in writing, of the name of the individual, and the name of an alternate person assigned to the position.
- (1) The DQC Manager is responsible for reporting to the overall Project Manager of the Contractor for the design-build contract. The Project Manager will be held responsible for the quality of design on the contract and is subject to removal by the Contracting Officer for non-compliance with the quality requirements specified in the contract.

The Contracting Officer will notify the Contractor in writing of the acceptance of the DQC Plan. After acceptance, any changes proposed by the Contractor are subject to the acceptance of the Contracting Officer.

### 3.2.3 Acceptance of Plan

Acceptance of the Contractor's plan is required prior to the start of design and construction. Acceptance is conditional and will be predicated on satisfactory performance during the design and construction. The Government reserves the right to require the Contractor to make changes in the Contractor Quality Control (CQC) Plan and operations including removal of personnel, as necessary, to obtain the quality specified.

### 3.2.4 Notification of Changes

After acceptance of the CQC Plan, notify the Contracting Officer in

writing of any proposed change. Proposed changes are subject to acceptance by the Contracting Officer.

### 3.3 COORDINATION MEETING

After the Postaward Conference, before start of design or construction, and prior to acceptance by the Government of the CQC Plan, meet with the Contracting Officer and discuss the Contractor's quality control system. Submit the CQC Plan a minimum of 10 calendar days prior to the Coordination Meeting. During the meeting, a mutual understanding of the system details must be developed, including the forms for recording the CQC operations, design activities, control activities, testing, administration of the system for both onsite and offsite work, and the interrelationship of Contractor's Management and control with the Government's Quality Assurance. Minutes of the meeting will be prepared by the Government, signed by both the Contractor and the Contracting Officer and will become a part of the contract file. There can be occasions when subsequent conferences will be called by either party to reconfirm mutual understandings or address deficiencies in the CQC system or procedures which can require corrective action by the Contractor.

### 3.4 QUALITY CONTROL ORGANIZATION

#### 3.4.1 Personnel Requirements

The requirements for the CQC organization are a Safety and Health Manager, CQC System Manager, a Design Quality Manager, and sufficient number of additional qualified personnel to ensure safety and Contract compliance. The Safety and Health Manager reports directly to a senior project (or corporate) official independent from the CQC System Manager. The Safety and Health Manager will also serve as a member of the CQC Staff. Include personnel identified in the technical provisions as requiring specialized skills to assure the required work is being performed properly as part of the CQC organization. The Contractor's CQC staff maintains a presence at the site at all times during progress of the work and have complete authority and responsibility to take any action necessary to ensure Contract compliance. The CQC staff will be subject to acceptance by the Contracting Officer. Provide adequate office space, filing systems and other resources as necessary to maintain an effective and fully functional CQC organization. Promptly complete and furnish all letters, material submittals, shop drawing submittals, schedules and all other project documentation to the CQC organization. The CQC organization is responsible to maintain these documents and records at the site at all times, except as otherwise acceptable to the Contracting Officer.

#### 3.4.2 CQC System Manager

Identify as CQC System Manager an individual within the onsite work organization that is responsible for overall management of CQC and has the authority to act in all CQC matters for the Contractor. The CQC System Manager is required to be a construction person with a minimum of 5 years in related work. This CQC System Manager is on the site at all times during construction and is employed by the prime Contractor. The CQC System Manager is assigned no other duties. Identify in the plan an alternate to serve in the event of the CQC System Manager's absence. The requirements for the alternate are the same as the CQC System Manager.

### 3.4.3 CQC Personnel

Maintain a staff under the direction of the CQC system manager to perform all QC activities. The staff must be of sufficient size to ensure adequate QC coverage of all work phases, work shifts, and work crews involved in the construction. These personnel may perform other duties, but must be fully qualified by experience and technical training to perform their assigned QC responsibilities and must be allowed sufficient time to carry out these responsibilities. Clearly state the duties and responsibilities of each staff member in the QC Plan. Other technical specifications may specify individuals for maintaining quality control for specific areas of work. Identify a separate Design Quality Control Manager who is a Registered Architect or Professional Engineer. This DQC Manager is considered part of the Contractor's Quality Control staff but reports directly to the overall Project Manager for the Contractor for the design-build contract.

### 3.4.4 Assignment of CQC System Manager, Project Superintendent, and SSHO Responsibilities

The CQC System Manager, Project Superintendent, and SSHO may not share duties and are required to be separate individuals.

### 3.4.5 Construction Quality Management Course

In addition to the above experience and education requirements, the Contractor Quality Control(CQC) System Manager and Alternate CQC System Manager are required to have completed the Construction Quality Management (CQM) for Contractors course.

Contractor personnel who otherwise fulfill all requirements for designation as a CQC Manager, but have not had the opportunity to obtain a CQM certificate due to COVID-19 restrictions, shall be permitted to serve as Quality Control Managers conditioned upon obtaining a CQM-C certificate within 120 days of USACE lifting current in person learning restrictions.

CQC Managers who were in possession of valid CQM certificate (i.e. not delinquent on the 5 year course renewal requirement) as of 01-Mar-2020 will have a grace period for obtaining the CQM renewal training of 6-months from the lifting of COVID-19 restrictions and USACE being able to provide face to face CQM training.

This course is periodically offered at offices indicated at the following web site:

<http://www.nwo.usace.army.mil/BusinessWithUs/Contracting/QualityManagement.aspx>

The exact date and location for the sessions will be determined approximately 30 calendar days in advance by the trainer (POC). Cost varies by location per student.

The Construction Quality Management Training certificate expires after 5 years. If the CQC System Manager's certificate has expired, retake the course to remain current.

The Government reserves the right to recognize certificates issued as a result of virtual training by a certified instructor as valid.

### 3.4.6 Organizational Changes

Maintain the CQC staff at full strength at all times. When it is necessary to make changes to the CQC staff, revise the CQC Plan to reflect the changes and submit the changes to the Contracting Officer for acceptance.

### 3.5 SUBMITTALS AND DELIVERABLES

Submittals, if needed, have to comply with the requirements in Section 01 33 00 SUBMITTAL PROCEDURES. The CQC organization is responsible for certifying that all submittals and deliverables are in compliance with the contract requirements. When Section 01 91 00.15 10 TOTAL BUILDING COMMISSIONING are included in the contract, the submittals required by those sections have to be coordinated with Section 01 33 00 SUBMITTAL PROCEDURES to ensure adequate time is allowed for each type of submittal required.

### 3.6 CONTROL

CQC is the means by which the Contractor ensures that the construction, to include that of subcontractors and suppliers, complies with the requirements of the contract. At least three phases of control are required to be conducted by the CQC System Manager for each definable feature of the construction work as follows:

#### 3.6.1 Preparatory Phase

This phase is performed prior to beginning work on each definable feature of work, after all required plans/documents/materials are approved/accepted, and after copies are at the work site. This phase includes:

- a. A review of each paragraph of applicable specifications, reference codes, and standards. Make available during the preparatory inspection a copy of those sections of referenced codes and standards applicable to that portion of the work to be accomplished in the field. Maintain and make available in the field for use by Government personnel until final acceptance of the work.
- b. Review of the Contract drawings.
- c. Check to assure that all materials and equipment have been tested, submitted, and approved.
- d. Review of provisions that have been made to provide required control inspection and testing.
- e. Review Special Inspections required by Section 01 45 35 SPECIAL INSPECTIONS (as provided by the DOR), the Statement of Special Inspections and the Schedule of Special Inspections.
- f. Examination of the work area to assure that all required preliminary work has been completed and is in compliance with the Contract.
- g. Examination of required materials, equipment, and sample work to assure that they are on hand, conform to approved shop drawings or submitted data, and are properly stored.
- h. Review of the appropriate activity hazard analysis to assure safety requirements are met.

- i. Discussion of procedures for controlling quality of the work including repetitive deficiencies. Document construction tolerances and workmanship standards for that feature of work.
- j. Check to ensure that the portion of the plan for the work to be performed has been accepted by the Contracting Officer.
- k. Discussion of the initial control phase.
- l. Schedule all preparatory inspections two(2) weeks in advance. Include a meeting conducted by the CQC System Manager and attended by the superintendent, other CQC personnel (as applicable), and the foreman responsible for the definable feature. Document the results of the preparatory phase actions by separate minutes prepared by the CQC System Manager and attach to the daily CQC report. Instruct applicable workers as to the acceptable level of workmanship required in order to meet contract specifications.

### 3.6.2 Initial Phase

This phase is accomplished at the beginning of a definable feature of work. Accomplish the following:

- a. Check work to ensure that it is in full compliance with contract requirements. Review minutes of the preparatory meeting.
- b. Verify adequacy of controls to ensure full contract compliance. Verify required control inspection and testing are in compliance with the contract.
- c. Establish level of workmanship and verify that it meets minimum acceptable workmanship standards. Compare with required sample panels as appropriate.
- d. Resolve all differences.
- e. Check safety to include compliance with and upgrading of the safety plan and activity hazard analysis. Review the activity analysis with each worker.
- f. The Government needs to be notified at least 48 hours in advance of beginning the initial phase for definable feature of work. Prepare separate minutes of this phase by the CQC System Manager and attach to the daily CQC report. Indicate the exact location of initial phase for definable feature of work for future reference and comparison with follow-up phases.
- g. The initial phase for each definable feature of work is repeated for each new crew to work onsite, or any time acceptable specified quality standards are not being met.
- h. Coordinate scheduled work with Special Inspections required by Section 01 45 35 SPECIAL INSPECTIONS (as provided by the DOR), the Statement of Special Inspections and the Schedule of Special Inspections.

### 3.6.3 Follow-up Phase

Perform daily checks to assure control activities, including control



testing, are providing continued compliance with contract requirements, until completion of the particular feature of work. Record the checks in the CQC documentation. Conduct final follow-up checks and correct all deficiencies prior to the start of additional features of work which may be affected by the deficient work. Do not build upon nor conceal non-conforming work. Coordinate scheduled work with Special Inspections required by Section 01 45 35 SPECIAL INSPECTIONS (as provide by the DOR), the Statement of Special Inspections and the Schedule of Special Inspections.

#### 3.6.4 Additional Preparatory and Initial Phases

Conduct additional preparatory and initial phases on the same definable features of work if: the quality of on-going work is unacceptable; if there are changes in the applicable CQC staff, onsite production supervision or work crew; if work on a definable feature is resumed after a substantial period of inactivity; or if other problems develop.

### 3.7 TESTS

#### 3.7.1 Testing Procedure

Perform specified or required tests to verify that control measures are adequate to provide a product which conforms to contract requirements. Upon request, furnish to the Government duplicate samples of test specimens for possible testing by the Government. Testing includes operation and acceptance tests when specified. Procure the services of a Corps of Engineers approved testing laboratory or establish an approved testing laboratory at the project site. Perform the following activities and record and provide the following data:

- a. Verify that testing procedures comply with contract requirements.
- b. Verify that facilities and testing equipment are available and comply with testing standards.
- c. Check test instrument calibration data against certified standards.
- d. Verify that recording forms and test identification control number system, including all of the test documentation requirements, have been prepared.
- e. Record results of all tests taken, both passing and failing on the CQC report for the date taken. Specification paragraph reference, location where tests were taken, and the sequential control number identifying the test. If approved by the Contracting Officer, actual test reports are submitted later with a reference to the test number and date taken. Provide an information copy of tests performed by an offsite or commercial test facility directly to the Contracting Officer. Failure to submit timely test reports as stated results in nonpayment for related work performed and disapproval of the test facility for this Contract.

#### 3.7.2 Testing Laboratories

All testing laboratories must be validated by the USACE Material Testing Center (MTC) for the tests to be performed. Information on the USACE MTC with web-links to both a list of validated testing laboratories and for the laboratory inspection request for can be found at:

<https://mtc.erdcdren.mil/>

Click on "Lab Validation"  
Search for a Validation

#### 3.7.2.1 Capability Check

The Government reserves the right to check laboratory equipment in the proposed laboratory for compliance with the standards set forth in the contract specifications and to check the laboratory technician's testing procedures and techniques. Laboratories utilized for testing soils, concrete, asphalt, and steel is required to meet criteria detailed in ASTM D3740 and ASTM E329.

#### 3.7.2.2 Capability Recheck

If the selected laboratory fails the capability check, the Contractor will be assessed the actual cost for the recheck to reimburse the Government for each succeeding recheck of the laboratory or the checking of a subsequently selected laboratory. Such costs will be deducted from the Contract amount due the Contractor.

#### 3.7.3 Onsite Laboratory

The Government reserves the right to utilize the Contractor's control testing laboratory and equipment to make assurance tests, and to check the Contractor's testing procedures, techniques, and test results at no additional cost to the Government.

### 3.8 COMPLETION INSPECTION

#### 3.8.1 Punch-Out Inspection

Conduct an inspection of the work by the CQC System Manager near the end of the work, or any increment of the work established by a time stated in FAR 52.211-10 "Commencement, Prosecution, and Completion of Work", or by the specifications. Prepare and include in the CQC documentation a punch list of items which do not conform to the approved drawings and specifications, as required by paragraph DOCUMENTATION. Include within the list of deficiencies the estimated date by which the deficiencies will be corrected. Make a second inspection by the CQC System Manager or staff to ascertain that all deficiencies have been corrected. Once this is accomplished, notify the Government that the facility is ready for the Government Pre-Final inspection.

#### 3.8.2 Pre-Final Inspection

The Government will perform the pre-final inspection to verify that the facility is complete and ready to be occupied. A Government Pre-Final Punch List may be developed as a result of this inspection. Ensure that all items on this list have been corrected before notifying the Government, so that a Final inspection with the customer can be scheduled. Correct any items noted on the Pre-Final inspection in a timely manner. These inspections and any deficiency corrections required by this paragraph need to be accomplished within the time slated for completion of the entire work or any particular increment of the work if the project is divided into increments by separate completion dates.

### 3.8.3 Final Acceptance Inspection

The Contractor's Quality Control Inspection personnel, plus the superintendent or other primary management person, and the Contracting Officer's Representative is required to be in attendance at the final acceptance inspection. Additional Government personnel including, but not limited to, those from Base/Post Civil Facility Engineer user groups, and major commands can also be in attendance. The final acceptance inspection will be formally scheduled by the Contracting Officer based upon results of the Pre-Final inspection. Notify the Contracting Officer at least 14 days prior to the final acceptance inspection and include the Contractor's assurance that all specific items previously identified to the Contractor as being unacceptable, along with all remaining work performed under the Contract, will be complete and acceptable by the date scheduled for the final acceptance inspection. Failure of the Contractor to have all contract work acceptably complete for this inspection will be cause for the Contracting Officer to bill the Contractor for the Government's additional inspection cost in accordance with FAR 52.246-12 "Inspection of Construction".

### 3.9 DOCUMENTATION

Maintain current records providing factual evidence that required quality control activities and tests have been performed. Include in these records the work of subcontractors and suppliers on an acceptable form that includes, as a minimum, the following information:

- a. The name and area of responsibility of the Contractor/Subcontractor.
- b. Operating plant/equipment with hours worked, idle, or down for repair.
- c. Work performed each day, giving location, description, and by whom. When Network Analysis (NAS) is used, identify each phase of work performed each day by NAS activity number.
- d. Test and control activities performed with results and references to specifications/drawings requirements. Identify the control phase (Preparatory, Initial, Follow-up). List of deficiencies noted, along with corrective action.
- e. Quantity of materials received at the site with statement as to acceptability, storage, and reference to specifications/drawings requirements.
- f. Submittals and deliverables reviewed, with Contract reference, by whom, and action taken.
- g. Offsite surveillance activities, including actions taken.
- h. Job safety evaluations stating what was checked, results, and instructions or corrective actions. Include information identified by the "Responsible Individual(s)" for Safety as outlined in Section 01 35 26 GOVERNMENTAL SAFETY REQUIREMENTS.
- i. Instructions given/received and conflicts in plans and/or specifications.
- j. Provide documentation of design quality control activities. For independent design reviews, provide, as a minimum, identification of

the Independent Technical Review (ITR) team, the ITR review comments, responses and the record of resolution of the comments.

k. Verification Statement.

Indicate a description of trades working on the project; the number of personnel working; weather conditions encountered; and any delays encountered. Cover both conforming and deficient features and include a statement that equipment and materials incorporated in the work and workmanship comply with the Contract. Furnish the original and one copy of these records in report form to the Contracting Officer's Representative on the first day following the date(s) covered by the report, except that reports need not be submitted for days on which no work is performed. The Government may elect to process these records electronically. Coordinate with the Contracting Officer's Representative. As a minimum, prepare and submit one report for every 7 days of no work and on the last day of a no work period. All calendar days need to be accounted for throughout the life of the contract. The first report following a day of no work will be for that day only. Reports need to be signed and dated by the Contractor Quality Control (CQC) System Manager. Include copies of test reports and copies of reports prepared by all subordinate quality control personnel within the CQC System Manager Report.

3.10 SAMPLE FORMS

Generate daily quality control reports using the Government-furnished Construction Contractor Module of RMS specified in Section 01 45 00.15 10 RESIDENT MANAGEMENT SYSTEM CONTRACTOR MODE(RMS CM).

3.11 NOTIFICATION OF NONCOMPLIANCE

The Contracting Officer will notify the Contractor of any detected noncompliance with the foregoing requirements. Take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the work site, will be deemed sufficient for the purpose of notification. If the Contractor fails or refuses to comply promptly, the Contracting Officer can issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to such stop orders will be made the subject of claim for extension of time or for excess costs or damages by the Contractor.

-- End of Section --

<b>CONTRACTORS QUALITY CONTROL REPORT (QCR)</b> <b>DAILY LOG OF CONSTRUCTION - MILITARY</b>		REPORT NUMBER 218      Page 1 of 1	
		DATE 09 Dec 2004 - Thursday	
PROJECT D/B Main Fire Station		CONTRACT NUMBER W9128F-04-C-0013 NA	
CONTRACTOR Bryan Construction	WEATHER Weather Not Entered		
<b>QC NARRATIVES</b> No QC Narratives were reported today			
<b>PREP/INITIAL DATES</b> (Preparatory and initial dates held and advance notice) No preparatory or initial inspections were held today			
<b>ACTIVITY START/FINISH</b> No activities were started or finished today			
<b>QC REQUIREMENTS</b> No QC requirements were completed today			
<b>QA/QC PUNCH LIST</b> (Describe QC Punch List items issued, Report QC and QA Punch List items corrected) No QC Punch List items were issued today No Punch List items were corrected today			
<b>CONTRACTORS ON SITE</b> (Report first and/or last day contractors were on site) No contractors had their first or last day on site today			
<b>LABOR HOURS</b> No labor hours were Reported today Total hours worked to date: 0.0			
<b>EQUIPMENT HOURS</b> No equipment hours were Reported today Total operating hours to date: 0.0			
<b>ACCIDENT REPORTING</b> (Describe accidents) No accidents reported today			
<b>CONTRACTOR CERTIFICATION</b> On behalf of the contractor, I certify that this Report is complete and correct and all equipment and material used and work performed during this Reporting period are in compliance with the contract plans and specifications, to the best of my knowledge, except as noted above.			
QC REPRESENTATIVE'S SIGNATURE		DATE	SUPERINTENDENT'S INITIALS
			DATE

SAMPLE

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## SECTION 01 45 00.15 10

## RESIDENT MANAGEMENT SYSTEM CONTRACTOR MODE(RMS CM)

**11/16; OMH 03/17**

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-- End of Section Table of Contents --



## SECTION 01 45 00.15 10

RESIDENT MANAGEMENT SYSTEM CONTRACTOR MODE(RMS CM)  
11/16; OMH 03/17

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this section to the extent referenced. The publications are referred to within the text by the basic designation only.

## U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1 (2014) Safety and Health Requirements  
Manual

## 1.2 CONTRACT ADMINISTRATION

The Government will use the Resident Management System (RMS) to assist in its monitoring and administration of this contract. The Contractor uses the Government-furnished Construction Contractor Mode of RMS, referred to as RMS3/CM, to record, maintain, and submit various information throughout the contract period. The Contractor mode user manuals, updates, and training information can be downloaded from the RMS web site at: <http://rmsdocumentation.com/>. The joint Government-Contractor use of RMS facilitates electronic exchange of information and overall management of the contract. RMS3/CM provides the means for the Contractor to input, track, and electronically share information with the Government in the following areas:

- Administration
- Finances
- Quality Control
- Submittal Monitoring
- Scheduling
- Import/Export of Data
- Closeout

## 1.2.1 Correspondence and Electronic Communications

For ease and speed of communications, exchange correspondence and other documents in electronic format to the maximum extent feasible between the Government and Contractor. Correspondence, pay requests and other documents comprising the official contract record are also be provided in paper format, with signatures and dates where necessary. Paper documents will govern, in the event of discrepancy with the electronic version.

## 1.2.2 Other Factors

Other portions of this document have a direct relationship to the reporting accomplished through RMS. Particular attention is directed to Contract Clause, "Schedules for Construction Contracts"; Contract Clause, 52.232-27 "Prompt Payment for Construction Contracts"; Contract Clause, 52.232-15 "Payments Under Fixed-Priced Construction Contracts"; Section

01 32 01.00 10PROJECT SCHEDULE; Section 01 33 00 SUBMITTAL PROCEDURES; ,  
 Section 01 35 26 GOVERNMENTAL SAFETY REQUIREMENTS; and Section  
 01 45 00.00 10 QUALITY CONTROL,. Also, there is no separate payment for  
 establishing and maintaining the RMS3/CM database; costs associated will  
 be included in the contract pricing for the work.

### 1.3 RMS3/CM SOFTWARE

RMS is a Windows-based program that can be run on a Windows based PC meeting the requirements as specified in paragraph SYSTEM REQUIREMENTS. The Contractor will be granted access to the contract in RMS3/CM after award of the construction contract.

Prior to the Pre-Construction Conference, the Contractor will be responsible to download, install and initiate entry of contractor data, such as pre-construction submittals, subcontractors, and schedule. Any program updates of RMS3/CM will be installed automatically each time the software is launched.

#### 1.3.1 RMS3/CM CONTRACTOR'S MODE (CM)

RMS Contractor's Mode or RMS3/CM is the replacement for Quality Control System or QCS. The database remains the same. References to RMS in this specification includes RMS3/CM.

### 1.4 SYSTEM REQUIREMENTS

The following is the minimum system configuration required to run RMS3/CM :

Minimum RMS System Requirements	
Hardware	
Windows-based PC	1.5 GHz 2 core or higher processor
RAM	8 GB
Hard drive disk	10 GB free space to install. Additional free space may be needed as demanded by data requirements for sole use by the RMS3/CM system
Optical Disc (CD or DVD) Reader	Used to Provide electronic copies, when required
Monitor	Screen resolution 1366 x 768, 24 bit or higher color depth
Mouse or other pointing device	
Windows compatible printer	
Connection to the Internet	minimum 4 Mbs upload/download speed
Software	

Minimum RMS System Requirements	
MS Windows	Windows 7 x 64 bit (RMS requires 64 bit O/S) or newer
Word Processing software	Viewer for MS Word 2013, MS Excel 2013, or newer

## 1.5 RELATED INFORMATION

### 1.5.1 RMS User Guide

After contract award, download instructions for the installation and use of RMS3/CM from the Government RMS Internet Website (RMS at: <http://rmsdocumentation.com/>).

### 1.5.2 Contractor Quality Control (CQC) Training

The use of RMS3/CM will have been discussed with the QC System Manager during the mandatory CQC Training class.

## 1.6 CONTRACT DATABASE

Data is entered by both Government and Contractor into a shared database. Inputs are live and are immediately visible to both parties. Prior to the pre-construction conference, the Government will input basic contract award data and will continue to provide feedback (submittal reviews, correspondence status, Quality Assurance (QA) comments, and other administrative data) using RMS3 for the duration of the contract. In turn, the Contractor will input its data into RMS3/CM.

## 1.7 DATABASE MAINTENANCE

Establish, maintain, and update data in the RMS3/CM database throughout the duration of the contract. Submit data updates to the Government (e.g., daily reports, submittals, RFI's, schedule updates, payment requests) using RMS3/CM. The RMS3 database typically includes current data on the following items:

### 1.7.1 Administration

#### 1.7.1.1 Contractor Information

Contain within the database the Contractor's name, address, telephone numbers, management staff, and other required items. Within 7 calendar days of receiving access to the contract in RMS3/CM, enter Contractor administrative data.

#### 1.7.1.2 Subcontractor Information

Within 7 calendar days of receiving access to the contract in RMS3/CM enter the name, trade, address, phone numbers, and other required information for all subcontractors. A subcontractor is listed separately for each trade to be performed. Assign each subcontractor/trade a unique Responsibility Code, provided in RMS3/CM.

#### 1.7.1.3 Correspondence

Identify all Contractor correspondence to the Government with a serial

number. Prefix correspondence initiated by the Contractor's site office with "S". Prefix letters initiated by the Contractor's home (main) office with "H". Letters are numbered starting from 0001. (e.g., H-0001 or S-0001). The Government's letters to the Contractor will be prefixed with "C". Submit all correspondence and attachments through RMS3/CM. All correspondence shall be signed.

#### 1.7.1.4 Equipment Checks

Contain within the Contractor's RMS3/CM database a current list of equipment planned for use or being used on the jobsite, including the most recent equipment inspection dates.

#### 1.7.1.5 Request For Information (RFI)

Exchange all Requests For Information (RFI) using the Built-in RFI generator and tracker in RMS3/CM.

### 1.7.2 Finances

#### 1.7.2.1 Pay Activity Data

Include within the RMS3/CM database a list of pay activities that the Contractor develops in conjunction with the construction schedule. The sum of pay activities equals the total contract amount, including modifications. Each pay activity must be assigned to a Contract Line Item Number (CLIN). The sum of the activities equals the amount of each CLIN. The sum of all CLINs equals the contract amount.

#### 1.7.2.2 Payment Requests

Prepare all progress payment requests using RMS3/CM. Complete the payment request worksheet, prompt payment certification, and payment invoice in RMS3/CM. Update the work completed under the contract, measured as percent or as specific quantities, at least monthly. After the update, generate a payment request report using RMS3/CM. Submit the payment request, prompt payment certification, and payment invoice with supporting data using RMS3/CM. If permitted by the Contracting Officer, email or a optical disc may be used. A signed paper copy of the approved payment request is also required and will govern in the event of discrepancy with the electronic version.

### 1.7.3 Quality Control (QC)

RMS provides a means to track implementation of the 3-phase QC Control System, prepare daily reports, identify and track deficiencies, document progress of work, and support other Contractor QC requirements. Maintain this data on a daily basis. Entered data will automatically output to the RMS3/CM generated daily report. Provide the Government a Contractor Quality Control (CQC) Plan within the time required in Section 01 45 00.00 10 QUALITY CONTROL. Within seven calendar days of Government acceptance, update RMS3/CM with the information contained in the accepted CQC Plan: schedule, pay activities, features of work, submittal register, QC requirements, and equipment list.

#### 1.7.3.1 Daily Contractor Quality Control (CQC) Reports.

RMS3/CM includes the means to produce the Daily CQC Report. The Contractor can use other formats to record basic Quality Control(QC)

data. However, the Daily CQC Report generated by RMS3/CM must be the Contractor's official report. Summarize data from any supplemental reports by the Contractor and consolidate onto the RMS3/CM-generated Daily CQC Report. Submit daily CQC Reports as required by Section 01 45 00.00 10 QUALITY CONTROL. Electronically submit reports to the Government within 24 hours after the date covered by the report. Also provide the Government a signed, printed copy of the daily CQC report.

#### 1.7.3.2 Deficiency Items

Use RMS3/CM to track deficiencies. Deficiencies identified by the Contractor will be numerically tracked using its Quality Control (QC) punch list items. Maintain a current log of its QC punch list items in the RMS3/CM database. The Government will log the deficiencies it has identified using its Quality Assurance (QA) punch list items. The Government's QA punch list items will be included in its export file to the Contractor. Regularly update the correction status of both QC and QA punch list items.

#### 1.7.3.3 Three-Phase Control Meetings

Maintain scheduled and actual dates and times of preparatory and initial control meetings in RMS3/CM.

#### 1.7.3.4 Features of Work

Include a complete list of the features of work in the RMS3/CM database. A feature of work is associated with multiple pay activities. However, each pay activity (see subparagraph "Pay Activity Data" of paragraph "Finances") will only be linked to a single feature of work.

#### 1.7.3.5 Hazard Analysis

Use RMS3/CM to develop a hazard analysis for each feature of work included in the CQC Plan. The Activity Hazard Analysis will include information required by EM 385-1-1, paragraph 01.A.13.

#### 1.7.3.6 QC Requirements

Develop and maintain a complete list of QC testing and required structural and life safety special inspections required by the International Code Council (ICC), transferred and installed property, and user training requirements in RMS3/CM. Update data on these QC requirements as work progresses.

#### 1.7.3.7 Management Reporting

RMS3/CM includes a number of reports that Contractor management can use to track the status of the project. The value of these reports is reflective of the quality of the data input, and is maintained in the various sections of RMS3/CM. Among these reports are: Progress Payment Request worksheet, Quality Assurance/Quality Control (QA/QC) comments, Submittal Register Status, Three-Phase Control checklists.

#### 1.7.3.8 Exposure Hours

Log labor and equipment exposure hours on a daily basis. The labor and equipment exposure data will be rolled up into a monthly exposure report.

#### 1.7.3.9 Accident/Safety Reporting

The Government will issue safety comments, directions, or guidance whenever safety deficiencies are observed. The Government's safety comments will be available in RMS3/CM. Regularly update the correction status of the safety comments. In addition, utilize RMS3/CM daily reports and exposure hours to advise the Government of any accidents occurring on the jobsite. A brief supplemental entry of an accident is not to be considered as a substitute for completion of mandatory reports, e.g., ENG Form 3394 and OSHA Form 300.

#### 1.7.4 Submittal Management

The Government will input the initial submittal register in RMS3. Thereafter, maintain a complete list of submittals, including completion of data columns. Dates when submittals are received and returned by the Government will be tracked in RMS3. Use RMS3/CM to track and transmit submittals. ENG Form 4025, submittal transmittal form, and the submittal register update must be produced using RMS3/CM. RMS3 will be used to update, store and exchange submittal registers and transmittals. In addition to requirements stated in specification 01 33 00, actual submittals are to be stored in RMS3/CM, with hard copies also provided (if required). Exception will be where the Contracting Officer specifies only hard copies required, where size of document cannot be saved in RMS3/CM, and where samples, spare parts, color boards, and full size drawings are to be provided.

#### 1.7.5 Schedule

Develop a construction schedule consisting of pay activities, in accordance with Section 01 32 01.00 10 PROJECT SCHEDULE or Contract Clause, "Schedules for Construction Contracts". Input and maintain in the RMS database the schedule either manually or by using the Standard Data Exchange Format (SDEF). Include with each pay request the updated schedule. Provide electronic copies of transmittals.

#### 1.7.6 Import/Export of Data

RMS includes the ability to import schedule data using SDEF.

### 1.8 IMPLEMENTATION

Use of RMS3/CM as described in the preceding paragraphs is mandatory. Ensure that sufficient resources are available to maintain contract data within the RMS3/CM with current information. RMS3/CM is an integral part of the Contractor's management of quality control.

### 1.9 MONTHLY COORDINATION MEETING

Update the RMS3/CM database each workday. As required in Contract Clause for Payments, at least one week prior to submittal of the progress payment request, meet with the Government representative to review the planned progress payment data submission for errors and omissions. Make all required corrections prior to Government acceptance of the progress payment request. Payment requests accompanied by incomplete or incorrect data will be returned. The Government will not process progress payments until all required data is received.

1.10 NOTIFICATION OF NONCOMPLIANCE

The Contracting Officer will notify the Contractor of any detected noncompliance with the requirements of this specification. Take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor, will be deemed sufficient for the purpose of notification.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

-- End of Section --

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## SECTION 01 57 20.00 10

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**10/20**

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SECTION 01 57 20.00 10  
ENVIRONMENTAL PROTECTION  
10/20

PART 1 GENERAL

ATTACHMENT:

01350 Environmental Standards

01351 Revegetation and Tree Care Standards

NOTE: If the requirements in Specification Section 01 57 20.00 10 conflict with requirements in the attached sections 01350 and 01351, the requirements in Section 01 57 20.00 10 shall govern.

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

U.S. AIR FORCE (USAF)

AFI 32-1053 (2009) Integrated Pest Management Program

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

33 CFR 328	Definitions
40 CFR 68	Chemical Accident Prevention Provisions
40 CFR 152 - 186	Pesticide Programs
40 CFR 260	Hazardous Waste Management System: General
40 CFR 261	Identification and Listing of Hazardous Waste
40 CFR 262	Standards Applicable to Generators of Hazardous Waste
40 CFR 279	Standards for the Management of Used Oil
40 CFR 302	Designation, Reportable Quantities, and Notification
40 CFR 355	Emergency Planning and Notification
49 CFR 171 - 178	Hazardous Materials Regulations

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1 (2014) Safety and Health Requirements Manual

## WETLAND MANUAL

Corps of Engineers Wetlands Delineation  
Manual Technical Report Y-87-1

## 1.2 DEFINITIONS

## 1.2.1 Environmental Pollution and Damage

Environmental pollution and damage is the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to humankind; or degrade the environment aesthetically, culturally and/or historically.

## 1.2.2 Environmental Protection

Environmental protection is the prevention/control of pollution and habitat disruption that may occur to the environment during construction. The control of environmental pollution and damage requires consideration of land, water, and air; biological and cultural resources; and includes management of visual aesthetics; noise; solid, chemical, gaseous, and liquid waste; radiant energy and radioactive material as well as other pollutants.

## 1.2.3 Contractor Generated Hazardous Waste

Contractor generated hazardous waste means materials that, if abandoned or disposed of, may meet the definition of a hazardous waste. These waste streams would typically consist of material brought on site by the Contractor to execute work, but are not fully consumed during the course of construction. Examples include, but are not limited to, excess paint thinners (i.e. methyl ethyl ketone, toluene etc.), waste thinners, excess paints, excess solvents, waste solvents, and excess pesticides, and contaminated pesticide equipment rinse water.

## 1.2.4 Land Application for Discharge Water

The term "Land Application" for discharge water implies that the Contractor shall discharge water at a rate which allows the water to percolate into the soil. No sheeting action, soil erosion, discharge into storm sewers, discharge into defined drainage areas, or discharge into the "waters of the United States" shall occur. Land Application shall be in compliance with all applicable Federal, State, and local laws and regulations.

## 1.2.5 Pests

The term "pests" means arthropods, birds, rodents, nematodes, fungi, bacteria, viruses, algae, snails, marine borers, snakes, weeds and other organisms (except for human or animal disease-causing organisms) that adversely affect readiness, military operations, or the well-being of personnel and animals; attack or damage real property, supplies, equipment, or vegetation; or are otherwise undesirable.

## 1.2.6 Surface Discharge

The term "Surface Discharge" implies that the water is discharged with possible sheeting action and subsequent soil erosion may occur. Waters that are surface discharged may terminate in drainage ditches, storm sewers, creeks, and/or "waters of the United States" and would require a

permit to discharge water from the governing agency.

#### 1.2.7 Waters of the United States

All waters which are under the jurisdiction of the Clean Water Act, as defined in 33 CFR 328.

#### 1.2.8 Wetlands

Wetlands means those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, and bogs. Official determination of whether or not an area is classified as a wetland must be done in accordance with WETLAND MANUAL.

### 1.3 GENERAL REQUIREMENTS

The Contractor shall minimize environmental pollution and damage that may occur as the result of construction operations. The environmental resources within the project boundaries and those affected outside the limits of permanent work shall be protected during the entire duration of this contract. The Contractor shall comply with all applicable environmental Federal, State, and local laws and regulations. The Contractor shall be responsible for any delays resulting from failure to comply with environmental laws and regulations. The contractor shall also reference USAFA Environmental Standards as found as an Attachment to this section.

#### 1.4 SUBCONTRACTORS

The Contractor shall ensure compliance with this section by subcontractors.

#### 1.5 PAYMENT

No separate payment will be made for work covered under this section. The Contractor shall be responsible for payment of fees associated with environmental permits, application, and/or notices obtained by the Contractor. All costs associated with this section shall be included in the contract price. The Contractor shall be responsible for payment of all fines/fees for violation or non-compliance with Federal, State, Regional and local laws and regulations.

#### 1.6 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Administrative Submittals

Environmental Protection Plan

The environmental protection plan.

## 1.7 CERTIFICATION REQUIREMENTS

An environmental agency may require design and construction documents to be certified by a Professional Engineer (PE) registered in the State of Colorado. The Contractor shall comply with the certification requirements of the environmental regulatory agencies.

## 1.8 ENVIRONMENTAL COORDINATION, PERMITS, NOTICES, REVIEWS AND/OR APPROVALS

The Contractor shall be responsible for contacting the appropriate Federal, State, Regional, and local environmental agencies to identify all required environmental permits (construction and operating), notices, reviews, and approvals required for the project. Once the requirements are identified, the Contractor shall be responsible for coordinating the requirements with the US Air Force Academy's Environmental Flight and the Contracting Officer in regard to implementation for a Federal Facility project. The Contractor shall ensure that all coordination, permits, notices, reviews and/or approvals are completed and submitted with each applicable phase of the design. Prior to construction starting for any phase, the Contractor shall assure that all permits and/or approvals are received and copies are submitted to the Contracting Officer. The Contractor shall be responsible for any contract delays resulting from failure to obtain environmental permits, notices, reviews and/or approvals when required.

### 1.8.1 Applications, Supporting Documents, and Fees

The Contractor shall obtain and complete all environmental permit applications and notices including any documents required for a modification for an existing permit held by the Facility. The Contractor is responsible for preparing all supporting documents, including but not limited to engineering reports, emission surveys, diagrams, pollutant load calculations, etc. If, in lieu of permits, the governing agency requires review and approval of the design, the Contractor shall submit and obtain approval of the design and associated documents. The Contractor shall be responsible for all fees associated with the permits, applications, reviews, approvals, and notices.

### 1.8.2 Environmental Permits, Notices, Reviews, and/or Approvals

The following is a listing of permits, notices, reviews, and/or approvals which **may be** required for this project. This listing and requirements are not to be considered all-inclusive by the Contractor, but is provided as information that may be used in successfully accomplishing the environmental compliances.

#### a. State of Colorado Fugitive Dust Permit

The Contractor shall be responsible for obtaining the State of Colorado Land Development (Fugitive Dust) permit prior to construction commencing. This development will exceed six months in duration, and will require a Land Disturbance Permit from CDPHE. The State of Colorado may take a maximum of 60-days to review and issue the permit. The Contractor shall be responsible for completing, modifying any information to comply with the State of Colorado laws and regulations, and submitting the attached Air Pollutant Emission Notice (APEN)-and-Application for Construction permit including the Land Development-Fugitive Dust Control Plan, and the Notice of Start-up (which is required to be submitted 30

days prior to commencement of construction) along with the project's grading plan to the State of Colorado. The Contractor is responsible for payment of all fees associated with the permit. Due to fact that this permit may take a while to obtain, the Corps of Engineers has started the application and the Contractor will apply for the ownership of the permit once selected.

- b. No soil may be removed off-site without approval from the Contracting Officer.
- c. EPA's National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharge Associated with Construction Sites. The Contractor shall be the permittee for EPA's National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharge Associated with Construction Sites on Federal Lands in the State of Colorado. Construction activities results in the disturbance of 1 acre of land or more, coverage under the EPA Storm Water General Permit For Construction Activities (Colorado Permit No. COR400000) is required. See SECTION 01 41 26.05 24 NPDES PERMITS FOR STORM WATER DISCHARGES FROM CONSTRUCTION SITES.

#### 1.9 ENVIRONMENTAL PROTECTION PLAN

During the initial design phase, the Contractor shall submit an Environmental Protection Plan for compliance review and acceptance by the Contracting Officer. For each additional submittal phases, the plan shall be updated and submitted for compliance review and acceptance by the Contracting Officer. Prior to construction, the Contractor shall meet with the Contracting Officer for the purpose of discussing the implementation of the environmental plan, possible subsequent additions and revisions to the plan including any reporting requirements, and methods for administration of the Contractor's environmental plans. The Contractor shall maintain a current version of the Environmental Protection Plan on site for review by interested parties.

##### 1.9.1 Compliance

No requirement in this Section shall be construed as relieving the Contractor of any applicable Federal, State, and local environmental protection laws and regulations. During Construction, the Contractor shall be responsible for identifying, submitting for compliance review, and implementing any additional requirements to be included in the Environmental Protection Plan.

##### 1.9.2 Contents

The environmental protection plan shall include, but shall not be limited to, the following:

- a. Name(s) of person(s) within the Contractor's organization who is(are) responsible for ensuring adherence to the Environmental Protection Plan.
- b. Name(s) and qualifications of person(s) responsible for manifesting hazardous waste to be removed from the site, if applicable.

- c. Name(s) and qualifications of person(s) responsible for training the Contractor's environmental protection personnel.
- d. Description of the Contractor's environmental protection personnel training program.
- e. An erosion and sediment control plan which identifies the type and location of the erosion and sediment controls to be provided. The plan shall include monitoring and reporting requirements to assure that the control measures are in compliance with the erosion and sediment control plan, Federal, State, and local laws and regulations. A Storm Water Pollution Prevention Plan (SWPPP) may be substituted for this plan.
- f. Drawings showing locations of proposed temporary excavations or embankments for haul roads, stream crossings, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials including methods to control runoff and to contain materials on the site.
- g. Traffic control plans including measures to reduce erosion of temporary roadbeds by construction traffic, especially during wet weather. Plan shall include measures to minimize the amount of mud transported onto paved public roads by vehicles or runoff.
- h. Work area plan showing the proposed activity in each portion of the area and identifying the areas of limited use or nonuse. Plan should include measures for marking the limits of use areas including methods for protection of features to be preserved within authorized work areas.
- i. Drawing showing the location of borrow areas.
- j. The Spill Control plan shall include the procedures, instructions, and reports to be used in the event of an unforeseen spill of a substance regulated by 40 CFR 68, 40 CFR 302, 40 CFR 355, and/or regulated under State or Local laws and regulations. The Spill Control Plan supplements the requirements of EM 385-1-1. This plan shall include as a minimum:
  - 1. The name of the individual who will report any spills or hazardous substance releases and who will follow up with complete documentation. This individual shall immediately notify the Contracting Officer, USAFA Fire Department, and USAFA Environmental Flight in addition to the legally required Federal, State, and local reporting channels (including the National Response Center 1-800-424-8802) if a reportable quantity is released to the environment. The plan shall contain a list of the required reporting channels and telephone numbers.
  - 2. The name and qualifications of the individual who will be responsible for implementing and supervising the containment and cleanup.
  - 3. Training requirements for Contractor's personnel and methods of accomplishing the training.
  - 4. A list of materials and equipment to be immediately available at the job site, tailored to cleanup work of the potential



hazard(s) identified.

5. The names and locations of suppliers of containment materials and locations of additional fuel oil recovery, cleanup, restoration, and material-placement equipment available in case of an unforeseen spill emergency.

6. The methods and procedures to be used for expeditious contaminant cleanup.

k. A non-hazardous solid waste disposal plan identifying methods and locations for solid waste disposal including clearing debris. The plan shall include schedules for disposal. The Contractor shall identify any subcontractors responsible for the transportation and disposal of solid waste. Licenses or permits shall be submitted for solid waste disposal sites that are not a commercial operating facility. Evidence of the disposal facility's acceptance of the solid waste shall be attached to this plan during the construction. The Contractor shall attach a copy of each of the Non-hazardous Solid Waste Diversion Reports to the disposal plan. The report shall be submitted on the first working day after the first quarter that non-hazardous solid waste has been disposed and/or diverted and shall be for the previous quarter (e.g. the first working day of January, April, July, and October). The report shall indicate the total amount of waste generated and total amount of waste diverted in cubic yards or tons along with the percent that was diverted.

l. A recycling and solid waste minimization plan with a list of measures to reduce consumption of energy and natural resources. The plan shall detail the Contractor's actions to comply with and to participate in Federal, State, Regional, and local government sponsored recycling programs to reduce the volume of solid waste at the source.

m. An air pollution control plan detailing provisions to assure that dust, debris, materials, trash, etc., do not become airborne and travel off the project site.

n. A contaminant prevention plan that: identifies potentially hazardous substances to be used on the job site; identifies the intended actions to prevent introduction of such materials into the air, water, or ground; and details provisions for compliance with Federal, State, and local laws and regulations for storage and handling of these materials. In accordance with EM 385-1-1, a copy of the Material Safety Data Sheets (MSDS) and the maximum quantity of each hazardous material to be on site at any given time shall be included in the contaminant prevention plan. As new hazardous materials are brought on site or removed from the site, the plan shall be updated. The Contractor shall furnish a copy of the initial and all updated contaminant prevention plans including each MSDS and quantities to USAFA's Environmental Flight.

o. A waste water management plan that identifies the methods and procedures for management and/or discharge of waste waters which are directly derived from construction activities, such as concrete curing water, clean-up water, dewatering of ground water, disinfection water, hydrostatic test water, and water used in flushing of lines. If a settling/retention pond is required, the plan shall include the design of the pond including drawings, removal plan, and testing requirements

for possible pollutants. If land application will be the method of disposal for the waste water, the plan shall include a sketch showing the location for land application along with a description of the pretreatment methods to be implemented. If surface discharge will be the method of disposal, a copy of the permit and associated documents shall be included as an attachment prior to discharging the waste water. If disposal is to a sanitary sewer, the plan shall include documentation that the Waste Water Treatment Plant Operator has approved the flow rate, volume, and type of discharge.

p. A historical, archaeological, cultural resources biological resources and wetlands plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources and wetlands known to be on the project site: **and/or** identifies procedures to be followed if historical archaeological, cultural resources, biological resources and wetlands not previously known to be onsite or in the area are discovered during design or construction. The plan shall include methods to assure the protection of known or discovered resources and shall identify lines of communication between Contractor personnel and the Contracting Officer.

q. If applicable, a pesticide treatment plan shall be included and updated, as information becomes available. The plan shall include: sequence of treatment, dates, times, locations, pesticide trade name, EPA registration numbers, authorized uses, chemical composition, formulation, original and applied concentration, application rates of active ingredient (i.e. pounds of active ingredient applied), equipment used for application and calibration of equipment. The Contractor is responsible for Federal, State, Regional and Local pest management record keeping and reporting requirements as well as any additional

### 1.9.3 Appendix

Copies of all environmental permits, permit application packages, approvals to construct, notifications, certifications, reports, and termination documents shall be attached, as an appendix, to the Environmental Protection Plan.

### 1.10 PROTECTION FEATURES

This paragraph supplements the Contract Clause PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES, AND IMPROVEMENTS. Prior to start of any onsite construction activities, the Contractor and the Contracting Officer shall make a joint condition survey. Immediately following the survey, the Contractor shall prepare a brief report including a plan describing the features requiring protection under the provisions of the Contract Clauses, which are not specifically identified on the drawings as environmental features requiring protection along with the condition of trees, shrubs and grassed areas immediately adjacent to the site of work and adjacent to the Contractor's assigned storage area and access route(s), as applicable. This survey report shall be signed by both the Contractor and the Contracting Officer upon mutual agreement as to its accuracy and completeness. The Contractor shall protect those environmental features included in the survey report and any indicated on the drawings, regardless of interference which their preservation may cause to the Contractor's work under the contract.

### 1.11 ENVIRONMENTAL ASSESSMENT OF CONTRACT DEVIATIONS

Any deviations, requested by the Contractor, from the drawings, plans and specifications which may have an environmental impact will be subject to approval by the Contracting Officer and may require an extended review, processing, and approval time. The Contracting Officer reserves the right to disapprove alternate methods, even if they are more cost effective, if the Contracting Officer determines that the proposed alternate method will have an adverse environmental impact.

### 1.12 NOTIFICATION

The Contracting Officer will notify the Contractor in writing of any observed noncompliance with Federal, State or local environmental laws or regulations, permits, and other elements of the Contractor's Environmental Protection plan. The Contractor shall, after receipt of such notice, inform the Contracting Officer of the proposed corrective action and take such action when approved by the Contracting Officer. The Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No time extensions shall be granted or equitable adjustments allowed to the Contractor for any such suspensions. This is in addition to any other actions the Contracting Officer may take under the contract, or in accordance with the Federal Acquisition Regulation or Federal Law.

## PART 2 PRODUCTS (NOT USED)

## PART 3 EXECUTION

### 3.1 LAND RESOURCES

The Contractor shall confine all activities to areas defined by the drawings and specifications. Prior to the beginning of any construction, the Contractor shall identify any land resources to be preserved within the work area. Except in areas indicated on the drawings or specified to be cleared, the Contractor shall not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, topsoil, and land forms without approval. No ropes, cables, or guys shall be fastened to or attached to any trees for anchorage unless specifically authorized. The Contractor shall provide effective protection for land and vegetation resources at all times as defined in the following subparagraphs. Stone, soil, or other materials displaced into uncleared areas shall be removed by the Contractor.

#### 3.1.1 Work Area Limits

Prior to commencing construction activities, the Contractor shall mark the areas that need not be disturbed under this contract. Isolated areas within the general work area which are not to be disturbed shall be marked or fenced. Monuments and markers shall be protected before construction operations commence. Where construction operations are to be conducted during darkness, any markers shall be visible in the dark. The Contractor's personnel shall be knowledgeable of the purpose for marking and/or protecting particular objects. Note: Contractor is working next to a creek but does not have authority to discharge anything to the creek. If this is required an 404 Permit from the US Army Corps of Engineers, Albuquerque District will be required.

### 3.1.2 Landscape

Trees, shrubs, vines, grasses, land forms and other landscape features indicated and defined on the drawings to be preserved shall be clearly identified by marking, fencing, or wrapping with boards, or any other approved techniques. The Contractor shall restore landscape features damaged or destroyed during construction operations outside the limits of the approved work area.

### 3.1.3 Erosion and Sediment Controls

The Contractor shall be responsible for providing erosion and sediment control measures in accordance with Federal, State, and local laws and regulations. The erosion and sediment controls selected and maintained by the Contractor shall be such that water quality standards are not violated as a result of the Contractor's construction activities. The area of bare soil exposed at any one time by construction operations should be kept to a minimum. The Contractor shall construct or install temporary and permanent erosion and sediment control best management practices (BMPs). BMPs may include, but not be limited to, vegetation cover, stream bank stabilization, slope stabilization, silt fences, construction of terraces, interceptor channels, sediment traps, inlet and outfall protection, diversion channels, and sedimentation basins. Any temporary measures shall be removed after the area has been stabilized.

### 3.1.4 Contractor Facilities and Work Areas

The Contractor's field offices, staging areas, stockpile storage, and temporary buildings shall be placed in areas designated on the drawings or as directed by the Contracting Officer. Temporary movement or relocation of Contractor facilities shall be made only when approved. Erosion and sediment controls shall be provided for on-site borrow and spoil areas to prevent sediment from entering nearby waters. Temporary excavation and embankments for plant and/or work areas shall be controlled to protect adjacent areas.

## 3.2 WATER RESOURCES

The Contractor shall monitor construction activities to prevent pollution of surface and ground waters. Toxic or hazardous chemicals shall not be applied to soil or vegetation unless otherwise indicated. All water areas affected by construction activities shall be monitored by the Contractor. For construction activities immediately adjacent to impaired surface waters, the Contractor shall be capable of quantifying sediment or pollutant loading to that surface water when required by State or Federally issued Clean Water Act permits.

### 3.2.1 Wetlands

DO not enter, disturb, destroy, or allow discharge of contaminants into any wetlands.

## 3.3 AIR RESOURCES

Equipment operation, activities, or processes performed by the Contractor shall be in accordance with all Federal and State air emission and performance laws and standards.

### 3.3.1 Particulates

Dust particles; aerosols and gaseous by-products from construction activities; and processing and preparation of materials, such as from asphaltic batch plants; shall be controlled at all times, including weekends, holidays and hours when work is not in progress. The Contractor shall maintain excavations, stockpiles, haul roads, permanent and temporary access roads, plant sites, spoil areas, borrow areas, and other work areas within or outside the project boundaries free from particulates which would cause the Federal, State, and local air pollution standards to be exceeded or which would cause a hazard or a nuisance. Sprinkling, chemical treatment of an approved type, baghouse, scrubbers, electrostatic precipitators or other methods will be permitted to control particulates in the work area. Sprinkling, to be efficient, must be repeated to keep the disturbed area damp at all times. The Contractor must have sufficient, competent equipment available to accomplish these tasks. Particulate control shall be performed as the work proceeds and whenever a particulate nuisance or hazard occurs. The Contractor shall comply with all State and local visibility regulations.

### 3.3.2 Odors

Odors from construction activities shall be controlled at all times. The odors shall not cause a health hazard and shall be in compliance with State regulations and/or local ordinances.

### 3.3.3 Sound Intrusions

The Contractor shall keep construction activities under surveillance and control to minimize environment damage by noise.

### 3.3.4 Burning

Burning shall be prohibited on the Government premises.

## 3.4 CHEMICAL MATERIALS MANAGEMENT AND WASTE DISPOSAL

Disposal of wastes shall be as directed below, unless otherwise specified in other sections and/or shown on the drawings.

### 3.4.1 Solid Wastes

Solid wastes (excluding clearing debris) shall be placed in containers which are emptied on a regular schedule. Handling, storage, and disposal shall be conducted to prevent contamination. Segregation measures shall be employed so that no hazardous or toxic waste will become co-mingled with solid waste. The Contractor shall transport solid waste off Government property and dispose of it in compliance with Federal, State, and local requirements for solid waste disposal. A Subtitle D RCRA permitted landfill shall be the minimum acceptable off-site solid waste disposal option. The Contractor shall verify that the selected transporters and disposal facilities have the necessary permits and licenses to operate.

### 3.4.2 Chemicals and Chemical Wastes

Chemicals shall be dispensed ensuring no spillage to the ground or water. Periodic inspections of dispensing areas to identify leakage and initiate corrective action shall be performed and documented. This documentation

will be periodically reviewed by the Government. Chemical waste shall be collected in corrosion resistant, compatible containers. Collection drums shall be monitored and removed to a staging or storage area when contents are within 6 inches of the top. Wastes shall be classified, managed, stored, and disposed of in accordance with Federal, State, and local laws and regulations. All hazardous materials brought on the facility shall be bar coded and tracked by the USAFA's HAZMAT. The Contractor shall contact the HAZMAT office prior to hazardous materials being brought on the facility to arrange for on-site bar coding and tracking by the HAZMAT office.

#### 3.4.3 Contractor Generated Hazardous Wastes/Excess Hazardous Materials

Hazardous wastes are defined in 40 CFR 261, or are as defined by applicable State and local regulations. Hazardous materials are defined in 49 CFR 171 - 178. The Contractor shall, at a minimum, manage and store hazardous waste in compliance with 40 CFR 262 and shall manage and store hazardous waste in accordance with the Installation hazardous waste management plan. The Contractor shall take sufficient measures to prevent spillage of hazardous and toxic materials during dispensing. The Contractor shall segregate hazardous waste from other materials and wastes, shall protect it from the weather by placing it in a safe covered location, and shall take precautionary measures such as berming or other appropriate measures against accidental spillage. The Contractor shall be responsible for storage, describing, packaging, labeling, marking, and placarding of hazardous waste and hazardous material in accordance with 49 CFR 171 - 178, State, and local laws and regulations. The Contractor shall contact EUSAFA's HAZMAT office to arrange for acceptance of any Contractor generated hazardous waste. No hazardous waste will be taken off the facility by the Contractor. Unused or partially used containers of hazardous materials (i.e., paint, adhesives) are not hazardous waste and will be taken off the facility for reuse by the Contractor. Spills of hazardous or toxic materials shall be immediately reported to the Contracting Officer. Cleanup and cleanup costs due to spills shall be the Contractor's responsibility. The disposition of Contractor generated hazardous waste and excess hazardous materials are the Contractor's responsibility.

#### 3.4.4 Fuel and Lubricants

Storage, fueling and lubrication of equipment and motor vehicles shall be conducted in a manner that affords the maximum protection against spill and evaporation. Fuel, lubricants and oil shall be managed and stored in accordance with all Federal, State, Regional, and local laws and regulations. Used lubricants and used oil to be discarded shall be stored in marked corrosion-resistant containers and recycled or disposed in accordance with 40 CFR 279, State, and local laws and regulations. There shall be no storage of fuel on the project site. Fuel must be brought to the project site each day that work is performed.

#### 3.4.5 Waste Water

Disposal of waste water shall be as specified below.

- a. Waste water from construction activities, such as onsite material processing, concrete curing, foundation and concrete clean-up, water used in concrete trucks, forms, etc. shall not be allowed to enter water ways or to be discharged prior to being treated to remove pollutants. The Contractor shall dispose of the

construction related waste water off-Government property in accordance with all Federal, State, Regional and Local laws and regulations.

- b. Ground water shall not be pumped or discharged without prior approval from the Contracting Officer.

### 3.5 RECYCLING AND WASTE MINIMIZATION

The Contractor shall participate in State and local government sponsored recycling programs. The Contractor is further encouraged to minimize solid waste generation throughout the duration of the project.

### 3.6 GREEN PROCUREMENT

The Design Contractor shall complete the design affirmative procurement form available from Environmental, which identifies recycle-content materials that shall be used in the design, and certifies that the Design Contractor has evaluated recycled-content alternatives. This document will be included in the scope of work package prior to 65% design review.

The Construction Contractor shall complete the construction affirmative procurement form available from Environmental, which identifies recycle-content materials that shall be purchased for construction, and shall match the design affirmative procurement form list of recycle-content material identified by the Design Contractor. This document shall be completed and returned to Environmental during the administrative period of the contract.

### 3.7 NON-HAZARDOUS SOLID WASTE DIVERSION REPORT

The Contractor shall maintain an inventory of non-hazardous solid waste diversion and disposal of construction and demolition debris. The Contractor shall submit a report to USAFA's Environmental Flight through the Contracting Officer on the first working day after each fiscal year quarter, starting the first quarter that non-hazardous solid waste has been generated. The following shall be included in the report:

- a. Construction and Demolition (C&D) Debris Disposed = \_\_\_\_\_ in cubic yards or tons, as appropriate.
- b. Construction and Demolition (C&D) Debris Recycled = \_\_\_\_\_ in cubic yards or tons, as appropriate.
- c. Total C&D Debris Generated = \_\_\_\_\_ in cubic yards or tons, as appropriate.
- d. Waste Sent to Waste-To-Energy Incineration Plant (This amount should not be included in the recycled amount) = \_\_\_\_\_ in cubic yards or tons, as appropriate.

### 3.8 HISTORICAL, ARCHAEOLOGICAL, AND CULTURAL RESOURCES

If during excavation or other construction activities any previously unidentified or unanticipated historical, archaeological, and cultural resources are discovered or found, all activities that may damage or alter such resources shall be temporarily suspended. Resources covered by this paragraph include but are not limited to: any human skeletal remains or burials; artifacts; shell, midden, bone, charcoal, or other deposits; rock

or coral alignments, pavings, wall, or other constructed features; and any indication of agricultural or other human historical activities. Upon such discovery or find, the Contractor shall immediately notify the Contracting Officer so that the appropriate authorities may be notified and a determination made as to their significance and what, if any, special disposition of the finds should be made. The Contractor shall cease all activities that may result in impact to or the destruction of these resources. The Contractor shall secure the area and prevent employees or other persons from trespassing on, removing, or otherwise disturbing such resources.

### 3.9 BIOLOGICAL RESOURCES

The Contractor shall minimize interference with, disturbance to, and damage to fish, wildlife, and plants including their habitat. The Contractor shall be responsible for the protection of threatened and endangered animal and plant species including their habitat in accordance with Federal, State, Regional, and local laws and regulations.

#### 3.9.1 Preble's Meadow Jumping Mouse (PMJM)

The Federally Threatened Preble's Meadow Jumping Mouse occurs on the Air Force Academy (AFA). The AFA has a Conservation Agreement and Plan with the U.S. Fish and Wildlife Service (USFWS) to protect PMJM's habitat and mitigate any adverse impacts to the habitat. On the AFA, the PMJM habitat is generally defined as riparian habitat (woody vegetated streams and drainage ways) and upland areas within 300-feet of the 100 year floodplain of a stream. Although the project site is not located in these areas and the PMJM and it's habitat are not likely to be affected, the Contractor shall be responsible for notifying the USFWS Colorado Ecological Services Field Office or the USFWS Law Enforcement Office and the AFA Natural Resources office if a PMJM (dead, injured, or hibernating) is located during construction.

##### 3.9.1.1 Construction in the Preble's Meadow Jumping Mouse Habitat

The Federally Threatened Preble's Meadow Jumping Mouse Habitat on the Air Force Academy is protected under a Conservation Agreement and Plan with the U.S. Fish and Wildlife Service (USFWS). This habitat has a restriction on construction time frames. The habitat can only have **construction occur between October 15th and May 15th**. Any construction in this habitat area can only occur with hand labor or portable fence tools. **No vehicle traffic is allowed in habitat area.** No vehicle roads or trails will be created inside or outside the fence perimeter in the habitat area. No mowing is allowed in the habitat area before or after construction either inside or outside the fence. **These requirements are in the Conservation Agreement and Plan and if not adhered to can be punished with criminal penalties.**

### 3.10 PREVIOUSLY USED EQUIPMENT

The Contractor shall clean all previously used construction equipment prior to bringing it onto the project site. The Contractor shall ensure that the equipment is free from soil residuals, egg deposits from plant pests, noxious weeds, and plant seeds. The Contractor shall consult with the USDA jurisdictional office for additional cleaning requirements.



### 3.11 MAINTENANCE OF POLLUTION FACILITIES

The Contractor shall maintain permanent and temporary pollution control facilities and devices for the duration of the contract or for that length of time construction activities create the particular pollutant.

### 3.12 MILITARY MUNITIONS

In the event the Contractor discovers or uncovers military munitions as defined in 40 CFR 260, the Contractor shall immediately stop work in that area and immediately inform the Contracting Officer.

### 3.13 TRAINING OF CONTRACTOR PERSONNEL

The Contractor's personnel shall be trained in all phases of environmental protection and pollution control. The Contractor shall conduct environmental protection/pollution control meetings for all Contractor personnel prior to commencing construction activities. The Contractor shall document all attendess with date of attendance for all meetings held. Additional meetings shall be conducted for new personnel and when site conditions change. The training and meeting agenda shall include: methods of detecting and avoiding pollution; familiarization with statutory and contractual pollution standards; installation and care of devices, vegetative covers, and instruments required for monitoring purposes to ensure adequate and continuous environmental protection/pollution control; anticipated hazardous or toxic chemicals or wastes, and other regulated contaminants; recognition and protection of archaeological sites, artifacts, wetlands, and endangered species and their habitat that are known to be in the area.

### 3.14 POST CONSTRUCTION CLEANUP

The Contractor shall clean up all areas used for construction in accordance with Contract Clause: "Cleaning Up". The Contractor shall, unless otherwise instructed in writing by the Contracting Officer, obliterate all signs of temporary construction facilities such as haul roads, work area, structures, foundations of temporary structures, stockpiles of excess or waste materials, and other vestiges of construction prior to final acceptance of the work. The disturbed area shall be graded, filled and the entire area seeded unless otherwise indicated.

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# USAFA ENVIRONMENTAL STANDARDS

## PART 1 GENERAL

### 1.0 Scope

**A.** The USAFA Environmental Standards identify processes necessary to achieve environmental compliance for contracted work done at USAFA. The requirement for compliance resides in the Regulatory Requirement and not with this document. Air Force Instruction 32-7001, Environmental Management (Section 2.33.10) requires USAFA and 10 CES/CEIEC to identify specific environmental requirements that pertain to all contracts and all work performed on behalf of the United State Air Force.

**B.** These Standards apply to all contracted work on USAFA, regardless of funding source.

**C.** Information provided in these Standards does not relieve the Contractor or other personnel from responsibility to comply with all state, local, and federal environmental laws, regulations and operating standards during performance of work on the Air Force Academy. This includes Air Force Directives and Instructions. USAFA ensures Contractor compliance through periodic inspections of the worksite and any material storage sites maintained by the Contractor on Academy grounds. **See Part 5 of this document for a list of regulatory references.**

**D.** Contractors shall cooperate with the government to take corrective action and clean up required by the Contractor's failure to comply with all state, local, and federal environmental laws, regulations and operating standards during performance of work on the Air Force Academy.

### 1.1 Environmental Permits, Licenses, Certifications, and Training

**A.** Contractors shall obtain, at Contractor's expense, all permits, licenses, certifications, and training required to perform the work stipulated in the contract or in-house design and specifications.

**B.** Contractors shall prepare all documentation required, including notices of intent and permit applications.

**1.** Contractors must originate all permit applications applicable to its activities and submit them to the Contracting Officer (CO) for review and approval by USAFA Environmental Office.

**2.** The Contracting Officer will return incorrect or incomplete documents for correction and re-submittal during the contract administrative period.

3. Once approved, Contractors shall submit the documents to the appropriate regulatory agencies.
4. Under no circumstances shall Contractors directly contact the regulatory agency concerning environmental issues for which USAFA may be liable without prior approval from the CO.

## **PART 2 SPECIFIC REQUIREMENTS**

### **2.0 Hazardous Materials**

A. AFI 32-7086, Hazardous Material Management, defines HAZMAT as: all items covered under Emergency Planning and Community Right-To-Know Act (EPCRA), (Federal, State or Local) tracking requirement covered under the OSHA Hazard Communication Standard, Class I or Class II ODS. It does not include munitions or Hazardous Waste. It does include medical supply items except as exempted under the OSHA HAZCOM Standard, unless the use results in an environmental tracking or reporting requirement.

**HAZMAT includes but is not limited to material in the following categories:**

**Chemicals**

**Gases: Compressed or Liquefied**

**Cleaning and Polishing Compounds**

**Paints, Dopes, Varnishes and related material**

**Preservatives and Sealing Compounds**

**Solid Fuels, Dyes, Pest Control Agents**

**Liquid Propellants Adhesives**

**Fuel Oils and Grease: Cutting, Lubricating, and Hydraulic**

**Other Materials as determined by the Hazardous Material Management Process Team**

B. All hazardous materials (HAZMAT) brought on site are subject to pre-approval by the USAFA HMMP Team. AFI 32-7086, Hazardous Material Management provides approval requirements for contractor used HAZMAT.

**C.** USAFA may prohibit the use of any HAZMAT it deems to be especially hazardous to human health or the environment or may result in excessive quantities of hazardous waste.

**D.** If USAFA does not approve use of a HAZMAT, USAFA may recommend a list of suitable substitutes; however, the Contractor retains responsibility for finding an acceptable substitute.

**E.** USAFA promotes waste minimization through source reduction and pollution prevention practices. The Contractor will take appropriate actions to comply with this policy.

**F.** The Prime Contractor will submit AF Form 3952, Chemical/Hazardous Material Authorization Request for all HAZMAT required for each Project. The Prime Contractor will also submit HAZMAT requirements for any subcontractors on the Contract. The approval process requires approximately 10 working days.

1. The Task Description, Block 18, must fully describe each process to be performed.
2. The Contractor must include a list of hazardous materials used in each process, as well as, a Safety Data Sheet (SDS) for each HAZMAT.
3. 29 CFR 1910.1200 requires the Contractor to maintain a complete written hazard communication program, including labels and forms of warning for chemicals, an up-to-date hazardous material inventory with copies of SDSs for all materials used on the job site, and employee information and training on hazardous chemicals in their work area.
4. All hazardous materials used on USAFA must be tracked via the Air Force approved tracking system and will be managed via bar code labels in order to comply with EPCRA requirements (40 CFR 350-472).

**G.** HAZMAT Usage Reports.

1. The Contractor may report HAZMAT used at any time during the execution of the contract or at least monthly to the HAZMART (email is the preferred method).
2. The report shall include a listing of the assigned barcode label numbers, and date used or disposed. This report may be emailed (LG\_Hazmat@usafa.af.mil) or hand delivered to the HAZMART.

**H.** Final HAZMAT Usage Report

1. The Contractor shall submit a final inventory of all hazardous materials used or disposed since the last hazardous usage report and no later than 10 business days after completion of work.
2. The report shall include a listing of the total quantity of HAZMAT used and a description of its disposition. For example, the Contractor used all of the HAZMAT during contract execution, saved it for future use, or disposed of it as hazardous waste in accordance with Colorado's hazardous waste regulations. See Section 2.2 for a description of hazardous waste management requirements.

## **I. HAZMAT Handling**

1. All hazardous materials must be transported and stored in original containers with manufacturer labels meeting the OSHA HAZCOM requirements found in Title 29 Code of Federal Regulations Part 1910.1200 (29 CFR1910.1200).
2. All HAZMAT which have been repackaged or dispensed into other than a manufacturer's original container must be clearly labeled in accordance with OSHA HAZCOM requirements. HAZMAT may not be brought on to USAFA without proper, legible labeling.
3. HAZMAT must be used and stored in areas that are free from obstructions or hazards such as tripping hazards, fire, standing water, or pests. All HAZMAT shall be separated in accordance with OSHA Material Handling requirements (29 CFR 1910.176[c]) and OSHA Hazard Communication requirements (1910.1200[b], and 1910.1200[f]).
4. HAZMAT must be stored in containers in good condition, with no leaks or rust.
5. All unused HAZMAT must be removed when the work is completed or when the material is no longer required. Unused HAZMAT may not be transferred to USAFA or its affiliates without the authorization of the HMMPTeam.

## **2.1 Hazardous Waste**

- A.** In coordination with the Environmental Office, Contractors shall properly identify, characterize, manage, and dispose of all hazardous waste (HW) generated from the Contractor's actions on USAFA property.
- B.** Contractors must dispose of all HW through USAFA's HW management program unless directed otherwise by contract specifications. The USAFA Hazardous Waste Accumulation Site (HWAS) will accept waste produced by contractors for disposal, the waste must be properly packaged IAW Dept. of Transportation (DOT) standards. The HWAS cannot provide HW containers to third-party contractors due to

budgeting constraints, also any HW shipped off USAFA by third-party contractors must have someone from the Gov't sign the Hazardous Waste Manifest IAW AFI 32-7042 para. 2.7.1.3.

**C.** If Contractors anticipate generating HW on site during contract performance, it shall prepare a Hazardous Waste Management Plan (HWMP) describing how it will comply with Colorado Department of Public Health (CDPHE) and Environment regulatory requirements and DoD, Air Force, and USAFA policies and instructions related to HW management.

1. Contractors may request a copy of USAFA HWMP from the Environmental Office to use as a guide in preparing its HWMP.
2. The Contractor shall submit the HWMP to the CO for approval a minimum of 15 business days prior to commencement of work on site.
3. The Contractor HWMP shall include the following elements:
  - a) Waste descriptions, waste codes, and estimated quantities of specific hazardous wastes that will be generated on site, such as batteries, paints, solvents, aerosol cans and mercury-containing lamps.
  - b) Copies of letters appointing Contractor personnel to positions of primary and alternate HW managers.
  - c) Copies and descriptions of HW training the Contractor's personnel have completed. Contractor personnel shall have completed appropriate training that fully satisfies Federal, State, and local regulatory requirements prior to managing HW.
  - d) Descriptions of HW storage containers and locations.

**D.** Contractors, with Environmental Office concurrence, shall determine if wastes generated are hazardous under applicable regulations for listed, characteristic, and universal wastes. The Contractor shall provide the CO and Environmental Office proof of such determination (e.g., SDS, process knowledge and/or analytical results). If Contractors do not have sufficient information to properly characterize a waste as hazardous, then Contractors shall, with Environmental Office concurrence:

1. Arrange for sampling and analysis for proper characterization of the waste.
2. Pay for sampling and analysis costs.
3. Provide the CO and the Environmental Office with documentation of analytical results for each HW generated on site.

**E.** Contractors shall accumulate HW in compliance with all applicable Federal, state, and local regulations; DoD, AF, and USAFA policies; and in accordance with the Contractor's (USAFA-approved) HWMP.

1. All containers holding HW shall be in good condition & DOT compliant with stored waste, with no leaks or rust and noted on a Weekly Inspection Sheet.
2. All containers holding HW shall be labeled with the words "Hazardous Waste", contents, and the identity of the generator (Contractor).
3. Fluorescent bulbs, batteries, mercury containing thermostats, aerosol cans, and pesticides and other designated Universal Wastes covered under the "Universal Waste Rule" shall be labeled in accordance with Colorado universal waste requirements found in Title 6 Colorado Code of Regulations Section 1007-3 Part 273 (6 CCR 1007-3 Part 273).
4. Used oil shall be labeled only with the words "USED OIL", unless it has been contaminated with solvents or other contaminants that would render it HW.

**F.** To the maximum extent practical and where cost effective, the Contractor shall recycle HW in accordance with all applicable Federal, State, and local laws and regulations. Hazardous waste recycling/re-use shall be approved by the Environmental Office prior to start of the activity. Any waste recycled or re-used on or off site, over 100 lbs. shall be reported to the Environmental Office, for Air Force Solid Waste metrics.

**G.** Only authorized USAFA personnel shall sign uniform HW manifests, land disposal restrictions, and bills of lading IAW AFI 32-7042 para. 2.7.1.3. All manifests for waste generated on site shall list USAFA's Environmental Protection Agency (EPA) generator identification number.

**H.** If the Contractor transports any HW off USAFA, it must be licensed to transport HW in Colorado. Transporters of hazardous wastes that operate in Colorado and have a transfer facility are required to obtain an EPA identification number and comply with additional requirements cited at 6 CCR 1007-3, Part 263.

## **2.2 Spill Prevention and Response Procedure (SPRP) Plan**

**A.** Contractors must develop a SPRP plan if it manages, stores, or uses HAZMAT (including fuels) or generates HW. Below is a list of the minimum requirements for development of a SPRP.

1. Contractor name
2. Mailing address



3. Primary and alternate emergency contacts
4. Emergency phone numbers, including fax number, if applicable
5. List of spill prevention and response equipment
6. Description of HAZMAT and HW managed on site
7. Description of HAZMAT and HW storage containers
8. A map showing locations of HAZMAT and HW containers and spill prevention and response equipment
9. Description of actions the Contractor will take upon discovery of an incident to contain and clean up spills and dispose of spill residue
10. Procedures for notification of USAFA after discovery of an incident (Note: Call 911)
11. Description of how the Contractor shall coordinate and complete any required corrective actions
12. Description of employee hazardous material and spill response training (Training to be provided to employees as required by all applicable Federal, state, and local regulations and copies of employee workplace hazard training program maintained on site at all times)

**B.** Contractors shall submit the completed SPRP plan to the CO a minimum of 15 business days prior to commencement of work for review and approval.

**C.** Contractors shall manage, store, and use all HAZMAT and HW (including fuels) in accordance with good engineering practices and implement best management practices in order to prevent spills and releases. Contractors shall report spills to USAFA and execute timely and appropriate actions to contain and clean up all spills in accordance with the Contractor SPRP plan. USAFA does not authorize or expect Contractors to provide emergency response or clean up actions beyond the level of training of its employees. Once a spill or release of a HAZMAT or HW managed, used, or stored by the Contractor has been contained, USAFA shall determine if additional cleanup is required and the extent of the Contractor's responsibility. Contractors shall be liable for any direct and indirect costs incurred during spill response and clean-up, including but not limited to administrative costs, materials, labor, equipment, shipping, packaging, testing, replacement equipment and materials, and disposal.

## **2.3 Water Resources**

**A.** Contractors are expected to comply with water resource regulations including, but not limited to, USAFA MS4 permit # COR-042007, Construction General Permit (CGP) # COR-21000F40, National Flood Insurance Program 44 CFR Parts 59,60,65,70, Section 404 and 401 of the Clean Water Act, CDPHE Regulation 32, and CDPS # COG070000. Contractors must coordinate with Environmental to ensure their actions comply with USAFA NPDES permits.

**B.** Concerning water resource responsibilities, Contractors shall:

1. Comply with all relevant requirements of storm water, municipal, multisector, and individual NPDES permits held by USAFA.
2. Not discharge wastewater or water (including surface discharges and underground injection) that could impact the quality of the surface water or groundwater of Colorado without prior approval of the Environmental Office.
3. Coordinate with Environmental Office to ensure that non-stormwater discharges are covered by an appropriate permit prior to authorizing the discharges, or determine if permitting is required.
4. Coordinate with the Environmental Office to obtain required permits not already in place at USAFA including permits to cover discharges to surfacewater, land application discharges that impact groundwater, de-watering discharges, 404 disturbances, and underground injection activities.
5. Apply for a septic system installation permit from CDPHE for septic systems or holding tanks that receive more than 2,000 gallons per day.
6. Apply for a septic system installation permit from the El Paso County Department of Health for any septic systems or holding tanks.

**C.** Concerning construction projects that shall disturb one (1) or more acres, Contractors shall:

1. Review and comply with EPA 2017 NPDES General Permit for Discharges from Construction Activities (COR12000F).
2. Prepare and submit a Storm Water Pollution Prevention Plan (SWPPP) for approval by the Environmental Office. The SWPPP must comply with requirements described in the 2017 NPDES General Permit for Discharges from Construction Activities (COR12000F) listed in Section 7 (Stormwater Pollution Prevention Plan).
3. Once the SWPPP has been approved, submit an electronic Notice of Intent

(NOI) to the US EPA. Prime contractor will be the permittee or co-permittee. Earth disturbing activities may commence as soon as the contractor receives an individual permit number from the EPA, usually 10-14 days after submitting the N.O.I.

4. Submit an electronic Notice of Termination (NOT) to EPA after USAFA Notice of Termination form is signed by the Environmental Office and contractor is advised to proceed.

5. Keep all SWPPP documents in their files and available for inspection upon request for 3 year after the NOT is filed.

**D.** Concerning construction projects that shall disturb less than one acre, Contractors shall:

1. Install perimeter controls or other control measures to prevent sediment from leaving the site.
2. Protect storm drain inlets to prevent sediment from entering active storm drains.
3. Protect large stockpiles
4. Immediately clean up spills of fuels, lubricants, and other HAZMAT.
5. Coordinate with Environmental Office if the project experiences excessive erosion, sediment discharges, or disturbs over an acre.

**E.** Projects shall be designed to comply with the USAFA NPDES Municipal Separate Storm Sewer System (MS4) permit and Energy Independence and Security Act Section 438.

1. Post-construction storm water runoff from project sites shall be restricted to the predevelopment hydrology for projects adding 5,000 square feet of impervious surface or greater. Devices/designs to comply with this condition shall be approved by the Environmental Office.

2. Permanent Water Quality Treatment Devices shall be consistent with criteria presented in the Colorado Springs City/County Storm Water Drainage Control Manual.

**F.** To ensure compliance with other Clean Water Act requirements, Contractors:

1. Shall not discharge any domestic, construction and/or industrial waste (including any hazardous material or hazardous waste) to the environment, sanitary or storm water sewer system without first securing approval from the Environmental Office. Such materials include, but are not limited to the following:

- a) Glycol-containing wastes drained from heating, ventilation, and air conditioning facilities
  - b) Cooling tower, chiller solutions, and boiler blow-down
  - c) Fluids generated from in-situ or slip-lining sewer line repairs
  - d) Swimming pool and pool filter backwashing wastewater
  - e) Super-chlorinated solutions from drinking water line or other repairs and replacement
  - f) Septic and holding tank waste
  - g) Oil/water separator residue and grease trap residue
  - h) High-temperature hot water from line replacement or repair
  - i) Any other wastewater that may contain pollutants
2. Shall not use surface or underground water supplies for any contract-related activities without approval from the Environmental Office.
  3. Shall not dispose of dredged or fill materials in wetlands, dispose of excavated materials into Waters of the US, use fill for road crossings, or dispose of similar dredge or fill materials in floodplain areas without a permit obtained in coordination with Environmental Office.
  4. Shall not discharge groundwater to Waters of the State from trenches, pits etc. during construction without a dewatering permit from EPA or CDPHE.

## 2.4 Special Pollutants – Asbestos, PCBs, Lead-Based Paint

**A.** In the design or planning phase of a construction, services, or operations and maintenance project, the Contractor's architect or engineer shall schedule for a complete survey of the entire project area, in order to determine whether there are hazards associated with asbestos (ACBM), polychlorinated biphenyls (PCBs), or lead-based paint (LBP). These surveys shall be conducted at the expense of the project. If hazards are identified, necessary abatement and disposal procedures shall be incorporated into contract documents and in all Requests for Proposal. All costs associated with meeting the requirements of the Federal, State, and local regulations are the responsibility of the Contractor unless otherwise noted in contract documentation. *NOTE: Projects which do not require AE design services must also comply with the requirements of CCR 8 and 5 CCR 1001 to determine if asbestos or lead-based paint are present and may be disturbed as a result of Contractor's actions.*

**B.** All asbestos surveys/inspections must be conducted in accordance with the requirements of Colorado Code of Regulations (CCR) 8 Part B – Asbestos, paragraph III.A and IV. C. Personnel conducting the Survey/Inspection shall be certified by the State of Colorado in accordance with paragraph III.A.1.a. Reports documenting the Survey/Inspection shall include as a minimum the information required by the Asbestos Hazard Emergency Response Act (AHERA).

**C.** All LBP surveys/inspections must be conducted in accordance with Colorado's LBP regulations codified at Volume 5, 5 CCR 1001, 1001-23, Regulation 19, EPA's LBP regulations codified at 40 CFR 745, and the US Department of Housing and Urban Development Guidelines for Evaluation and Control of Lead-based Paint Hazards in Housing.

**D.** Contractors shall inform the CO, or in the event of an emergency, the Environmental Office, of the presence of asbestos, LBP, or PCBs not previously identified within the project area. The CO shall evaluate the extent to which there are cost impacts to abatement and disposal and take necessary steps to resolve the issue.

**E.** Contractors shall be responsible for ensuring equipment or materials brought on USAFA do not contain PCBs, asbestos, or LBP. Contractors shall be required to obtain prior approval from the Environmental Office for an exemption to this requirement.

**F.** Contractors shall test construction debris for lead using the Toxicity Characteristic Leaching Procedure (TCLP) and submit analytical results to the CO or Environmental, as applicable. The Contractor shall use sampling procedures and analytical methods consistent with EPA guidance. The results of the analysis shall be reviewed by the Environmental Office and filed in the project folder. Disposal of lead-containing material classified as hazardous waste shall be consistent with requirements shown in Section 2.1.

**G.** If asbestos abatement is required, Contractors shall submit a report documenting the amount and location of asbestos removed in addition to all waste manifests generated during the course of the project, to the CO and the Environmental Office, as applicable.

**H.** Contractors shall immediately report to the Construction Inspector or Contract Manager, accidental releases of asbestos, PCBs, or LBP that occurred as part of performance of the contract. The Construction Inspector or Contract Manager will report these releases to the CO and the Environmental Office.

## **2.5 Petroleum, Oils, and Lubricants (POLS)**

- A.** The staging of tanks for vehicle and equipment refueling requires the approval of the CO and the Environmental Office.
- B.** Follow all regulatory guidance from AFI 32-7044, Storage Tank Compliance and 7 C.C.R. 1104-14 Storage Tank Compliance.
- C.** Contractors shall prepare a SPRP Plan according to Section 2.3 and submit it to the CO and Environmental for approval.
- D.** All fuel and oil storage containers with a capacity of 55 gallons or more must have secondary containment sized to hold the capacity of the largest container in it. Secondary containment for containers stored outside without cover must include additional freeboard volume for precipitation.
- E.** Contractors will keep and maintain spill containment materials (i.e. spill kits) near all oil storage areas.
- F.** During fuel or oil transfers, Contractors must use spill containment devices and have additional spill containment materials available. Potential paths to navigable waters (i.e. storm drains, stormwater channels) near the transfer area will be completely blocked for the entire duration of the transfer.
- G.** Contractors shall not apply oil to roadways or other surface areas for dust suppression.
- H.** Water accumulated in secondary containment with an oil sheen may not be released. The Contractor will coordinate with the Environmental Office for its proper disposal. If the water has no apparent sheen or odor, it can be discharged to the environment. The Contractor will maintain a log documenting every discharge of uncontaminated water to the environment.
- I.** Aboveground POL storage tanks must be Underwriters Laboratory-approved, double-walled tanks meeting requirements of Colorado aboveground storage tank regulations (7 C.C.R. 1104-14).
- J.** Contractors shall comply with the OSHA HAZCOM Standard cited at 29 CFR

1910.1200 and must comply with labels and other forms of warning, SDSs, and training.

**K.** Contractors shall not conduct routine servicing of vehicles, such as oil changes or brake fluid changes, on USAFA property.

**L.** Contractors who generate used oil shall comply with Colorado's used oil management standards (6 CCR 1007-3 Part 279) and must:

1. Store used oil only in compatible tanks and containers
2. Keep tanks and containers in good condition and free of leaks
3. Label tanks and containers with the words "USED OIL"
4. Stop, contain and cleanup spills or releases to the environment
5. Use a transporter licensed by Colorado to transport used oil when shipping used oil off site.
6. POLs at USAFA is subject to Colorado's Oil and Petroleum Spill Prevention Requirements (7 CCR 1101-14) including but not limited to the following reporting requirements:
  - a. Contractors must report a release of POLs that enters or may enter "Waters of the U.S." including surface waters, groundwater, dry gullies, or storm sewers leading to surface waters to Environmental immediately.
  - b. Contractors must report releases of POLs to land greater than 25 gallons or any oil release to waters of the US to Environmental immediately.

**M.** Contractors shall not mix used oil with characteristic hazardous waste (e.g. gasoline) because the mixing constitutes hazardous waste treatment and requires a permit (6 CCR 1007-3, Part 279.10 (b) (2)(ii)).

**N.** Contractors storing an aggregate of 1320 gallons or more of oil as defined by 40

CFR 112.2 must prepare and implement a Spill Prevention, Controls, and Countermeasures Plan (SPCC) as required by 40 CFR 112. Only containers 55 gallons or greater will be counted toward the aggregate storage. The Plan must be submitted to and approved by the Environmental Office, and fully implemented before work can begin. All contractors who handle oil will be trained according to 40 CFR 112.7(f).

## **2.6 Solid Waste**

**A.** Contractors shall complete a monthly Solid Waste Diversion Report for Construction and Demolition (C&D) available from Environmental for any solid waste generated on USAFA, and submit the completed form to the Contracting Office, as described in the submittal register.

**B.** Prior to start of work, or during the contract administrative period, Contractors shall provide the Environmental Office with a plan identifying the quantity, type and disposal method for any medical waste.

**C.** The medical waste plan must address the following issues:

1. Contaminated reusable sharps and other regulated wastes are required to be placed in puncture resistant, color coded, leak proof containers, as soon as possible after use and until properly reprocessed.

2. Specimens of blood or other potentially infectious materials are required to be placed in a container that prevents leakage during collection, handling, processing, storage, transport, or shipping and specific labeling and handling requirements are to be followed (29 CFR 1910.1030[d]).

3. Contractors must also comply with infectious waste packaging, storage and labeling requirements specified in Colorado's solid waste regulation 6 CCR 1007-2-13.8.

**D.** Contractors shall recycle all solid waste where practicable, to include bulky wastes and demolition waste reporting it to Environmental on the Solid Waste Diversion Report for Construction and Demolition (C&D). Solid waste that cannot be recycled must be crushed to minimize the volume of waste.

**E.** Scrap tires shall only be disposed of at solid waste disposal facilities that are approved to manage scrap tires (6 CCR 1007-2-10.1).



**F.** Contractors shall store solid wastes only in appropriate containers and keep lids closed to prevent releases to the environment.

As identified in the Solid Waste Diversion Report for C&D and to the extent practicable, Contractors shall collect compostable materials (organics, vegetation, grass, wood debris, etc.) and re-use and recycle. Approval to re-use or store materials at the compost site must be received from the Environmental Office prior to the activity.

**G.** Contractors shall dispose of solid waste only at facilities holding valid regulatory permits to manage the waste.

Recycling and re-use facilities on or off the installation shall be approved by the Environmental Office.

## **2.7 Green Procurement**

**A.** Design Contractors shall complete the design affirmative procurement form available from Environmental, which identifies recycle-content materials that shall be used in the design, and certifies that the Design Contractor has evaluated recycled-content alternatives. This document will be included in the scope of work package prior to 65% design review.

**B.** Construction Contractors shall complete the construction affirmative procurement form available from Environmental, which identifies recycle-content materials that shall be purchased for construction, and shall match the design affirmative procurement form list of recycle-content material identified by the Design Contractor. This document shall be completed and returned to Environmental during the administrative period of the contract.

## **2.8 Air Quality**

**A.** Contractors shall remain in compliance with all Federal, State, local, DoD and Air Force (AFI 32-7040) Air Quality requirements.

**B.** For projects disturbing more than one acre, but less than 25 acres, for less than six months duration, Contractors shall submit a permit application to El Paso County with copies submitted to the Environmental Office. For projects disturbing more than 25 acres, or disturbing an area of any size for a duration longer than six months, the Contractor shall submit an air pollution emission notice (APEN) along with associated fees to CDPHE. A copy of the APEN will be submitted to the Environmental Office.

**C.** Any equipment or activity that emits or has the potential to emit pollutants or that disturbs solid or liquid materials, which can become airborne, is a source of air pollution that may require a permit. Activities with anticipated air emissions include but are not limited to painting, stripping, cleaning with degreasers or solvents, material hauling, demolition, sand blasting, use of fuel-burning equipment (other than motor vehicles), welding, use of volatile organic compounds or ozone-depleting chemicals (ODCs), and remediation activities. Contractors shall obtain approval for use of hazardous materials as identified in section 2.0 Hazardous Materials. Incomplete documentation submitted will prolong the administrative period.

**D.** If air emission estimate for criteria or hazardous air pollutants exceeds threshold levels (as defined by 5 CCR 1001-5: Regulation No. 3) the Contractor shall complete an APEN and/or construction permit applications required by CDPHE, Air Pollution Control Division (APCD). Contractors shall submit the completed APEN(s) and/or construction permit application(s) to CDPHE and provide a copy to the Environmental Office.

**E.** Contractors shall ensure all company-owned and employee owned gasoline and diesel vehicles which shall be driven on USAFA comply with the emissions inspection requirements of CDPHE 5 CCR 1001-13: Regulation No. 11 (Motor Vehicle Emissions Inspection Program) and 5 CCR 1001-15: Regulation No. 12 (Reduction of Diesel Vehicle Emissions).

**F.** Open burning on USAFA is prohibited.

**G.** Contractors shall create no noxious odors that violate Colorado's odoremissions regulation (5 CCR 1001-4: Regulation No. 2).

**H.** Contractors shall ensure any equipment containing ODCs are operated and maintained in accordance with Colorado's Control of Emission of Ozone-Depleting Compounds requirements (5 CCR 1001-19: Regulation No.15). All Contractors and subcontractor employees servicing ODC containing equipment shall be trained and certified in accordance with Regulation No. 15. Contractors must submit copies of technician and equipment certifications to the Environmental Office prior to start of work. All Class I ODC use is prohibited at USAFA per AFI 32-7040. Any requests for use of Class II ODC must be submitted in writing to the CO for review and approval, otherwise, the use of Class II ODS will be prohibited.

**I.** Employee certifications and an ODC Service Plan that identifies type of service, ODSs used, and recovery information shall be submitted to the Environmental Office prior to start of work.

**J.** Contractors shall take active steps to prevent evaporation of all solid or liquid materials that have potential to become airborne including but not limited to fuels, solvents, paints, and other volatile chemicals under the Contractor's control. All containers holding solid or liquid materials that have potential to become airborne shall be closed at all times, except when adding product to or removing product from the container.

**K.** Contractors shall fully comply with the conditions of all applicable Colorado Air Pollution Prevention and Control Act and regulations as identified in 5 CCR 1001: Regulations 1-19.

**L.** When a Fugitive Particulate Control Plan is not required by 5 CCR 1001-3: Regulation No. 1, Contractors shall perform all fugitive particulate control measures necessary to prevent emissions of over 20 percent opacity or visible emissions that cross USAFA's property boundaries. Contractors shall maintain a daily log of fugitive particulate emissions that exceed 20 percent opacity or that cause visible emissions. Contractors shall maintain a copy of this log on site at all times and shall make it available for review to the Environmental Office upon request.

**M.** Contractors shall not utilize cutback asphalt or any coating included in the definition of cutback asphalt as defined at 5 CCR 1001-9: Regulation No. 7 during the months of March through September unless the cutback asphalt is used solely as a penetrating prime coat or if the user can demonstrate to the CDPHE APCD that under the conditions of its intended use, there will be no emissions of volatile organic compounds to the ambient air.

**N.** Contractors shall not apply sand or gravel to USAFA roads without obtaining prior written approval from the Environmental Office. Similarly, in-house forces shall not apply sand or gravel to USAFA roads without obtaining prior written approval.

**O.** Contractors shall properly re-vegetate all disturbed land to prevent fugitive particulate emissions following the completion of work.

**P.** Contractors shall provide to the Air Quality Manager data plate information (i.e. a photograph) and install date for all new permanent external combustion equipment (boilers, water heaters), internal combustion engine equipment (generators, fire pumps), and equipment with a refrigerant capacity of 50 pounds or more. Data plate information must include, at minimum, model number, serial number, and manufacture date. For external combustion equipment, provide the rated heat capacity. For internal combustion equipment, provide the rated *engine* power (not the alternator or genset power). For cooling equipment, provide refrigerant charge for each circuit (for cooling equipment with charge > 50 lbs)

**Q.** When permanent internal combustion engines (generators, fire pumps) will be installed, contractors shall provide to Air Quality Manager certifications or other records that demonstrating the engine's compliance with the Clean Air Act.

## **2.9 Natural Resources**

### **A. Fish and Wildlife**

1. The federally threatened Preble's Meadow Jumping Mouse (PMJM) occurs on USAFA, and the base has a Conservation Agreement with the US Fish and Wildlife Service (USFWS) to protect PMJM and mitigate any adverse impact to its habitat. PMJM habitat is generally defined as riparian habitat (woody vegetated streams and drainage ways) and upland areas within 300-feet of the 100-year floodplain of a stream. In accordance with the Conservation Agreement, all activities that will cause habitat disturbance must comply with the following conditions:

- a. Workers shall be instructed by USAFA personnel on procedures that must be followed to limit or prevent habitat impacts within and adjacent to the work area.
- b. Work shall be coordinated with and supervised by USAFA personnel familiar with PMJM and the requirements of the Conservation Agreement.
- c. The limits of any pre-approved ground disturbing activities shall be delineated with fencing or other visible barrier to prevent inadvertent impacts to habitat outside the approved construction footprint.
- d. In the event that a PMJM (dead, injured, or hibernating) is observed during any activities, the USAFA Natural Resources office shall be notified immediately to determine the necessary course of action.

2. Harassment of all wildlife is strictly prohibited.

3. All work shall strictly adhere to the environmental requirements for protecting wetlands, controlling erosion and sediment, and managing storm water to protect wildlife, vegetation, and aquatic habitats.

**B. Vegetation Management**

1. Procedures for site restoration, reseeding, and erosion control specific to USAFA and Farish Recreation Area have been developed by the USAFA Natural Resources office. Contractors shall consult with the Natural Resources office, Bldg. 9030, for guidance in implementing a reclamation plan for disturbed project

areas. Any deviation from the USAFA Erosion Control, Re-vegetation, and Tree Care Standards shall be approved by both Natural Resources and the Contracting Officer. Contractors should pay particular attention to the requirements for seedbed preparation, topsoil, native seed mixes and planting techniques, and erosion control materials and installation.

2. Contractors shall clean their equipment prior to coming on base and shall use only certified weed-free hay for revegetation to prevent introducing noxious weeds.

3. Contractors shall minimize, to the extent possible, creating new roads and trails around the project area. Any new trails or roads shall be rehabilitated and revegetated as part of the completed project.

4. Protocol for trees transplanted from construction footprint, and for trees moved into project areas is addressed in the USAFA Erosion Control, Re-vegetation and Tree Care Standard.

5. To the extent possible, trenching shall be located as far as possible from existing trees. Because roots extend as far as three times the tree height and are located primarily within the top 18" of soil, trenching can cause substantial damage to trees, especially under drought conditions. Absolutely no trenching is acceptable directly under tree crowns.

### C. Construction Timber

1. All projects on USAFA, including Farish Recreation Area, for which removal of trees is a requirement shall be coordinated with and approved by Natural Resources. In accordance with Department of Defense Instruction (DODI) 4715.3, DODI 7310.1, and AFI 32-7064 Section 8.3, forest products shall not be given away, abandoned, destroyed, or used to offset contract costs.

2. All merchantable wood [tree stem wood equal to or greater than 4 (four) inches in diameter] that results from projects on USAFA proper shall have all limbs removed and be delivered to the Natural Resources wood yard at Building 9030. Such deliveries shall be coordinated with Natural Resources to allow access to the wood yard. Leaving wood outside the wood yard fence is strictly prohibited. Disposition of products from projects at Farish Recreation Area shall be determined by Natural Resources personnel. If Contractor personnel wish to purchase wood from a project on the Academy or Farish on site, they may request a permit from Natural Resources. The price will be the current rate for field firewood. Payment must be made by check before any wood is removed from USAFA property.

3. All limb wood and tree tops less than four inches in diameter shall be identified in the Solid Waste Determination, and off-site recycling shall be approved by the Contract Officer prior to start of work. There is no on-site

recycling available on the Academy. Limb wood may be chipped and spread on site to a depth not to exceed 3 inches, with chips spread at least 30 feet from a road, trail or building. Chips shall not be spread in improved or mowed areas. Projects involving small amounts of limb wood may dispose of the wood by scattering it on-site if prior coordination has been made with the Natural Resources. In such cases, the limbs shall be moved at least 50 feet from buildings, roads, or major trails, and lopped and scattered so as not to exceed eight inches above ground level. Disposition of all wood products from Farish Recreation Area shall be determined by Natural Resources.

**4.** Any and all stumps that are to remain on site shall be cut as close to ground level as practical, not to exceed two (2) inches above ground level within 25 feet of buildings, roads or major trails, and four (4) inches above ground level elsewhere. Tree branches that obstruct the movement of equipment or are in need of removal shall be cut to the trunk or to an acceptable branch, according to proper pruning procedures. The remaining portions of limbs broken by the passage of equipment shall also be cut to the trunk or to an acceptable branch. Flush cuts are not allowed, as these promote decay of the tree stem. Pruning procedures are outlined in Appendix A of the USAFA Erosion Control, Re-vegetation and Tree Care Standards.

**5.** Any and all stumps with attached root masses shall be disposed of off USAFA property unless specifically authorized by a representative of Natural Resources. Proper disposal of such stumps is the exclusive responsibility of the Contractor or other entity responsible for the project.

**6.** Removal of forest products without a permit from USAFA or Farish Recreation Area constitutes theft of government property and shall be punished under the applicable laws or regulations.

**7.** In the event of a bona fide emergency outside of normal duty hours, trees may be removed, if absolutely necessary, without consulting Natural Resources. All other provisions remain in effect with regard to disposal of wood products at the earliest opportunity.

**8.** Contractor will contact Natural Resources as soon as possible if any transplantable trees (generally up to 20 feet) will have to be removed during construction. Natural Resources will attempt to salvage these trees by transplanting to an alternate location on the installation, or through sale to the public.

**9.** Refer to the USAFA Erosion Control, Re-vegetation and Tree Care Standards for additional information and requirements.

## 2.10 Cultural Resources

### A. Facility Treasures

1. The Cadet Area is a National Historic Landmark (NHL) district and most of the Cadet Area facilities are listed on the National Register of Historic Places (NHRP). Contractors and government forces must exercise "...ample care to the 50 plus year old facilities...to support the AFA's mission— "...to educate, train, and inspire men and women to become officers of character motivated to lead the United States Air Force in service to our nation."

2. If work is to be done on a facility listed on, or eligible for listing on, the NRHP, a record of completion of Section 106 consultation/letter of "no adverse effect" from the Colorado State Historic Preservation Office will be in the project folder. Work must not begin without this letter or a written memorandum from the Cultural Resources Manager (CRM) that such coordination is not necessary.

### B. Archaeological or Paleontological Finds

USAFA has many cultural resources, artifacts, archaeological sites, Native American sacred sites and cultural areas, and these historic sites and structures are fragile. All Contractors and government personnel must take care to avoid harming them. Items will be left undisturbed and may be protected by establishing a 100 foot perimeter around the site and cordoning it off to prevent damage. No materials will be moved or removed within, or surrounding, the work site.

Although USAFA may receive concurrence from the CO SHPO and other parties about its proposed undertakings at many points in the compliance process, USAFA should also maintain the necessary resources to handle an unanticipated discovery.

An unanticipated discovery is defined as a discovery (usually archaeological) made during a construction project in an area that has already been adequately surveyed or deemed as not requiring survey (with CO SHPO concurrence), and the unanticipated discovery in question was not found during that survey. Examples of such discoveries could include structural remains, individual or clusters of artifacts, paleontological specimens or deposits, or human remains.

#### Procedures:

1. If previously undetected archaeological resources are discovered during project activities, the USAFA personnel or contractor responsible for implementing the work will immediately stop work and notify the CRM, who will take steps to minimize impact to the resource.
2. No media or news agencies will be notified of the discovery and all information and details regarding the discovery will be official use only unless deemed releasable



by the appropriate UFASA government personnel.

3. If the remains are potentially eligible for the NRHP, the CRM will notify the Departmental Consulting Archeologist (DCA) of the NPS, Archeological Assistance Division in writing of the find, pursuant to the requirements of the AHPA (16 U.S.C. 469).
4. The CRM will notify the CO SHPO and ACHP in writing within 48 hours of the discovery, to solicit their comments (36 CFR800.13(b) (3)).
5. The stoppage of work is not required by 36 CFR 800.13; however, the CRM is reasonable for avoiding unnecessary impacts to the identified resource(s) and ensuring proper identification and notification procedures are followed.
6. Pursuant to the requirements of the AHPA, the CRM may request that the NPS record the information that is in danger of being lost, or may direct that this work be undertaken by a qualified archeologist for USAFA.
7. After notification, the NPS may undertake the recordation of information it feels is significant, and in danger of being lost after notifying USAFA in writing of its decision to do so.
8. Any archeological investigations carried out by USAFA on such archeological sites will be carried out in consultation with the CO SHPO and under the direct supervision of an archaeologist who meets, at a minimum, the Secretary of Interior's Professional Qualifications Standards (48 FR 44738-9).
9. USAFA shall provide the CO SHPO and ACHP a copy of the final report detailing the investigations.

### **Discovery and Removal of Human Remains**

If bones are discovered in the course of excavation on the base, the work resulting in the discovery shall stop, and the individual responsible for implementing the work will immediately notify the CRM of the find. No media or news agencies will be notified of the discovery and all information and details regarding the discovery will be official use only unless deemed releasable by the appropriate UFASA government personnel.

The CRM will then ensure that the following procedures are implemented:

1. The Air Force Office of Special Investigations (AFOSI) will be notified.
2. Security Forces will establish security for the remains.
3. The CRM will determine (with the aide of AFOSI, a coroner, or a physical or forensic anthropologist) if the remains are human, and whether or not they are associated with an archeological deposit.
4. If the remains are not human, and not associated with an archeological deposit, work may continue.
5. If the remains are human, AFOSI with the aide of the coroner, or a physical or forensic anthropologist, will determine if the remains are recent or ancient.
6. If the human remains are modern, the matter becomes the responsibility of law enforcement officials who will determine when project activities may resume.
7. If the human remains are not modern, and not Native American, the provisions described above for inadvertently discovered archeological remains are to be followed.
8. If the human remains have been determined to be Native American, the provisions of NAGPRA apply, and the regulations outlined in 43 CFR Part 10 shall be followed.
9. Immediately upon notification that Native American human remains have been found at USAFA, the CRM will ensure that Security Forces protection of the site will continue, and notify by phone, or in writing within one working day, 10th ABW, the Federal Preservation Officer 10 CES, the CO SHPO, and the tribal representatives of all interested Native American tribes. The CRM will initiate the consultation process outlined in 43 CFR Part 10.

The project may proceed 30 days after certification of notification is received by 10th ABW, or the Federal Preservation Officer 10 CES, or the relevant tribes (see NAGPRA 225 U.S.C. 3002 [d]); or at any time after a written, binding agreement has been executed by USAFA and the tribes that includes a recovery plan for the removal, treatment, and disposition of the human remains, and any associated cultural objects.

## **1.11 Environmental Management Systems (EMS)**

1. Contractors shall participate in USAFA's EMS by the way of understanding, implementing, and integrating the USAFA Environmental Commitment Statement (Attachment 2) to all areas of work.

## **PART 3 INSPECTIONS**

### **3.0 INSPECTIONS**

Environmental conducts routine announced and unannounced inspections during the performance of the contract to ensure the regulatory requirements are met. Non-compliance or deficiencies noted during the inspection shall be appropriately corrected, and submitted in writing to the contract office. USAFA shall perform follow up visits to verify completion of corrective actions. Non-compliance could lead to complete halt in project activities, depending on the severity of the violation.

## PART 4 POINTS OF CONTACT

### 4.0 Environmental Points of Contact

<u>Performance Requirement/Program Area</u>	<u>Phone</u>
Spill Prevention and Response Procedure Plan	719.333.6418
Hazardous Materials	719.333.3852
Hazardous Waste	719.333.3852
Waste Water and Storm Water	719.333.6420
Wetlands, Waters of U.S./State	719.333.6420
Toxic Substances (Asbestos, PCB, LBP)	719.333.3852
Pesticides	719.333.6420
Petroleum, Oils, and Lubricants (POLs-Tanks)	719.333.6425
Solid Waste	719.333.3852
Air Quality	719.333.6418
EMS	719.333.6716
Natural Resources	719.333.3308
Cultural Resources	719.333.0897

If you are unable to reach the necessary point of contact, call the Environmental Compliance Supervisor, 719.333.6412. If the concern is an **environmental emergency**, call the Emergency Response number at 911 and ask for immediate assistance.

## **PART 5 REGULATORY INFORMATION**

**5.0 REFERENCES – NOTE: THESE REFERENCES ARE PROVIDED FOR INFORMATION ONLY AND ARE NOT ALL INCLUSIVE. THE CONTRACTOR IS RESPONSIBLE FOR PERFORMING THE WORK COVERED BY THE CONTRACT IN COMPLIANCE WITH ALL APPLICABLE STATE, LOCAL, AND FEDERAL ENVIRONMENTAL LAWS, REGULATIONS AND OPERATING STANDARDS DURING PERFORMANCE OF WORK ON THE AIR FORCE ACADEMY. THIS INCLUDES AIR FORCE DIRECTIVES AND INSTRUCTIONS.**

### **A. United States Environmental Protection Agency (EPA) Regulations:**

1. Resource Conservation and Recovery Act (RCRA) - 40 Code of Federal Regulation (CFR) Parts 148, 244, 260, 261, 263, 264, 265, 266, 268, 270, 271, 272, 273, 279, 280, 281, 282, 355 and 745.
2. Clean Water Act – 40 CFR Parts 112, 122, 123, 124, 125, 129, 130, 131, and 401–471.
3. Clean Air Act – 40 CFR Parts 50, 52, 61, 63, 68, 70, 71, 86-89, 745.
4. EPCRA – SARA Title III Sections 301, 302, 303, 304, 311, 312, and 313.

### **B. Occupational Safety and Health Administration (OSHA) Regulations:**

1. Hazard Communication – 29 CFR 1910.1200
2. Hazardous Waste Operations and Emergency Responses (HAZWOPER) – 29 CFR 1910.120
3. Material Handling – 29 CFR 1910.176
4. Toxic and Hazardous Substances – 29 CFR 1910.1030

### **C. Department of Transportation (DOT) Regulations:**

1. 49 CFR Parts 171 – 173

### **D. Other Federal Regulations:**

1. National Historic Preservation Act and related Acts
2. The American Indian Religious Freedom Act

3. Archeological Resources Protection Act
4. The Native American Graves Protection and Repatriation Act
5. Endangered Species Act
6. Executive Order 13101, Greening the Government through Waste Prevention, Recycling and federal Acquisition
7. Executive Order 13148, Greening the Government through Leadership in Environmental Management

**E. State of Colorado Regulations:**

1. Air Pollution Prevention and Control Act – 5 Code of Colorado Regulation (CCR) 1001 Regulations No. 1 -19
2. Hazardous Waste Regulations – 6 CCR 1007-3 Parts 260 –279
3. Water Quality and Wastewater Regulations – 5 CCR 1002
4. Tank Regulations – 7 CCR 1101-14
5. Oil and Petroleum Spill Prevention Regulations – 7 CCR 1101 –14
6. Solid Waste Regulations – 6 CCR 1007 –2
7. Special Pollutants – 5 CCR 1001 and 6 CCR 1007
8. Pesticides, Herbicides, and Fungicides – 8 CCR 1203

**F. Department of Defense (DoD), United States Army Corps of Engineers (COE), Air Force Instructions (AFI), Policies, Guidance Documents, Memoranda, USAFA Regulations and associated guidance documents:**

1. COE document EP 1165-2-314 (Flood Proofing Regulations).
2. EPA Document 832-R-92-005, Storm water Management for Construction Activities.
3. Department of Defense, Measure of Merit, Solid Waste Management.

4. US Department of Housing and Urban Development Guidelines for Evaluation and Control of Lead-based Paint Hazards in Housing.
5. AFI 32-7001, Environmental Management.
6. AFI 32-4002, Hazardous Material Emergency Planning and Response Program.
7. AFI 32-7040, Air Quality Compliance and Resource Management
8. AFI 32-7044, Storage Tank Compliance
9. AFI 32-7042, Waste Management
10. AFI 32-7080, Pollution Prevention Program
11. AFI 32-7041 Water Quality Compliance
12. AFI 32-7086, Hazardous Materials Management
13. USAFA Asbestos Management Plan
14. USAFA Hazardous Waste Management Plan
15. USAFA Integrated Solid Waste Management Plan
16. Flood Plain Regulations for Flood Plain Management - COE document EO 1165-2-304, 1976
17. El Paso County Policy Plan
  - a. City/County Drainage Criteria Manual (City of Colorado Springs/El Paso County, Colorado) and updated storm intensity curves dated January 7, 2003.
  - b. El Paso County Individual Sewage Disposal System Regulations.

Copies of these regulations are available on the internet or from the organizations listed. It is the responsibility of all Contractors associated with the project to review and understand these regulations.

## SECTION 01351: EROSION CONTROL, REVEGETATION AND TREE CARE STANDARDS

### PART 1 – GENERAL

- 1.0 Erosion control, revegetation, and tree care is required for any project that disturbs soil, vegetation, or trees, and where other types of site stabilization (i.e. landscaping, sod, hardscape) is not included in the project. Compliance with the Standards is mandatory to promote the natural resource and tree protection required by the Integrated Natural Resources Management Plan, Noxious Weed Management Plan, Preble's Meadow Jumping Mouse Conservation Agreement, Construction Storm Water Pollution Prevention Plan (as applicable), or Clean Water Act permit. Any deviation from the Standards must be approved by the Contracting Officer (CO) and/or **USAFA Natural Resources (10 CES/CEIEA, (719) 333-3308)**. As applicable, other Landscaping requirements in the USAFA Design Standards shall also be followed.

Contractors shall consult with USAFA Natural Resources for assistance in understanding and implementing these Standards. Particular attention shall be given to the requirements for seedbed preparation, imported topsoil, planting native seed mixes, seeding techniques, and erosion control materials and installation. **The checklist in Appendix D shall be used by the Contractor and USAFA Construction Inspector to document compliance with the Standards.**

To prevent the introduction and spread of noxious weeds and other non-native plants, all construction and seeding equipment shall be free of dirt, seed, and plant parts prior to entering the base.

Contractors shall minimize creating new roads and trails adjacent to the authorized project area. Any new trails, roads, parking areas, or staging areas shall be rehabilitated as part of the project.

As part of the Environmental Deliverables List, Contractors shall provide invoices, trip tickets, tags, or other documentation to verify that the specified type, quantity, and quality of seed, topsoil, erosion fabric, and other materials is delivered and installed per the Standards. Seed and topsoil quantities shall be determined by the post-construction area (acres) of ground disturbance requiring revegetation. The disturbance area shall be calculated by tape/wheel measurement or gps mapping performed by the contractor and verified by the Construction Inspector or USAFA Project Manager.

#### 1.1. SITE PREPARATION

- A. **SOIL PREPARATION.** All disturbed areas shall be tilled on the contour to a minimum depth of four inches, and then harrowed, raked or rolled to produce a firm seed bed. Imported topsoil (see 1.1.B) shall be required to provide an acceptable planting medium. Large rocks (>3 inch diameter) and debris that may impede seeding equipment shall be cleared from the site. Any required erosion control features (e.g., water bars, berms, basins, turnouts) shall be constructed prior to seeding. No fertilizers shall be applied. Sites that are not adequately prepared prior to seeding (e.g., compacted soil, insufficient topsoil, rocky, eroded surface, etc.) shall be rejected.
- B. **TOPSOIL.** **All areas to be revegetated shall be top-soiled with at least 3-inches of imported topsoil unless the requirement is waived by the Contracting Officer, with concurrence from USAFA Natural Resources.** Where possible, the upper 2-3 inches of the native soil shall also be salvaged for re-distribution over the restoration area. Imported topsoil shall be free of rocks, noxious weeds, large woody debris, or trash. Topsoil shall not be used from areas infested with noxious weeds. Once spread throughout the restoration area, any salvaged native soil and the imported topsoil shall be lightly disked on the contour to reduce compaction and fully mix the soils.



Prior to delivering and spreading the topsoil, a chemical and physical laboratory analysis (including a hydrometer particle size analysis) of randomly collected soil samples (composite of random grab samples) shall be submitted as part of the Environmental Deliverables List for evaluation of the topsoil's compliance with the Standards. Acceptable topsoil shall be tested for and have the characteristics listed in the table below. If the topsoil does not meet these criteria, approved soil amendments (such as organic compost, humates, or other imported soils) shall be required to meet the Standards.

Soil Texture Particle Size Distribution	Loam, Sandy Loam, Sandy Clay Loam Sand <70%, Clay <30%
Soil pH	6.5 to 7.8
Salt Content	<3mmhos/cm
Organic Matter (% by weight)	>2%
Topsoil @ 3" depth per acre	403 cubic yards per acre

The composite samples shall be collected from a commercial topsoil source and laboratory tested within one month (30 days) of the delivery date to USAFA. The contractor shall reasonably coordinate with the supplier to ensure that the delivered topsoil is the same or closely similar to the material submitted for analysis, assuming the sample met the Standards. At the Government's discretion, any delivered topsoil may be re-analyzed at Government expense to determine if the topsoil must be amended to comply with the Standards. Any required soil amendment shall be at the Contractor's expense.

For multi-year or multi-season projects, a new soil laboratory analysis shall be conducted by the Contractor within one month (30 days) of the delivery date and approved by the 10 CES inspector for each phase of the revegetation. Any required soil amendment shall be at the Contractor's expense.

For shorter-term projects, if the required topsoil delivery shall take the Contractor more than one month (30 days) to deliver, the Government shall be responsible for determining whether the topsoil source still conforms to the Standard, or if a new soil analysis (at Government expense) needs to be performed. Any required soil amendment shall be at the Contractor's expense.

## 1.2. PLANT MATERIALS FOR REVEGETATION

- A. NATIVE SEED. Depending on the site conditions, and in coordination with USAFA Natural Resources, one of the following native seed mixes shall be used for revegetating the disturbed area. Other seed mixes may need to be developed for unique situations on a case-by-case basis. All seed mixes shall consist of certified seed varieties that are free of noxious weeds and have been tested for purity and germination within one year of the planting date. Locally adapted seed ecotypes collected from a similar elevation (6300-8000' at USAFA; 9000' at Farish Recreation Area) and precipitation zone (15-20 inches) shall be used. Seed certification labels which indicate the species, purity, germination, weed content, origin, and test date shall be submitted as part of the Environmental Deliverable List. If the seed will be broadcast by hand, mechanical spreader or hydro-seeder, the Pure Live Seed (PLS) seeding rate shall be doubled.

1. **Xeric (dry) areas** with a variety of soil and slope conditions shall be planted with the following seed mix:

SPECIES (Variety)	PLS RATE PER ACRE DRILL SEEDING	PLS RATE PER ACRE BROADCAST SEEDING
Perennial Ryegrass (Tetraploid) <i>Lolium perenne</i>	6.0	12.0
Little Bluestem (Camper) <i>Schizachyrium scoparium</i>	3.0	6.0
Blue Grama (Hachita) <i>Bouteloua gracilis</i>	1.5	3.0
Side Oats Grama (Vaughn) <i>Bouteloua curtipendula</i>	3.5	7.0
Green Needlegrass <i>Stipa viridula</i>	0.5	1.0
Sand Dropseed <i>Sporobolus cryptandrus</i>	0.05	0.10
Western Wheatgrass (Arriba) <i>Pascopyrum smithii</i>	3.0	6.0
Slender Wheatgrass (San Luis) <i>Elymus trachycaulus</i>	1.0	2.0

2. **Forest and Shrubland areas** with a variety of soil and slope conditions shall be planted with the following seed mix:

SPECIES (Variety)	PLS RATE PER ACRE DRILL SEEDING	PLS RATE PER ACRE BROADCAST SEEDING
Perennial Ryegrass (Tetraploid) <i>Lolium perenne</i>	6.0	12.0
Little Bluestem (Camper) <i>Schizachyrium scoparium</i>	3.0	6.0
Blue Grama (Hachita) <i>Bouteloua gracilis</i>	1.5	3.0
Side Oats Grama (Vaughn) <i>Bouteloua curtipendula</i>	3.5	7.0
Green Needlegrass <i>Stipa viridula</i>	0.5	1.0
Sand Dropseed <i>Sporobolus cryptandrus</i>	0.05	0.10
Indian Ricegrass <i>Oryzopsis hymenoides</i>	1.0	2.0
Spike Muhly <i>Muhlenbergia wrightii</i>	0.5	1.0
Prairie Junegrass <i>Koeleria macrantha</i>	0.5	1.0

3. **Mesic riparian areas and wetland fringes** shall be planted with the following seed mix:

SPECIES (Variety)	PLS RATE PER ACRE DRILL SEEDING	PLS RATE PER ACRE BROADCAST SEEDING
Perennial Ryegrass (Tetraploid) <i>Lolium perenne</i>	6.0	12.0
Switchgrass (Forrestburg) <i>Panicum virgatum</i>	2.5	5.0
Western Wheatgrass (Arriba) <i>Pascopyrum smithii</i>	2.0	4.0
Canada Wildrye (Mandan) <i>Elymus canadensis</i>	4.5	9.0
Slender Wheatgrass (San Luis) <i>Elymus trachycaulus</i>	1.5	3.0
Canadian reed-grass <i>Calamagrostis canadensis</i>	0.25	0.50
Streambank wheatgrass (Sodar) <i>Elymus lanceolatus</i>	1.5	3.0

4. **Wetland areas** shall be planted with 2.5" containerized live plugs on 18" centers and seeded with the grasses identified below. Plugs shall be planted flush with the ground surface and rooted in moist to saturated soil depending on the species' moisture preference. The quantity of plugs needed, by species, shall be based on the percentages below.

SPECIES (Variety)	PLS RATE PER ACRE DRILL SEEDING	PLS RATE PER ACRE BROADCAST SEEDING
Canadian reed-grass <i>Calamagrostis canadensis</i>	0.25	0.50
Ticklegrass <i>Agrostis scabra</i>	0.2	0.4
Nebraska sedge <i>Carex canadensis</i>	Plugs – 70%	Plugs – 70%
Creeping spikerush <i>Eleocharis palustris</i>	Plugs – 10%	Plugs – 10%
Torrey's rush <i>Juncus torreyi</i>	Plugs – 5%	Plugs – 5%
Baltic rush <i>Juncus balticus</i>	Plugs – 10%	Plugs – 10%
Pale bulrush <i>Scirpus pallidus</i>	Plugs – 5%	Plugs – 5%

5. **Upland areas at Farish Recreation Area**, with a wide variety of slope and soil conditions, shall be planted with the following seed mix:

SPECIES (Variety)	PLS RATE PER ACRE DRILL SEEDING	PLS RATE PER ACRE BROADCAST SEEDING
Perennial Ryegrass (Tetraploid) <i>Lolium perenne</i>	6.0	12.0
Spike Muhly <i>Muhlenbergia wrightii</i>	0.5	1.0
Arizona fescue (Redondo) <i>Festuca arizonica</i>	1.5	3.0
Western wheatgrass (Arriba) <i>Pascopyrum smithii</i>	2.5	5.0
Sideoats grama (Vaughn) <i>Bouteloua curtipendula</i>	2.0	4.0
Thickspike wheatgrass (Critana) <i>Elymus lanceolatus</i>	2.0	4.0
Idaho fescue (Winchester) <i>Festuca idahoensis</i>	1.5	3.0

### 1.3 SEEDING AND MULCHING

- A. **SEEDING DATES.** Fall (September-November) or spring (March-May) planting is preferable to help maximize seed establishment. If the project schedule does not coincide with the preferred seeding periods, or if there are unsuitable site conditions (i.e. muddy or frozen ground), then soil stabilization and/or stormwater Best Management Practices shall be implemented to stabilize the area until the next appropriate seeding date. Seeding outside the preferred months shall have prior approval from the CO and/or Natural Resources.
- B. **SEEDING METHODS.** Drill seeding or broadcast seeding shall be used for revegetation. As outlined below, the size and slope of the disturbed area shall determine which seeding method(s) is appropriate and acceptable. **Where feasible, rangeland drill seeding combined with a cover of crimped hay mulch or hydro-mulch is the required method of revegetation.**
- Slopes less than 3:1** – Seed shall be planted using a rangeland drill with a small seed/legume box and an agitator box for fluffy or bulky seed. Seed rows shall be spaced 7-10 inches apart, and planted 0.5 to 0.75 inches deep. The drill shall have double-disk furrow openers with depth bands and packer wheels. Seeding shall be accomplished using bi-directional drilling and following the land contour. The drill equipment shall be calibrated daily or whenever there is a change in the seed mix to ensure proper seed distribution and rate.
  - Slopes greater than 3:1 or areas less than 0.10 acre** – Seed shall be broadcast by hand, mechanical spreader, or hydro-seeding equipment. Broadcasted areas shall be raked or harrowed to incorporate the seed into the soil at a depth not exceeding 0.50 inches. If hydro-seeding is used, the seed shall not be tank mixed with hydro-mulch and broadcast. Broadcast seeding shall be avoided when wind speed exceeds 15 miles per hour.
- C. **MULCHING.** Weed-free native hay, weed-free straw, or virgin wood fiber hydro-mulch shall be used to control erosion and promote seed germination and plant establishment. Native hay, straw, or hydro-mulch shall be applied at 2000 pounds/acre on slopes less than 3:1. On steeper slopes, a mulching rate of 2500 pounds/acre shall be used. Native hay or straw shall be crimped into the soil to a depth of at least 3-inches and must protrude above the ground at least 3-inches. An organic tackifier shall be used to hold hay or straw in place if crimping alone is insufficient.

Hydro-mulch shall be applied using a colored dye and the manufacturer's recommended rate of an organic tackifier.

- D. **EROSION CONTROL MATERIALS.** Erosion control blankets, straw coir logs, or soil berms shall be used whenever reclaiming and stabilizing slopes greater than 3:1, or along drainageways where erosion is probable. **Erosion control blankets shall be 100% biodegradable, net-free, and consist of wood fiber (excelsior) or coconut fiber materials with at least a two-year functional longevity (Western Excelsior Excel S-1 All Natural, Excel R-2 All Natural, Excel S-2 All Natural, Excel CC-4, Excel CC-4 All Natural, or equivalent). Straw-based erosion fabric and plastic netting shall be rejected.** Manufactured biodegradable stakes (6-inch minimum) or wooden stakes (8-inch minimum) shall be used to anchor all erosion materials; the use of metal staples (8-inch minimum, 8 gauge) must have prior approval from the CO and/or Natural Resources. All erosion control materials shall be installed in accordance with the manufacturer's instructions and recommendations. Particular attention shall be given to overlapping the fabric seams, burying the fabric edges in a small trench, partially burying coir logs, and utilizing a stake pattern and sufficient number of stakes to prevent the erosion fabric from being dislodged by wind or "tenting" with plant growth.
- E. **FENCING/BARRIERS.** Temporary fencing or other barriers shall be installed around the perimeter of the re-seeded areas to exclude pedestrian and vehicle access.
- F. **WATERING.** Supplemental irrigation shall normally not be necessary or required if the seeding is accomplished during the preferred fall and spring planting periods. If a water hook-up is available a sprinkler system may be used to promote rapid plant establishment, but the system must then be operated throughout the first growing season to prevent plant die-off. Generally, watering at 0.75-1.0 inches/week is recommended during the April-October growing season depending on rainfall. Supplemental irrigation of seeded areas using a watering truck is prohibited.
- G. **MOWING.** Spring and summer mowing can help limit competition between invasive weeds and the seeded native grasses. Post-revegetation mowing is normally not required in construction contracts, but it may help expedite the establishment of vegetation and, therefore, a contractors' release from a SWPPP permit. Optimally, mowing should be conducted before the native grasses set seed and at a mower height which removes little of the native vegetation leaf area.

#### 1.4 FINAL INSPECTION AND SEEDING SUCCESS CRITERIA

- A. A final inspection of all revegetated areas, using the checklist in Appendix D, shall be coordinated with the CO, Construction Inspector, and Natural Resources. If the project is under a Construction Storm Water Permit, the USAFA Water Quality Manager shall also be consulted. Any seeding, topsoil, or erosion control deficiencies or damage noted during the inspection shall be corrected prior to project close-out.
- B. A successful revegetation project shall have at least three (3) native grass seedlings per square foot, with no bare areas exceeding one square meter. For drill seeded areas, continuous planting rows shall be visually apparent by the end of the first full growing season. If a partial or total seeding failure is apparent, poorly vegetated areas shall be reseeded in the same manner described above. Appropriate site preparation shall be used to create a suitable seedbed for replanting, but any established native vegetation shall be left undisturbed to the extent possible. Areas that erode before plant establishment can occur shall be repaired and immediately reseeded during the same growing season.

## 1.5 CARE OF TREES DURING CONSTRUCTION OR UNDERGROUND UTILITY WORK

- A. There are numerous forms of direct tree injury caused by mechanized equipment: trenching injury, surface grading, soil compaction, bark removal, and branch breakage. Extreme care shall be exercised in protecting root systems and branches of trees. A USAFA Natural Resource forestry representative should be contacted before construction operations commence to ensure understanding and adherence to tree care standards.

Additional information on protecting trees during construction activities can be found at:

- [www.warnell.uga.edu/outreach/pubs/pdf/forestry/Development%20Assessment%20Tools%20Pub10-24.pdf](http://www.warnell.uga.edu/outreach/pubs/pdf/forestry/Development%20Assessment%20Tools%20Pub10-24.pdf)
- <http://www.extension.umn.edu/garden/yard-garden/trees-shrubs/protecting-trees-from-construction-damage>
- [www.ext.colostate.edu/PUBS/GARDEN/07420.html](http://www.ext.colostate.edu/PUBS/GARDEN/07420.html)

- B. Protective Fencing: In construction areas, post highly-visible fencing or barricades around trees and areas to be protected. The optimal size of barricaded areas varies by tree species, size, and construction project. For recently planted trees (one to four years), the area under the branches (dripline) should be adequate (Appendix A). For minimal protection of trees older than four years, barricades should extend beyond the dripline; for each inch of trunk diameter, extend the protection area an additional one foot. For additional protection, a four (4) inch deep layer of seasoned wood chips can be placed around each tree prior to placement of barricades.

- C. Trenching: Trenches shall be placed as far from trees as possible, and filled in as quickly as feasible. No trenching is permitted within the tree dripline. While the dripline is the absolute minimum distance, the goal is to trench no closer than 1.25 feet per diameter inch of tree from the tree stem, known as the protected root zone (PRZ). Damaging structural roots within this zone can have serious adverse impacts on tree stability and health. Directional boring to minimize root damage should be utilized to the extent feasible, with highest priority put on large, healthy trees or groups of trees. Moist conditions shall be maintained during construction to help protect roots, with cut structural roots freshly pruned before filling trenches. Grading: As with trenching, no changes in soil grade are permitted within the dripline of trees. The goal is to limit disturbance to no closer than the PRZ.

1. Soil Fill: Excessive amounts of soil around a tree base interfere with normal air and moisture circulation to the roots, resulting in improper gas exchange and toxic gas buildup. Minor fills with topsoil of less than three inches will not harm most trees. Topsoil should not be clay. Early symptoms of decline from excessive fill are small leaf size, premature fall coloration, and branch dieback. Dieback may not be noticed for several years, depending on tree species and initial tree health.
2. Soil Cut: Lowering soil grade can be equally harmful. Where the grade has been changed near a tree, the most common damage is the complete severing of major roots in that area, leading to decline, death or decreased stability to high winds.

- E. Soil Compaction: Construction traffic can compact soil and severely damage roots, which exist predominantly in the top 18" of soil. Compaction decreases soil permeability, impacts drainage, interferes with gas exchange processes, and leads to less water and nutrient availability. Tree decline and dieback can occur gradually as a result. Construction traffic, vehicle parking and material storage should be kept outside the tree dripline to a distance of one additional foot per inch of trunk diameter, and delineated with construction fencing or similar barrier. If available, a layer of four (4) inches of wood chips can help further mitigate compaction damage.

- F. Bark Removal: Wounding of the trunk can significantly damage a tree by introducing a site for decay fungi and predisposing the tree to other insect and disease agents such as bark beetles.

Extreme care should be taken to avoid skinning a tree with equipment or ripping rather than cleanly pruning branches in need of removal.

- G. Branch Pruning: Removal of live branches shall be kept to a minimum to limit loss of photosynthetic material and to reduce stress to the tree. Branches requiring removal shall be cut back to the trunk or to an acceptable branch, according to proper pruning procedures. The remaining portions of limbs inadvertently broken by the passage of equipment shall also be cut back to the trunk or to an acceptable branch. Flush cuts are not acceptable, as these promote decay of the tree stem. Branches shall be cut by saw; not ripped off by heavy equipment. Pruning procedures are outlined in Appendix B.

#### 1.6 TREE TRANSPLANTING FROM CONSTRUCTION AREA

- A. Whenever possible, existing trees that need to be cleared shall be relocated or sold by USAFA Natural Resources as a forest product prior to site clearing. Transplantable trees are generally less than fifteen feet in height, although this maximum height will be less under extreme drought conditions due to increased transplant shock in larger trees. Coordinate with USAFA Natural Resources at least one month in advance to assess the feasibility of transplanting trees. Under continued drought conditions, tree transplanting may be infeasible.

#### 1.7 CARE OF TREES MOVED INTO CONSTRUCTION AREA

- A. Trees moved into the project area for landscaping purposes shall have irrigation needs addressed for three years, including winter watering. Approximately ten (10) gallons per inch of tree caliper (measured at six inches above ground level) shall be applied to the tree ring area (see "C" below) upon planting. Water shall be applied approximately weekly for the first two months, and then every two to three weeks throughout the remainder of the first growing season, depending on natural moisture and soil conditions. Depending on precipitation, frequency of deep watering during the second and third years may be decreased as the tree continues to establish on the site, but newly transplanted trees will likely still require periodic watering for at least three full growing seasons to maintain tree health and vigor and encourage root establishment. *Light watering applications (i.e. sprinklers) will not provide adequate water saturation, tending rather to promote root proliferation within the top several inches of soil instead of encouraging deeper root establishment which is vital to long-term survival.* The objective of deep watering is to saturate the root ball to a depth of at least twelve (12) inches. Water amounts on heavy clay soils with poor drainage may need to be lessened to avoid drowning the root system. A rule of thumb is to check the edge of the root ball for moisture at a depth of eight inches. If this area is still moist, watering can be postponed.
- B. Winter watering from October through March is critical, especially in dry climates with desiccating winter winds. *Water shall be applied monthly during dry periods, when the ground is not frozen.* Fall plantings shall receive a deep watering upon planting, followed by periodic winter watering as conditions warrant. As the tree becomes established, the need for supplemental watering should decrease. This watering regime shall be implemented for at least the first three growing seasons to assist in establishment, but is advisable beyond this timeframe if the transplanted tree is especially large, or is slow in adapting to its new site. See Appendix C for additional information on watering.
- C. A soil berm or tree ring of at least four (4) inches in height shall be constructed around the tree (roughly under the tree dripline (outer edge of branches), or at least the size of the transplanted root ball). This will allow water to focus onto the root ball. The berm shall be removed in three years, when roots should have spread well beyond the dripline. Retaining the berm beyond this timeframe tends to lead to subsequent watering only within the bermed area, which will encourage root growth primarily in this area and not outward, to the detriment of the tree.

- D. Approximately three to four inches of mulch shall be placed above the root ball to preserve soil moisture, and to protect trees from lawnmower damage in mowed areas. Mulch should not be placed directly against tree stem, as this could cause rotting of wood and afford rodents a place to hide and potentially damage tree. A distance of at least six inches from the tree stem should be left un-mulched.
- E. Transplanted pines are a prime target for the Ips (engraver) beetle, which are attracted to environmentally stressed trees. Landscape planted spruce are highly susceptible to the white pine weevil which can cause significant damage to the tree crown. Transplanted pines and spruce shall be sprayed to prevent bark beetle infestation with an insecticide on the USAF-approved pesticide list. Spring-planted pine and spruce shall be sprayed within one week of transplanting. Autumn-planted pine and spruce shall be sprayed within one week of planting, and again at the beginning of the following growing season. All pine and spruce shall be sprayed by late March for the following two years (three years total). USAFA Natural Resources will be available to consult on spraying activities. All pesticide use shall be coordinated through the HAZMART and Pest Management Coordinator.
- F. In general, trees over six (6) feet in height shall be staked, unless they are not located in a wind-prone location (i.e. sheltered from predominant west/north winds by a building), or do not have a large crown. Stakes shall be removed in one year, unless in unusually windy location, in which case they should be removed after the second growing season. Retaining stakes for too long compromises wind-firmness and encourages a tall spindly rather than a sturdy tree trunk.
- G. Trees should not be fertilized upon transplanting, as this encourages stem growth at the expense of root growth. Root growth is more critical at this time, so fertilization (nitrogen in particular) is best held off for several years. A root stimulant (generally high in phosphorus) may be used during or immediately after transplanting.
- H. Holes resulting from trees shall be filled with weed-free soil and graded evenly to ground level within one week of tree removal. Holes shall be marked with at least three (3) brightly-colored pin flags during the interim.
- I. Coordinate with USAFA Natural Resources for advice on transplant tree care.

#### 1.8 MERCHANTABLE WOOD

- A. In accordance with Department of Defense Instruction (DODI) 4715.3, DODI 7310.1, and AFI 32-7064 Section 8.3, forest products shall not be given away, abandoned, destroyed, or used to offset contract costs. Removal of forest products without a permit from USAFA or Farish Recreation Area constitutes theft of government property and shall be punished under the applicable laws or regulations.
- B. Trees to be removed shall be cut and limbed (all limbs removed). Merchantable firewood (sound tree trunks greater or equal to four (4) inches in diameter) shall be delivered to the USAFA Natural Resources woodlot at Building 9030. Branch wood is not considered merchantable firewood, with the exception of straight portions greater or equal to four (4) inches in diameter.
- C. Contractor may opt to purchase wood at the existing published rate. All wood delivery or purchase shall be coordinated in advance with USAFA Natural Resources. Disposition of wood products from Farish Recreation Area shall be determined by USAFA Natural Resources.



## 1.9 UNMERCHANTABLE WOOD AND STUMP REMOVAL

- A. Disposal of woody slash (limbs, tops), rotten wood, stumps and rootwads (stumps with attached roots) is the sole responsibility of the Contractor. All un-merchantable wood will be removed from the installation, with the following two possible exceptions. If approved in advance by a Natural Resource forestry representative, woody slash may be chipped and spread across up to 50% of the project area to a depth not to exceed three inches, with chips spread at least 30 feet from a road, trail or building. No chips shall be spread in improved or mowed areas. On small projects, it may be possible to dispose of minor amounts of woody slash by lopping and scattering onsite, but only if prior approval has been given by Natural Resources. In such cases, the limbs shall be moved at least 50 feet from buildings, roads, or major trails, and lopped and scattered so as not to exceed eight inches above ground level. Limbs on all insect-infested trees shall be chipped to destroy emerging broods within branches.
- B. Where trees are removed but stumps and roots are not extricated, stumps shall be cut as close to ground level as practical, not to exceed two (2) inches (measured on the uphill side of the tree on a slope) above ground level within 25 feet of buildings, roads or major trails, and four (4) inches above ground level elsewhere.

## 1.10 BEETLE-INFESTED TREES

- A. *A USAFA Natural Resource forestry representative shall be contacted in the event that any trees to be cut may be infested with beetles.* These will generally be faded green, red or straw-colored, and may have visible pitch tubes or red sawdust-like frass at the base of the tree. If a tree is determined to be actively infested with beetles, known as a "brood" tree, wood shall not be delivered to the NR woodlot unless coordinated in advance with a USAFA Natural Resources forestry representative. All limbs of infested tree will be chipped to destroy branch bark beetles. If removed from site and not processed in a mill, infested wood should not be placed within five miles of any pines, to prevent beetle spread to other areas.

## 2.1 LIVE WILLOW STAKING

- A. Prior to planting, Natural Resources shall identify all necessary willow staking areas and approve any on-site locations for the harvesting of plant materials. All willow stakes shall be disease- and insect-free (e.g., oyster scale). Off-site plant materials shall only be used with prior approval from Natural Resources.
- B. Willow stakes shall be harvested and planted in late-winter to early-spring before dormancy is broken (as identified by swelling lateral and terminal buds). Planting shall only be conducted when the weather and soil conditions are appropriate. Stakes shall not be planted when the ground is frozen or otherwise unsuitable.
- C. Live stakes shall be coyote willow (*Salix exigua*) cuttings that are one-half inch (1/2") to one-inch (1") in diameter and at least 4.0-feet (4.0') in length. Stakes shall be harvested with sharp pruning shears with the base cut at a forty-five degree (45°) angle and all side branches removed. Harvested stakes shall be submerged in water for at least 5 days immediately after cutting and shall be planted within 7 days of harvesting.
- D. Stakes shall be kept moist, cool, shaded, and protected from wind until installed. During transport or storage, the stakes shall be covered to protect them from heat, light and wind damage.
- E. Willow stakes shall normally be planted on 24" to 36" centers in a staggered pattern, but the pattern and spacing may need to be adjusted depending on the availability of groundwater and plant materials. A planting hole shall be excavated to the groundwater using a hammer drill and a one-inch drill bit, rebar probe, dibble bar, or other approved method. Damage to any erosion

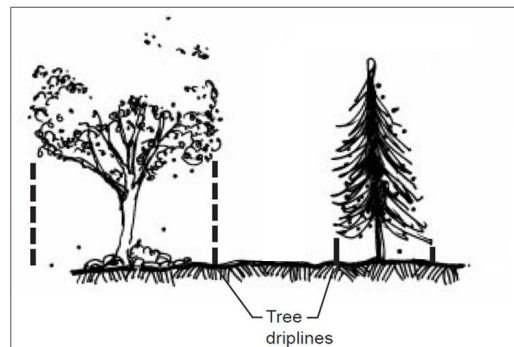
blanket shall be avoided to the maximum extent possible. Stakes shall be gently placed in the hole, ensuring that the butt end reaches below the groundwater level. Each hole shall be backfilled, hand-tamped, and/or watered to eliminate air pockets around the stake. Stakes shall be cut-off at 18-24" from the ground surface with at least two lateral buds remaining above-ground.

## 2.2. LIVE COTTONWOOD POLE PLANTING

- A. Prior to planting, Natural Resources shall identify all necessary pole planting areas and approve any on-site locations for the harvesting of plant materials. All cottonwood poles shall be disease- and insect-free. Off-site plant materials shall only be used with prior approval from Natural Resources.
- B. Poles shall be harvested and planted in late-winter to early-spring before dormancy is broken (as identified by swelling lateral and terminal buds). Planting shall only be conducted when the weather and soil conditions are appropriate. Poles shall not be planted when the ground is frozen or otherwise unsuitable.
- C. Live poles shall be plains cottonwood (*Populus deltoides*) or narrow-leaf cottonwood (*Populus angustifolia*) cuttings that are approximately one-inch (1") in diameter and at least 10.0-feet (10.0') in length. Poles shall be harvested with sharp pruning shears with the base cut at a forty-five degree (45°) angle and all side branches removed. Harvested poles shall be submerged in water for at least 5 days immediately after cutting and shall be planted within 7 days of harvesting.
- D. Poles shall be kept moist, cool, shaded, and protected from wind until installed. During transport or storage, the poles shall be covered to protect them from heat, light and wind damage.
- E. The number and location of pole plantings shall be determined by groundwater conditions and the availability of plant materials. A planting hole shall be excavated to the groundwater using an auger or other approved method. Damage to any erosion blanket shall be avoided to the maximum extent possible. Poles shall be gently placed in the hole, ensuring that the butt end reaches below the groundwater level. Each hole shall be backfilled, hand-tamped, and/or watered to eliminate air pockets around the pole. The terminal bud will be removed from the pole immediately after planting.
- F. Wire cages constructed of 2"x2" wire mesh with a 30-inch diameter shall be constructed around each pole and anchored to the ground to prevent beaver damage.

## SECTION 01351 APPENDIX A – “DRIPLINE” SKETCH AND DEFINITION

**Dripline:** The dripline is the area directly located under the outer circumference of the tree branches. Because this area contains the highest amount of roots, protecting roots from cutting or compaction is critical. No trenching is permitted within this zone.



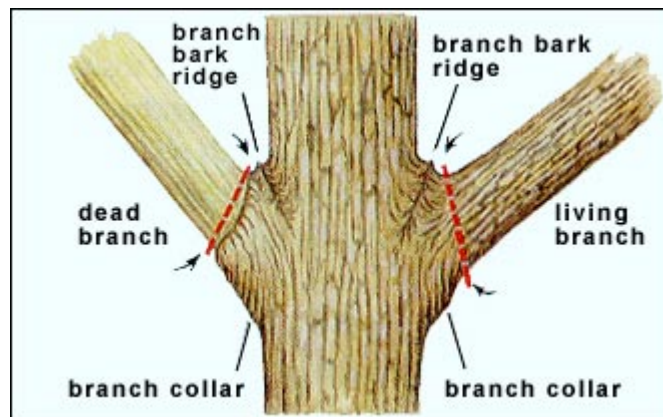
## SECTION 01351 APPENDIX B – PRUNING TECHNIQUES

### **Pruning Cuts**

Pruning cuts should be made so that only branch tissue is removed and stem tissue is not damaged. At the point where the branch attaches to the stem, branch and stem tissues remain separate, but are contiguous. If only branch tissues are cut when pruning, the stem tissues of the tree will probably not become decayed, and the wound will seal more effectively.

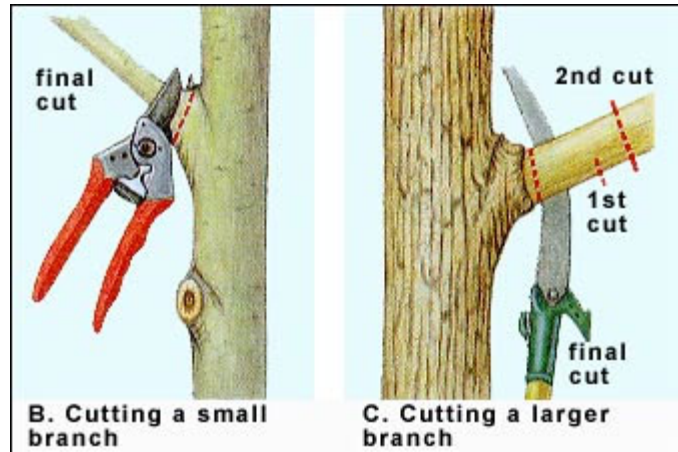
#### **1. Pruning living branches (Fig. 6)**

To find the proper place to cut a branch, look for the **branch collar** that grows from the stem tissue at the underside of the base of the branch (Fig. 6A). On the upper surface, there is usually a **branch bark ridge** that runs (more or less) parallel to the branch angle, along the stem of the tree. A proper pruning cut does not damage either the branch bark ridge or the branch collar.



**Figure 6A.** Targeting the cut

A proper cut begins just outside the branch bark ridge and angles down away from the stem of the tree, avoiding injury to the branch collar (Fig. 6B). Make the cut as close as possible to the stem in the [branch axil](#), but outside the branch bark ridge, so that stem tissue is not injured and the wound can seal in the shortest time possible. If the cut is too far from the stem, leaving a branch stub, the branch tissue usually dies and woundwood forms from the stem tissue. Wound closure is delayed because the woundwood must seal over the stub that was left.



The quality of pruning cuts can be evaluated by examining pruning wounds after one growing season. A concentric ring of woundwood will form from proper pruning cuts (Fig. 6B). [Flush cuts](#) made inside the branch bark ridge or branch collar, result in pronounced development of woundwood on the sides of the pruning wounds with very little woundwood forming on the top or bottom (Fig. 7D). As described above, stub cuts result in the death of the remaining branch and woundwood forms around the base from stem tissues.

When pruning small branches with hand pruners, make sure the tools are sharp enough to cut the branches cleanly without tearing. Branches large enough to require saws should be supported with one hand while the cuts are made. If the branch is too large to support, make a three-step pruning cut to prevent bark ripping (Fig. 6C).

1. The first cut is a shallow notch made on the underside of the branch, outside the branch collar. This cut will prevent a falling branch from tearing the stem tissue as it pulls away from the tree.
2. The second cut should be outside the first cut, all the way through the branch, leaving a short stub.
3. The stub is then cut just outside the branch bark ridge/branch collar, completing the operation.

## **2. Pruning dead branches (Fig. 6)**

Prune dead branches in much the same way as live branches. Making the correct cut is usually easy because the branch collar and the branch bark ridge can be distinguished from the dead branch because they continue to grow (Fig. 6A). Make the pruning cut just outside of the ring of woundwood tissue that has formed, being careful not to cause unnecessary injury (Fig. 6C). Large dead branches should be supported with one hand or cut with the three-step method, just as live branches. Cutting large living branches with the three step method is more critical because of the greater likelihood of bark ripping.

### SECTION 01351 APPENDIX C – TREE CARE FOLLOWING PLANTING

After planting the tree, build a 4-inch tall berm around the edge of the hole. Fill the berm with mulch (i.e. shredded bark, compost). The mulch and berm make it easier to water the tree and reduce weed competition. Below are diagrams of a typical tree planting.

Right after planting, water the tree in by filling the bermed basin with water. This will settle the existing soil around the root ball. Fill the bermed basin with water once a week during the growing season, unless natural precipitation is abundant. The goal is to wean the tree slowly off of supplemental irrigation, and get the root system large enough for the tree to thrive on natural rainfall. Continue with winter watering once a month during extended dry periods from late October through March, unless ground is frozen.

REMEMBER: These are just guidelines. Use your index finger to check the soil moisture under the mulch. More plants are killed by over-watering than by under-watering.



(Portions of this appendix are from Douglas F. Welsh, Landscape Horticulturist  
Texas A&M University, College Station, Texas).

SECTION 01351 APPENDIX D – REVEGETATION AND EROSION CONTROL CHECKLIST

Standards Section	Description of Standard	Construction Inspector Approval Date and Initials	Contractor Acknowledgment Date and Initials
1.0	The area (acres or square feet) of ground disturbance requiring revegetation was measured.		
Comments			
1.1.A	All disturbed areas were graded, tilled, and prepared for seeding and erosion control.		
Comments			
1.1.B	The imported topsoil was analyzed and met the physical and chemical standards.		
Comments			
1.1.B	The delivered quantity of imported topsoil was verified by trip tickets and adequate to cover the disturbed area to a 3" depth.		
Comments			
1.1.B	The imported topsoil and any salvaged native soil was distributed evenly across the disturbed area and mixed together by tilling.		
Comments			
1.2.A	The native seedmix and quantity of seed provided was appropriate to cover the disturbed area.		
Comments			
1.3.A	Seeding was performed during suitable ground conditions.		
Comments			
1.3.B	The seeding method was appropriate given the size and/or slope of the disturbed area or access limitations.		
Comments			
1.3.C	The appropriate type and amount of mulch was evenly applied over the seeded area.		
Comments			
1.3.D	The required amount of erosion fabric and other materials was installed to prevent soil and seed erosion from slopes and drainage areas.		
Comments			
1.3.D	The erosion fabric met the material type, netting type, longevity, staking, and installation requirements.		
Comments			
1.3.E	Temporary barrier fencing was installed around the revegetated areas.		
Comments			

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10/20

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## SECTION 01 57 23

TEMPORARY STORM WATER POLLUTION CONTROL  
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## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## ASTM INTERNATIONAL (ASTM)

ASTM D448 (2012; R 2017) Standard Classification for Sizes of Aggregate for Road and Bridge Construction

ASTM D4873/D4873M (2017) Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS  
(AASHTO)

AASHTO M 288 (2021) Standard Specification for Geosynthetic Specification for Highway Applications

## U.S. FEDERAL HIGHWAY ADMINISTRATION (FHWA)

FHWA FP-03 (2003) FP-03 Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects

## 1.2 GENERAL

The Contractor shall install and maintain stabilization and structural best management practices which will minimize erosion and sediment pollution from the construction site to the extent attainable. The Contractor shall be responsible for selection of appropriate best management practices as specified herein.

## 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-07 Certificates

## Mill Certificate or Affidavit

## 1.4 EROSION AND SEDIMENT CONTROLS

The controls and measures required by the Contractor are described below.

## 1.4.1 Stabilization Practices

The stabilization practices to be implemented may include temporary seeding, mulching, sod stabilization, vegetative buffer strips, erosion control blankets, protection of trees, preservation of mature vegetation, etc. On his daily CQC Report, the Contractor shall record the dates when the major grading activities occur; when construction activities temporarily or permanently cease on a portion of the site; and when stabilization practices are initiated.

## 1.4.1.1 Permanent Seeding

Disturbed areas of the site where construction activities permanently ceases shall be stabilized with permanent seeding no more than 14 days after the construction activity ceases, except as follows. When the initiation of permanent seeding is stopped due to snow cover or arid conditions, permanent seeding shall be initiated as soon as practicable.

## 1.4.1.2 Temporary Seeding and Mulching

Areas where construction activities will temporarily cease for more than one year shall be temporarily seeded and mulched. Disturbed areas of the site where construction activities temporarily cease for more than 21 days and less than one year shall be stabilized with either temporary seeding and mulching or mulching not more than 14 days after construction activity ceases, except as follows. When the initiation of temporary stabilization measures is stopped due to snow cover or arid conditions, stabilization measures shall be initiated as soon as practicable.

## 1.4.1.3 Erosion Control Blankets

Erosion control blanket may be installed on steep slopes and in drainage swales and ditches to protect finished grades from erosion.

## 1.4.2 Temporary Structural Practices

Temporary structural practices shall be implemented to divert flows from exposed soils, temporarily store flows, or otherwise limit runoff and the discharge of pollutants from exposed areas of the site to the degree attainable. Temporary structural practices shall be implemented in a timely manner during the construction process to minimize erosion and sediment runoff. Temporary structural practices shall include but not be limited to the following devices.

## 1.4.2.1 Silt Fences

The Contractor shall provide silt fences as a temporary structural practice to minimize erosion and sediment runoff. Silt fences shall be properly installed to effectively retain sediment immediately after completing each phase of work where erosion would occur in the form of sheet and rill erosion (e.g. clearing and grubbing, excavation, embankment, and grading). Silt fence barriers shall be installed along the down slope boundary of all disturbed areas prior to beginning

land-disturbing activities in those areas. Silt fence barriers may be installed across ditches or swales but not where the drainage area is greater than 1 acre. Removal of silt fence barriers shall be approved by the Contracting Officer.

#### 1.4.2.2 Storm Drain Inlet Protection

Storm drain inlet protection shall be installed at each new and existing inlet which receives storm runoff from disturbed areas of 1 acre or less. The protection at each inlet shall be removed once the disturbed area has been finally stabilized.

#### 1.4.2.3 Culvert Inlet Protection

Culvert inlet protection shall be installed at all culverts with a drainage area of 1 acre or less.

#### 1.4.2.4 Rock Check Dams

Rock check dams may be used to reduce erosion of temporary or permanent ditches or swales. Type 1 rock check dams shall be used when the upstream drainage area is less than 2 acres. Type 2 rock check dams shall be used when the upstream area is 2 to 10 acres.

#### 1.4.2.5 Stone Construction Entrance

A stone construction entrance shall be constructed wherever traffic will be leaving the construction site and move directly onto a paved road. Stone construction entrances shall be removed after the site has been finally stabilized.

#### 1.4.2.6 Sediment Trap

Sediment traps may be constructed below disturbed areas where the total contributing drainage area is less than 3 acres. Sediment traps, when used, should be constructed prior to disturbance of upslope areas. Sediment traps must have an initial storage volume of 134 cubic yards per acre of drainage area, half of which shall be in the form of a permanent pool or wet storage to provide a stable settling medium. The remaining half shall be in the form of a drawdown or dry storage which will provide extended settling time during less frequent, larger storm events.

#### 1.4.2.7 Diversion Dikes

Diversion dikes may be constructed to divert runoff from upslope drainage areas away from unprotected disturbed areas and slopes to a stabilized outlet or to divert sediment-laden runoff from a disturbed area to a sediment-trapping facility such as a sediment trap or sediment basin. Diversion dikes shall have a maximum channel slope of 2 percent and shall be adequately compacted to prevent failure. The minimum height measured from the top of the dike to the bottom of the channel shall be 18 inches. The minimum base width shall be 6 feet and the minimum top width shall be 2 feet. The Contractor shall ensure that the diversion dikes are not damaged by construction operations or traffic.

## PART 2 PRODUCTS

### 2.1 COMPONENTS FOR SILT FENCES

#### 2.1.1 Geotextile

The geotextile shall comply with the requirements of AASHTO M 288 for temporary silt fence.

#### 2.1.2 Silt Fence Stakes and Posts

The Contractor may use either wooden stakes or steel posts for fence construction. Wooden stakes utilized for silt fence construction, shall have a minimum cross section of 2 inches by 2 inches when oak is used and 4 inches by 4 inches when pine is used, and shall have a minimum length of 3 feet. Steel posts (standard "U" or "T" section) utilized for silt fence construction, shall have a minimum weight of 1.33 pounds per linear foot and a minimum length of 5 feet.

#### 2.1.3 Mill Certificate or Affidavit

A mill certificate or affidavit shall be provided attesting that the geotextile and factory seams meet chemical, physical, and manufacturing requirements specified above. The mill certificate or affidavit shall specify the actual Minimum Average Roll Values and shall identify the fabric supplied by roll identification numbers. The Contractor shall submit a mill certificate or affidavit signed by a legally authorized official from the company manufacturing the geotextile.

#### 2.1.4 Identification Storage and Handling

Geotextile shall be identified, stored and handled in accordance with ASTM D4873/D4873M.

#### 2.1.5 Support Mesh

Support mesh shall be 14-1/2 gage or heavier steel wire with a mesh spacing of 6 by 6 inch or a prefabricated polymeric mesh of equivalent strength.

### 2.2 Erosion Control Blankets

Installation staple patterns shall be clearly marked on the erosion control blanket with environmentally safe paint.

#### 2.2.1 Netless Erosion Control Blanket

Erosion control blankets shall be a machine-produced mat with a biodegradable agricultural straw matrix (approximately 0.50 lb/sq yd). The blanket shall have a 12-month typical functional longevity and be designed for use on geotechnically stable slopes with gradients up to 1V:4H and channels with shear stresses up to 0.50 pounds per square foot.

#### 2.2.2 Single-Net Erosion Control Blanket

Erosion control blankets shall be a machine-produced mat with a biodegradable agricultural straw matrix (approximately 0.50 lb/sq yd) and photodegradable netting on the top side. The blanket shall be sewn together with degradable thread. The blanket shall have a 12-month

typical functional longevity and be designed for use on geotechnically stable slopes with gradients up to 1V:3H and channels with shear stresses up to 1.50 pounds per square foot.

#### 2.2.3 Double-Net Erosion Control Blanket

Erosion control blankets shall be a machine-produced mat with a biodegradable agricultural straw matrix (approximately 0.50 lb/sq yd) and photodegradable netting on each side. The blanket shall be sewn together with degradable thread. The blanket shall have a 12-month typical functional longevity and be designed for use on geotechnically stable slopes with gradients up to 1V:2H and channels with shear stresses up to 1.75 pounds per square foot.

#### 2.3 Permanent Turf Reinforcement Mat

Turf reinforcement matting shall conform to FHWA FP-03, Section 713, Type 5.A.

#### 2.4 COMPONENTS FOR SEDIMENT TRAP

Coarse aggregate shall conform to ASTM D448, Size 3, 357, or 5. Minor variations from the gradations specified will be permitted. Stone for riprap shall consist of field stone or rough unhewn quarry stone of approximately rectangular shape. The stone shall be hard and angular and of such quality that it will not disintegrate on exposure to water or weathering. The specific gravity of individual stones shall be at least 2.5. Riprap stones shall weigh between 50 and 150 pounds each, except that approximately 10 percent may weigh 50 pounds or less. At least 60 percent shall weigh more than 100 pounds. Geotextile shall conform to paragraph GEOTEXTILES.

#### 2.5 COMPONENTS FOR INLET PROTECTION

Aggregates for gravel filter should be sized to get the greatest amount of filtering action possible (by using smaller-sized stone), while not creating significant ponding problems.

#### 2.6 STONE CONSTRUCTION ENTRANCE

Aggregate for construction entrance shall conform to ASTM D448, Size 1. Minor variations from the gradation specified will be permitted. Geotextile shall conform to paragraph GEOTEXTILES.

#### 2.7 ROCK CHECK DAMS

Coarse aggregate shall conform to ASTM D448 size number 1 or approved equal. Riprap shall consist of field stone or rough unhewn quarry stone of approximately rectangular shape. Riprap shall be hard and angular. The specific gravity of individual stones shall be at least 2.5. Concrete rubble may be used provided it has a density of at least 150 pcf. Individual stones shall have a weight of 50 to 150 lbs except that a maximum of 10 percent of stone may weigh less than 50 lbs. At least 60 percent of stones shall weigh more than 100 lbs.

#### 2.8 GEOTEXTILES

Geotextile for other than silt fence shall comply with the requirements of AASHTO M 288 for a separation geotextile.

## PART 3 EXECUTION

### 3.1 INSTALLATION OF SILT FENCES

Silt fences shall extend a minimum of 16 inches above the ground surface and shall not exceed 34 inches above the ground surface. Geotextile shall be from a continuous roll cut to the length of the barrier to avoid the use of joints. When joints are unavoidable, geotextile shall be spliced together at a support post, with a minimum 6 inch overlap, and securely sealed. Silt fence may be installed using either the trench or soil slicing method. Silt fences shall be removed upon approval by the Contracting Officer.

### 3.2 EROSION CONTROL BLANKETS

Installation of erosion control blankets shall conform to the manufacturer's recommendations.

### 3.3 TURF REINFORCEMENT MAT

Installation of turf reinforcement matting shall conform to the manufacturer's recommendations.

### 3.4 Sediment Trap

The area under the embankment shall be cleared, grubbed, and stripped of any vegetation and root mat. A geotextile shall be placed between the riprap and subgrade.

### 3.5 Stone Construction Entrance

The area of the entrance shall be cleared of all vegetation, roots, and other objectionable material. The aggregate layer shall have a minimum total thickness of 6 inches. A geotextile shall be placed beneath aggregate for the full width and length of the entrance. A minimum of 3 inches of the aggregate shall be placed in a cut section to provide stability and secure the geotextile. If conditions on the site are such that the majority of the mud is not removed by the vehicles traveling over the stone, then the tires of the vehicles shall be washed before entering the road. Wash water must be carried away from the entrance to an approved settling area to remove sediment. A wash rack may also be installed for washing of vehicles.

### 3.6 MAINTENANCE

The Contractor shall maintain the temporary and permanent vegetation, erosion and sediment control measures, and other protective measures in good and effective operating condition by performing routine inspections to determine condition and effectiveness, by restoration of destroyed vegetative cover, and by repair of erosion and sediment control measures and other protective measures. The following procedures shall be followed to maintain the protective measures.

#### 3.6.1 Silt Fences

Silt fences shall be inspected in accordance with paragraph INSPECTIONS. Any required repairs shall be made promptly. Close attention shall be paid to the repair of damaged silt fence resulting from end runs and

undercutting. Should the fabric on a silt fence decompose or become ineffective, and the barrier is still necessary, the fabric shall be replaced promptly. Sediment deposits shall be removed when deposits reach one-third of the height of the barrier. When a silt fence is no longer required, it shall be removed. The immediate area occupied by the fence and any sediment deposits shall be shaped to an acceptable grade. The areas disturbed by this shaping shall be seeded.

### 3.6.2 Storm Drain Inlet Protection

Inlet protection structures shall be inspected after each rainfall and repairs made as needed. Sediment shall be removed and the trap restored to its original dimensions when the sediment has accumulated to one half the design depth.

### 3.6.3 Rock Check Dams

Check dams should be checked for sediment after each runoff-producing storm event. Sediment should be removed when it reaches one half the original height of the measure.

### 3.6.4 Stone Construction Entrance

Stone construction entrances shall be maintained in a condition which will prevent tracking or flow of mud onto paved roads. This may require periodic top dressing with additional stone or the washing and reworking of existing stone as conditions demand and repair and/or cleanout of any structures used to trap sediment. The use of water trucks to remove materials dropped, washed, or tracked onto roadways will not be permitted under any circumstances.

### 3.6.5 Sediment Traps

Sediment shall be removed and the trap restored to its original dimensions when the sediment has accumulated to one half the design volume of the wet storage. Filter stone shall be regularly checked to ensure that filtration performance is maintained. Stone choked with sediment shall be removed and cleaned or replaced. The structure should be inspected regularly to ensure that it is structurally sound and has not been damaged by erosion or construction equipment. The height of the stone outlet should be inspected to ensure that its center is at least 1 foot below the top of the embankment.

### 3.6.6 Diversion Dikes

Diversion dikes shall be inspected in accordance with paragraph INSPECTIONS. Close attention shall be paid to the repair of damaged diversion dikes and necessary repairs shall be accomplished promptly. When diversion dikes are no longer required, they shall be shaped to an acceptable grade. The areas disturbed by this shaping shall be seeded.

## 3.7 INSPECTIONS

### 3.7.1 General

The Contractor shall inspect disturbed areas of the construction site, areas used for storage of materials that are exposed to precipitation that have not been finally stabilized, stabilization practices, structural practices, other controls, and area where vehicles exit the site at least

once every seven (7) calendar days and within 24 hours of the end of any storm that produces 0.5 inches or more rainfall at the site. Where sites have been finally stabilized, such inspection shall be conducted at least once every month.

### 3.7.2 Inspections Details

Disturbed areas and areas used for material storage that are exposed to precipitation shall be inspected for evidence of, or the potential for, pollutants entering the drainage system. Erosion and sediment control measures shall be observed to ensure that they are operating correctly. Discharge locations or points shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters. Locations where vehicles exit the site shall be inspected for evidence of offsite sediment tracking.

### 3.7.3 Inspection Reports

For each inspection conducted, the Contractor shall prepare a report summarizing the scope of the inspection, name(s) of personnel making the inspection, the date(s) of the inspection, major observations relating to the implementation of the storm water pollution prevention measures, maintenance performed, and actions taken. The report shall be furnished to the Contracting Officer within 24 hours of the inspection as a part of the Contractor's daily CQC REPORT.

-- End of Section --



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SECTION 01 62 35

RECYCLED / RECOVERED MATERIALS

**07/06**

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## SECTION 01 62 35

## RECYCLED / RECOVERED MATERIALS

07/06

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

40 CFR 247

Comprehensive Procurement Guideline for  
Products Containing Recovered Materials

## 1.2 OBJECTIVES

Government procurement policy is to acquire, in a cost effective manner, items containing the highest percentage of recycled and recovered materials practicable consistent with maintaining a satisfactory level of competition without adversely affecting performance requirements or exposing suppliers' employees to undue hazards from the recovered materials. The Environmental Protection Agency (EPA) has designated certain items which must contain a specified percent range of recovered or recycled materials. EPA designated products specified in this contract comply with the stated policy and with the EPA guidelines. Make all reasonable efforts to use recycled and recovered materials in providing the EPA designated products and in otherwise utilizing recycled and recovered materials in the execution of the work.

## 1.3 EPA DESIGNATED ITEMS INCORPORATED IN THE WORK

Various sections of the specifications contain requirements for materials that have been designated by EPA as being products which are or can be made with recovered or recycled materials. These items, when incorporated into the work under this contract, shall contain at least the specified percentage of recycled or recovered materials unless adequate justification (non-availability) for non-use is provided. When a designated item is specified as an option to a non-designated item, the designated item requirements apply only if the designated item is used in the work.

## 1.4 EPA PROPOSED ITEMS INCORPORATED IN THE WORK

Products other than those designated by EPA are still being researched and are being considered for future Comprehensive Procurement Guideline (CPG) designation. It is recommended that these items, when incorporated in the work under this contract, contain the highest practicable percentage of recycled or recovered materials, provided specified requirements are also met.

### 1.5 EPA LISTED ITEMS USED IN CONDUCT OF THE WORK BUT NOT INCORPORATED IN THE WORK

There are many products listed in 40 CFR 247 which have been designated or proposed by EPA to include recycled or recovered materials that may be used by the Contractor in performing the work but will not be incorporated into the work. These products include office products, temporary traffic control products, and pallets. It is recommended that these non-construction products, when used in the conduct of the work, contain the highest practicable percentage of recycled or recovered materials and that these products be recycled when no longer needed.

### PART 2 PRODUCTS

Not Used

### PART 3 EXECUTION

Not Used

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## DIVISION 01 - GENERAL REQUIREMENTS

## SECTION 01 74 19

## CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

02/19

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## SECTION 01 74 19

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL  
02/19

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

## U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

40 CFR 273	Standards for Universal Waste Management
49 CFR 173	Shippers - General Requirements for Shipments and Packagings
49 CFR 178	Specifications for Packagings

## 1.2 DEFINITIONS

## 1.2.1 Co-mingle

The practice of placing unrelated materials together in a single container, usually for benefits of convenience and speed.

## 1.2.2 Construction Waste

Waste generated by construction activities, such as scrap materials, damaged or spoiled materials, temporary and expendable construction materials, and other waste generated by the workforce during construction activities.

## 1.2.3 Demolition Debris/Waste

Waste generated from demolition activities, including minor incidental demolition waste materials generated as a result of Intentional dismantling of all or portions of a building, to include clearing of building contents that have been destroyed or damaged.

## 1.2.4 Disposal

Depositing waste in a solid waste disposal facility, usually a managed landfill, regulated in the US under the Resource Conservation and Recovery Act (RCRA).

## 1.2.5 Diversion

The practice of diverting waste from disposal in a landfill, by means of eliminating or minimizing waste, or reuse of materials.

#### 1.2.6 Final Construction Waste Diversion Report

A written assertion by a material recovery facility operator identifying constituent materials diverted from disposal, usually including summary tabulations of materials, weight in short-ton.

#### 1.2.7 Recycling

The series of activities, including collection, separation, and processing, by which products or other materials are diverted from the solid waste stream for use in the form of raw materials in the manufacture of new products sold or distributed in commerce, or the reuse of such materials as substitutes for goods made of virgin materials, other than fuel.

#### 1.2.8 Reuse

The use of a product or materials again for the same purpose, in its original form or with little enhancement or change.

#### 1.2.9 Salvage

Usable, salable items derived from buildings undergoing demolition or deconstruction, parts from vehicles, machinery, other equipment, or other components.

#### 1.2.10 Source Separation

The practice of administering and implementing a management strategy to identify and segregate unrelated waste at the first opportunity.

### 1.3 CONSTRUCTION WASTE (INCLUDES DEMOLITION DEBRIS/WASTE)

Divert a minimum of 60 percent by weight of the project construction waste and demolition debris/waste from the landfill. Follow applicable industry standards in the management of waste. Apply sound environmental principles in the management of waste. (1) Practice efficient waste management when sizing, cutting, and installing products and materials and (2) use all reasonable means to divert construction waste and demolition debris/waste from landfills and incinerators and to facilitate the recycling or reuse of excess construction materials.

### 1.4 CONSTRUCTION WASTE MANAGEMENT

Implement a construction waste management program for the project. Take a pro-active, responsible role in the management of construction construction waste, recycling process, disposal of demolition debris/waste, and require all subcontractors, vendors, and suppliers to participate in the construction waste management program. Establish a process for clear tracking, and documentation of construction waste and demolition debris/waste.

#### 1.4.1 Implementation of Construction Waste Management Program

Develop and document how the construction waste management program will be implemented in a construction waste management plan. Submit a Construction Waste Management Plan to the Contracting Officer for approval. Construction waste and demolition debris/waste materials include un-used construction materials not incorporated in the final work,



as well as demolition debris/waste materials from demolition activities or deconstruction activities. In the management of waste, consider the availability of viable markets, the condition of materials, the ability to provide material in suitable condition and in a quantity acceptable to available markets, and time constraints imposed by internal project completion mandates.

#### 1.4.2 Oversight

The Quality Control Manager, as specified in Section 01 45 00.00 10 QUALITY CONTROL, is responsible for overseeing and documenting results from executing the construction waste management plan for the project.

#### 1.4.3 Special Programs

Implement any special programs involving rebates or similar incentives related to recycling of construction waste and demolition debris/waste materials. Retain revenue or savings from salvaged or recycling, unless otherwise directed. Ensure firms and facilities used for recycling, reuse, and disposal are permitted for the intended use to the extent required by federal, state, and local regulations.

#### 1.4.4 Special Instructions

Provide on-site instruction of appropriate separation, handling, recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the projects. Designation of single source separating or commingling will be clearly marked on the containers.

#### 1.4.5 Waste Streams

Delineate waste streams and characterization, including estimated material types and quantities of waste, in the construction waste management plan. Manage all waste streams associated with the project. Typical waste streams are listed below. Include additional waste streams not listed:

- a. Land Clearing Debris
- b. Asphalt
- c. Masonry and CMU
- d. Concrete
- e. Metals (e.g. banding, stud trim, ductwork, piping, rebar, roofing, other trim, steel, iron, galvanized, stainless steel, aluminum, copper, zinc, bronze, etc.)
- f. Wood (nails and staples allowed)
- g. Glass
- h. Paper
- i. Plastics (PET, HDPE, PVC, LDPE, PP, PS, Other)
- j. Gypsum
- k. Non-hazardous paint and paint cans
- l. Carpet
- m. Ceiling Tiles
- n. Insulation
- o. Beverage Containers

#### 1.5 SUSTAINABILITY REQUIREMENTS

Materials in this technical specification may contribute towards contract compliance with sustainability requirements. See Section 01 33 29 SUSTAINABILITY REPORTING for project requirements.

## 1.6 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

### SD-01 Preconstruction Submittals

Construction Waste Management Plan; G, RO

### SD-06 Test Reports

Quarterly Reports

Annual Report

### SD-11 Closeout Submittals

Final Construction Waste Diversion Report; G, RO

## 1.7 MEETINGS

Conduct Construction Waste Management meetings. After award of the Contract and prior to commencement of work, schedule and conduct a meeting with the Contracting Officer to discuss the proposed construction waste management plan and to develop a mutual understanding relative to the management of the construction waste management program and how waste diversion requirements will be met.

The requirements of this meeting may be fulfilled during the coordination and mutual Understanding meeting outlined in Section 01 45 00.00 10 QUALITY CONTROL. At a minimum, discuss and document waste management goals at following meetings:

- a. Preconstruction meeting.
- b. Regular Quality Control meetings.
- c. Work safety meeting (if applicable).

## 1.8 CONSTRUCTION WASTE MANAGEMENT PLAN

Submit Construction Waste Management Plan within 30 days after contract award. Revise and resubmit Construction Waste Management Plan until it receives final approval from the Contracting Officer, in order for construction to begin. Execute demolition or deconstruction activities in accordance with Section 02 41 00 DEMOLITION. Manage demolition debris/waste or deconstruction materials in accordance with the approved construction waste management plan.

An approved construction waste management plan will not relieve the Contractor of responsibility for compliance with applicable environmental regulations or meeting project cumulative waste diversion requirement. Ensure all subcontractors receive a copy of the approved Construction Waste Management Plan. The plan demonstrates how to meet the project waste diversion requirement. Also, include the following in the plan:

- a. Identify the names of individuals responsible for waste management and waste management tracking, along with roles and responsibilities on the project.
- b. Actions that will be taken to reduce solid waste generation, including coordination with subcontractors to ensure awareness and participation.
- c. Description of the regular meetings to be held to address waste management.
- d. Description of the specific approaches to be used in recycling/reuse of the various materials generated, including the areas on site and equipment to be used for processing, sorting, and temporary storage of materials.
- e. Name of landfill and/or incinerator to be used.
- f. Identification of local and regional re-use programs, including non-profit organizations such as schools, local housing agencies, and organization that accept used materials such as material exchange networks and resale stores. Include the name, location, phone number for each re-use facility identified, and provide a copy of the permit or license for each facility.
- g. List of specific materials, by type and quantity, that will be salvaged for resale, salvaged and reused on the current project, salvaged and stored for reuse on a future project, or recycled. Identify the recycling facilities by name, address, and phone number.
- h. Identification of materials that cannot be recycled or reused with an explanation or justification, to be approved by the Contracting Officer.
- i. Description of the means by which any materials identified in item (g) above will be protected from contamination.
- j. Description of the means of transportation of the recyclable materials (whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler and removed from the site).
- k. Copy of training plan for subcontractors and other services to prevent contamination by co-mingling materials identified for diversion and waste materials.
- l. Facilities or subcontractors offering construction waste transport on-site or off-site must ensure that proper shipping orders, bill of lading, manifests, or other shipping documents containing waste diversion information meet requirements of 40 CFR 273 Universal Waste Management, 49 CFR 173 Shippers - General Requirements for Shipments and Packagings, and 49 CFR 178 Specifications for Packaging. Individuals signing manifests or other shipping documents should meet the minimum training requirements.
- m. List each supplier who deliver construction materials, in bulk, or package products in returnable containers or returnable packaging, or

have take-back programs. List each program and the applicable material to actively monitor and track to assist in meeting waste diversion requirements on the project.

- n. Identify any local jurisdiction requirements for waste management. Include those requirements, points of contact, etc.

Distribute copies of the waste management plan to each subcontractor, Quality Control Manager, and the Contracting Officer.

## 1.9 RECORDS (DOCUMENTATION)

### 1.9.1 General

Maintain records to document the types and quantities of waste generated and diverted through re-use, recycling and/or sale to third parties; through disposal to a landfill or incinerator facility. Provide explanations for any materials not recycled, reused or sold. Collect and retain manifests, weight tickets, sales receipts, and invoices specifically identifying diverted project waste materials or disposed materials.

### 1.9.2 Accumulated

Maintain a running record of materials generated and diverted from landfill disposal, including accumulated diversion rates for the project. Make records available to the Contracting Officer during construction or incidental demolition activities. Provide a copy of the diversion records to the Contracting Officer upon completion of the construction, incidental demolitions or minor deconstruction activities.

## 1.10 REPORTS

### 1.10.1 General

Maintain current construction waste diversion information on site for periodic inspection by the Contracting Officer. Include in the quarterly reports, annual reports and final reports: the project name, contract information, information for waste generated, diverted and disposed of for the current reporting period and show cumulative totals for the project. Reports must identify quantities of waste by type and disposal method. Also include in each report, supporting documentation to include manifests, weigh tickets, receipts, and invoices specifically identifying the project and waste material type and weighted sum.

### 1.10.2 Quarterly Reporting

Provide cumulative reports at the end of each quarter (December, March, June, and September, corresponding with the federal fiscal year for reporting purposes). Submit quarterly reports not later than 15 calendar days after the preceding quarter has ended.

### 1.10.3 Annual Reporting

Provide a cumulative construction waste diversion report annually. Submit annual report not later than 30 calendar days after the preceding fourth quarter has ended.

### 1.11 FINAL CONSTRUCTION WASTE DIVERSION REPORT

A Final Construction Waste Diversion Report is required at the end of the project. Provide Final Construction Waste Diversion Report 60 days prior to the Beneficial Occupancy Date (BOD). The final Construction Waste Diversion Report must be included in the Sustainability eNotebook in accordance with Section 01 33 29 SUSTAINABILITY REPORTING.

### 1.12 COLLECTION

Collect, store, protect, and handle reusable and recyclable materials at the site in a manner which prevents contamination, and provides protection from the elements to preserve their usefulness and monetary value. Provide receptacles and storage areas designated specifically for recyclable and reusable materials and label them clearly and appropriately to prevent contamination from other waste materials. Keep receptacles or storage areas neat and clean.

Train subcontractors and other service providers to either separate waste streams or use the co-mingling method as described in the construction waste management plan. Handle hazardous waste and hazardous materials in accordance with applicable regulations and other applicable contract requirements. Separate materials by one of the following methods described herein:

#### 1.12.1 Source Separation Method

Separate waste products and materials that are recyclable from trash and sort as described below into appropriately marked separate containers and then transport to the respective recycling facility for further processing. Deliver materials in accordance with recycling or reuse facility requirements (e.g., free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process). Separate materials into the category types as defined in the construction waste management plan.

#### 1.12.2 Other Methods

Other methods proposed by the Contractor (such as co-mingled recycling) may be used when approved by the Contracting Officer, and supported with verifiable documentation.

### 1.13 DISPOSAL

Control accumulation of waste materials and trash. Recycle or dispose of collected materials off-site at intervals approved by the Contracting Officer and in compliance with waste management procedures as described in the waste management plan. Except as otherwise specified in other sections of the specifications, dispose of in accordance with the following:

#### 1.13.1 Reuse

Give first consideration to reusing construction and demolition materials as a disposition strategy. Recover for reuse materials, products, and components as described in the approved construction waste management plan. Coordinate with the Contracting Officer to identify onsite reuse opportunities or material sales or donation available through Government resale or donation programs. Sale of recovered materials is not allowed

on the Installation with out explicit approval by the Contracting Officer.

#### 1.13.2 Recycle

Recycle non-hazardous construction and demolition/debris materials that are not suitable for reuse. Track rejection of contaminated recyclable materials by the recycling facility. Rejected recyclables materials will not be counted as a percentage of diversion calculation. Recycle all fluorescent lamps, HID lamps, mercury (Hg) -containing thermostats and ampoules, and PCBs-containing ballasts and electrical components as directed by the Contracting Officer. Do not crush lamps on site as this creates a hazardous waste stream with additional handling requirements.

#### 1.13.3 Waste

Dispose by landfill or incineration only those waste materials with no practical use, economic benefit, or recycling opportunity.

### PART 2 PRODUCTS

Not used.

### PART 3 EXECUTION

Not used.            -- End of Section --

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## SECTION 01 78 23

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07/06

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## SECTION 01 78 23

OPERATION AND MAINTENANCE DATA  
07/06

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

## ASTM INTERNATIONAL (ASTM)

ASTM E1971 (2005; R 2011) Standard Guide for  
Stewardship for the Cleaning of Commercial  
and Institutional Buildings

## 1.2 SUSTAINABILITY REQUIREMENTS

Materials in this technical specification may contribute towards contract compliance with sustainability requirements. See Section 01 33 29 SUSTAINABILITY REQUIREMENTS AND REPORTING for project requirements.

## 1.3 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are for information only. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

## SD-10 Operation and Maintenance Data

O&M Database; G, RO

Training Plan; G, RO

Training Outline; G, RO

Training Content; G, RO

## SD-11 Closeout Submittals

Training Video Recording; G, RO

Validation of Training Completion; G, RO

## 1.4 SUBMISSION OF OPERATION AND MAINTENANCE DATA

Submit Operation and Maintenance (O&M) Data specifically applicable to this contract and a complete and concise depiction of the provided equipment, product, or system, stressing and enhancing the importance of system interactions, troubleshooting, and long-term preventative maintenance and operation. The subcontractors shall compile and prepare data and deliver to the Contractor prior to the training of Government personnel. Compile and prepare aggregate O&M data including clarifying

and updating the original sequences of operation to as-built conditions. Organize and present information in sufficient detail to clearly explain O&M requirements at the system, equipment, component, and subassembly level. Include an index preceding each submittal. Submit in accordance with this section and Section 01 33 00 SUBMITTAL PROCEDURES.

#### 1.4.1 Package Quality

Documents must be fully legible. Poor quality copies and material with hole punches obliterating the text or drawings will not be accepted.

#### 1.4.2 Package Content

Data package content shall be as shown in the paragraph titled "Schedule of Operation and Maintenance Data Packages." Comply with the data package requirements specified in the individual technical sections, including the content of the packages and addressing each product, component, and system designated for data package submission, except as follows. Commissioned items without a specified data package requirement in the individual technical sections shall use Data Package 3. Commissioned items with a Data Package 1 or 2 requirement shall use instead Data Package 3.

#### 1.4.3 Changes to Submittals

Manufacturer-originated changes or revisions to submitted data shall be furnished by the Contractor if a component of an item is so affected subsequent to acceptance of the O&M Data. Changes, additions, or revisions required by the Contracting Officer for final acceptance of submitted data, shall be submitted by the Contractor within 30 calendar days of the notification of this change requirement.

#### 1.4.4 Review and Approval

The Contractor's Commissioning Authority (CA) shall review the commissioned systems and equipment submittals for completeness and applicability. The CA shall verify that the systems and equipment provided meet the requirements of the Contract documents and design intent, particularly as they relate to functionality, energy performance, water performance, maintainability, sustainability, system cost, indoor environmental quality, and local environmental impacts. The CA shall communicate deficiencies to the Contracting Officer. Upon a successful review of the corrections, the CA shall recommend approval and acceptance of these O&M manuals to the Contracting Officer. This work shall be in addition to the normal review procedures for O&M data.

#### 1.4.5 O&M Database

Develop a database from the O&M manuals that contains the information required to start a preventative maintenance program.

### 1.5 TYPES OF INFORMATION REQUIRED IN O&M DATA PACKAGES

#### 1.5.1 Operating Instructions

Include specific instructions, procedures, and illustrations for the following phases of operation for the installed model and features of each system:

#### 1.5.1.1 Safety Precautions

List personnel hazards and equipment or product safety precautions for all operating conditions.

#### 1.5.1.2 Operator Prestart

Include procedures required to install, set up, and prepare each system for use.

#### 1.5.1.3 Startup, Shutdown, and Post-Shutdown Procedures

Provide narrative description for Startup, Shutdown and Post-shutdown operating procedures including the control sequence for each procedure.

#### 1.5.1.4 Normal Operations

Provide narrative description of Normal Operating Procedures. Include Control Diagrams with data to explain operation and control of systems and specific equipment.

#### 1.5.1.5 Emergency Operations

Include Emergency Procedures for equipment malfunctions to permit a short period of continued operation or to shut down the equipment to prevent further damage to systems and equipment. Include Emergency Shutdown Instructions for fire, explosion, spills, or other foreseeable contingencies. Provide guidance and procedures for emergency operation of all utility systems including required valve positions, valve locations and zones or portions of systems controlled.

#### 1.5.1.6 Operator Service Requirements

Include instructions for services to be performed by the operator such as lubrication, adjustment, inspection, and recording gage readings.

#### 1.5.1.7 Environmental Conditions

Include a list of Environmental Conditions (temperature, humidity, and other relevant data) that are best suited for the operation of each product, component or system. Describe conditions under which the item equipment should not be allowed to run.

#### 1.5.2 Preventive Maintenance

Include the following information for preventive and scheduled maintenance to minimize corrective maintenance and repair for the installed model and features of each system. Include potential environmental and indoor air quality impacts of recommended maintenance procedures and materials.

##### 1.5.2.1 Lubrication Data

Include preventative maintenance lubrication data, in addition to instructions for lubrication provided under paragraph titled "Operator Service Requirements":

- a. A table showing recommended lubricants for specific temperature ranges and applications.

- b. Charts with a schematic diagram of the equipment showing lubrication points, recommended types and grades of lubricants, and capacities.
- c. A Lubrication Schedule showing service interval frequency.

#### 1.5.2.2 Preventive Maintenance Plan and Schedule

Include manufacturer's schedule for routine preventive maintenance, inspections, tests and adjustments required to ensure proper and economical operation and to minimize corrective maintenance. Provide manufacturer's projection of preventive maintenance work-hours on a daily, weekly, monthly, and annual basis including craft requirements by type of craft. For periodic calibrations, provide manufacturer's specified frequency and procedures for each separate operation.

#### 1.5.3 Corrective Maintenance (Repair)

Include manufacturer's recommended procedures and instructions for correcting problems and making repairs.

##### 1.5.3.1 Troubleshooting Guides and Diagnostic Techniques

Include step-by-step procedures to promptly isolate the cause of typical malfunctions. Describe clearly why the checkout is performed and what conditions are to be sought. Identify tests or inspections and test equipment required to determine whether parts and equipment may be reused or require replacement.

##### 1.5.3.2 Wiring Diagrams and Control Diagrams

Wiring diagrams and control diagrams shall be point-to-point drawings of wiring and control circuits including factory-field interfaces. Provide a complete and accurate depiction of the actual job specific wiring and control work. On diagrams, number electrical and electronic wiring and pneumatic control tubing and the terminals for each type, identically to actual installation configuration and numbering.

##### 1.5.3.3 Maintenance and Repair Procedures

Include instructions and a list of tools required to repair or restore the product or equipment to proper condition or operating standards.

##### 1.5.3.4 Removal and Replacement Instructions

Include step-by-step procedures and a list required tools and supplies for removal, replacement, disassembly, and assembly of components, assemblies, subassemblies, accessories, and attachments. Provide tolerances, dimensions, settings and adjustments required. Instructions shall include a combination of text and illustrations.

##### 1.5.3.5 Spare Parts and Supply Lists

Include lists of spare parts and supplies required for maintenance and repair to ensure continued service or operation without unreasonable delays. Special consideration is required for facilities at remote locations. List spare parts and supplies that have a long lead-time to obtain.

#### 1.5.4 Corrective Maintenance Work-Hours

Include manufacturer's projection of corrective maintenance work-hours including requirements by type of craft. Corrective maintenance that requires completion or participation of the equipment manufacturer shall be identified and tabulated separately.

#### 1.5.5 Appendices

Provide information required below and information not specified in the preceding paragraphs but pertinent to the maintenance or operation of the product or equipment. Include the following:

##### 1.5.5.1 Product Submittal Data

Provide a copy of all SD-03 Product Data submittals required in the applicable technical sections.

##### 1.5.5.2 Manufacturer's Instructions

Provide a copy of all SD-08 Manufacturer's Instructions submittals required in the applicable technical sections.

##### 1.5.5.3 O&M Submittal Data

Provide a copy of all SD-10 Operation and Maintenance Data submittals required in the applicable technical sections.

##### 1.5.5.4 Parts Identification

Provide identification and coverage for all parts of each component, assembly, subassembly, and accessory of the end items subject to replacement. Include special hardware requirements, such as requirement to use high-strength bolts and nuts. Identify parts by make, model, serial number, and source of supply to allow reordering without further identification. Provide clear and legible illustrations, drawings, and exploded views to enable easy identification of the items. When illustrations omit the part numbers and description, both the illustrations and separate listing shall show the index, reference, or key number that will cross-reference the illustrated part to the listed part. Parts shown in the listings shall be grouped by components, assemblies, and subassemblies in accordance with the manufacturer's standard practice. Parts data may cover more than one model or series of equipment, components, assemblies, subassemblies, attachments, or accessories, such as typically shown in a master parts catalog

##### 1.5.5.5 Warranty Information

List and explain the various warranties and clearly identify the servicing and technical precautions prescribed by the manufacturers or contract documents in order to keep warranties in force. Include warranty information for primary components such as the compressor of air conditioning system. Provide copies of warranties required by Section 01 78 36.00 24 WARRANTY OF CONSTRUCTION AND DESIGN.

##### 1.5.5.6 Extended Warranty Information

List all warranties for products, equipment, components, and sub-components whose duration exceeds one year. For each warranty listed,

indicate the applicable specification section, duration, start date, end date, and the point of contact for warranty fulfillment. Also, list or reference the specific operation and maintenance procedures that must be performed to keep the warranty valid. Provide copies of warranties required by Section 01 78 36.00 24 WARRANTY OF CONSTRUCTION AND DESIGN.

#### 1.5.5.7 Personnel Training Requirements

Provide information available from the manufacturers that is needed for use in training designated personnel to properly operate and maintain the equipment and systems.

#### 1.5.5.8 Testing Equipment and Special Tool Information

Include information on test equipment required to perform specified tests and on special tools needed for the operation, maintenance, and repair of components.

#### 1.5.5.9 Testing and Performance Data

Include completed prefunctional checklists, functional performance test forms, and monitoring reports. Include recommended schedule for retesting and blank test forms.

#### 1.5.5.10 Contractor Information

Provide a list that includes the name, address, and telephone number of the General Contractor and each Subcontractor who installed the product or equipment, or system. For each item, also provide the name address and telephone number of the manufacturer's representative and service organization that can provide replacements most convenient to the project site. Provide the name, address, and telephone number of the product, equipment, and system manufacturers.

### 1.6 TYPES OF INFORMATION REQUIRED IN CONTROLS O&M DATA PACKAGES

Include Data Package 5 and the following for control systems:

- a. Narrative description on how to perform and apply all functions, features, modes, and other operations, including unoccupied operation, seasonal changeover, manual operation, and alarms. Include detailed technical manual for programming and customizing control loops and algorithms.
- b. Full as-built sequence of operations.
- c. Copies of all checkout tests and calibrations performed by the Contractor (not Cx tests).
- d. Full points list. A listing of rooms shall be provided with the following information for each room:
  - (1) Floor
  - (2) Room number
  - (3) Room name
  - (4) Air handler unit ID

- (5) Reference drawing number
- (6) Air terminal unit tag ID
- (7) Heating and/or cooling valve tag ID
- (8) Minimum cfm
- (9) Maximum cfm
- e. Full print out of all schedules and set points after testing and acceptance of the system.
- f. Full as-built print out of software program.
- g. Electronic copy on disk or CD of the entire program for this facility.
- h. Marking of all system sensors and thermostats on the as-built floor plan and mechanical drawings with their control system designations.

#### 1.7 SCHEDULE OF OPERATION AND MAINTENANCE DATA PACKAGES

Furnish the O&M data packages specified in individual technical sections. The required information for each O&M data package is as follows:

##### 1.7.1 Data Package 1

- a. Safety precautions
- b. Cleaning recommendations
- c. Maintenance and repair procedures
- d. Warranty information
- e. Contractor information
- f. Spare parts and supply list

##### 1.7.2 Data Package 2

- a. Safety precautions
- b. Normal operations
- c. Environmental conditions
- d. Lubrication data
- e. Preventive maintenance plan and schedule
- f. Cleaning recommendations
- g. Maintenance and repair procedures
- h. Removal and replacement instructions
- i. Spare parts and supply list

- j. Parts identification
- k. Warranty information
- l. Contractor information

#### 1.7.3 Data Package 3

- a. Safety precautions
- b. Operator prestart
- c. Startup, shutdown, and post-shutdown procedures
- d. Normal operations
- e. Emergency operations
- f. Environmental conditions
- g. Lubrication data
- h. Preventive maintenance plan and schedule
- i. Cleaning recommendations
- j. Troubleshooting guides and diagnostic techniques
- k. Wiring diagrams and control diagrams
- l. Maintenance and repair procedures
- m. Removal and replacement instructions
- n. Spare parts and supply list
- o. Product submittal data
- p. O&M submittal data
- q. Parts identification
- r. Warranty information
- s. Testing equipment and special tool information
- t. Testing and performance data
- u. Contractor information

#### 1.7.4 Data Package 4

- a. Safety precautions
- b. Operator prestart
- c. Startup, shutdown, and post-shutdown procedures



- d. Normal operations
  - e. Emergency operations
  - f. Operator service requirements
  - g. Environmental conditions
  - h. Lubrication data
  - i. Preventive maintenance plan and schedule
  - j. Cleaning recommendations
  - k. Troubleshooting guides and diagnostic techniques
  - l. Wiring diagrams and control diagrams
  - m. Maintenance and repair procedures
  - n. Removal and replacement instructions
  - o. Spare parts and supply list
  - p. Corrective maintenance man-hours
  - q. Product submittal data
  - r. O&M submittal data
  - s. Parts identification
  - t. Warranty information
  - u. Personnel training requirements
  - v. Testing equipment and special tool information
  - w. Testing and performance data
  - x. Contractor information
- 1.7.5 Data Package 5
- a. Safety precautions
  - b. Operator prestart
  - c. Start-up, shutdown, and post-shutdown procedures
  - d. Normal operations
  - e. Environmental conditions
  - f. Preventive maintenance plan and schedule
  - g. Troubleshooting guides and diagnostic techniques
  - h. Wiring and control diagrams

- i. Maintenance and repair procedures
- j. Removal and replacement instructions
- k. Spare parts and supply list
- l. Product submittal data
- m. Manufacturer's instructions
- n. O&M submittal data
- o. Parts identification
- p. Testing equipment and special tool information
- q. Warranty information
- r. Testing and performance data
- s. Contractor information

## PART 2 PRODUCTS

Not Used

## PART 3 EXECUTION

### 3.1 TRAINING

Prior to acceptance of the facility by the Contracting Officer for Beneficial Occupancy, provide comprehensive training for the systems and equipment specified in the technical specifications. The training must be targeted for the building maintenance personnel, and applicable building occupants. Instructors must be well-versed in the particular systems that they are presenting. Address aspects of the Facility Data Workbook and Facility Document Set as defined in 01 78 24.00 10 FACILITY DATA REQUIREMENTS. Training must include classroom or field lectures based on the system operating requirements. The location of classroom training requires approval by the Contracting Officer.

#### 3.1.1 Training Plan

Submit a written training plan to the Contracting Officer for approval at least 60 calendar days prior to the scheduled training. Training plan must be approved by the Commissioning Authority (CxA) prior to forwarding to the Contracting Officer. Also, coordinate the training schedule with the Contracting Officer and CxA. Include within the plan the following elements:

- a. Equipment included in training
- b. Intended audience
- c. Location of training
- d. Dates of training

- e. Objectives
- f. Outline of the information to be presented and subjects covered including description
- g. Start and finish times and duration of training on each subject
- h. Methods (e.g. classroom lecture, video, site walk-through, actual operational demonstrations, written handouts)
- i. Instructor names and instructor qualifications for each subject
- j. List of texts and other materials to be furnished by the Contractor that are required to support training
- k. Description of proposed software to be used for video recording of training sessions.

### 3.1.2 Training Content

The core of this training must be based on manufacturer's recommendations and the operation and maintenance information. The CxA is responsible for overseeing and approving the content and adequacy of the training. Spend 95 percent of the instruction time during the presentation on the OPERATION AND MAINTENANCE DATA. Include the following for each system training presentation:

- a. Start-up, normal operation, shutdown, unoccupied operation, seasonal changeover, manual operation, controls set-up and programming, troubleshooting, and alarms.
- b. Relevant health and safety issues.
- c. Discussion of how the feature or system is environmentally responsive. Advise adjustments and optimizing methods for energy conservation.
- d. Design intent.
- e. Use of O&M Manual Files.
- f. Review of control drawings and schematics.
- g. Interactions with other systems.
- h. Special maintenance and replacement sources.
- i. Tenant interaction issues.

### 3.1.3 Training Outline

Provide the Operation and Maintenance Manual Files (Bookmarked PDF) and a written course outline listing the major and minor topics to be discussed by the instructor on each day of the course to each trainee in the course. Provide the course outline 14 calendar days prior to the training.

### 3.1.4 Training Video Recording

Record classroom training session(s) on video. Provide to the Contracting

Officer two copies of the training session(s) in DVD video recording format. Capture within the recording, in video and audio, the instructors' training presentations including question and answer periods with the attendees. The recording camera(s) must be attended by a person during the recording sessions to assure proper size of exhibits and projections during the recording are visible and readable when viewed as training.

#### 3.1.5 Unresolved Questions from Attendees

If, at the end of the training course, there are questions from attendees that remain unresolved, the instructor must send the answers, in writing, to the Contracting Officer for transmittal to the attendees, and the training video must be modified to include the appropriate clarifications.

#### 3.1.6 Validation of Training Completion

Ensure that each attendee at each training session signs a class roster daily to confirm Government participation in the training. At the completion of training, submit a signed validation letter that includes a sample record of training for reporting what systems were included in the training, who provided the training, when and where the training was performed, and copies of the signed class rosters. Provide two copies of the validation to the Contracting Officer, and one copy to the Operation and Maintenance Manual Preparer for inclusion into the Manual's documentation.

#### 3.1.7 Quality Control Coordination

Coordinate this training with the CxA in accordance with Section 01 45 00.00 10 QUALITY CONTROL.

-- End of Section --

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## DIVISION 01 - GENERAL REQUIREMENTS

## SECTION 01 78 24.00 10

## FACILITY DATA REQUIREMENTS (BUILDER)

05/18

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## SECTION 01 78 24.00 10

FACILITY DATA REQUIREMENTS (BUILDER)  
05/18

## PART 1 GENERAL

This specification requires the collection, organization, and turnover of electronic Facility Data for specific assets designed and constructed as part of this contract. Provide deliverables as defined in this specification. See Sections 01 33 00 SUBMITTAL PROCEDURES, and 01 78 23 OPERATION AND MAINTENANCE DATA, for additional Facility Data delivery requirements.

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

## INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

ISO 19005-3	(2012) Document Management -- Electronic Document File Format for Long-Term Preservation -- Part 3: Use of ISO 32000-1 with Support for Embedded Files (PDF/A-3)
ISO 32000-1	(2008) Document Management -- Portable Document Format -- Part 1: PDF 1.7

## U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 1110-1-2909	(2012) Geospatial Data and Systems
BUILDER Guide	Army BUILDER™ SMS Inventory and Assessment Guide

## 1.2 DEFINITIONS AND ABBREVIATIONS

## 1.2.1 Assets

Assets are specific items of property or equipment.

## 1.2.2 Attributes

Attributes are individual pieces of Facility Data that describe facilities and their associated assets.

## 1.2.3 Facility Data

Information defined and collected in the deliverables described herein.

## 1.2.4 Facility Data Project Execution Plan (FDPxP)

A document that describes the clear and organized plan for the collection, organization, and turnover of the Facility Data deliverables required by this specification.

### 1.3 UNITS OF MEASURE

Provide Facility Data deliverables utilizing the units of measure identified in the contract documents.

### 1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval and information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

#### SD-01 Preconstruction Submittals

Facility Data Project Execution Plan(FDPxP); G, RO

FDPxP Coordination Meeting; G, RO

Submittal Demonstration Meeting; G, RO

#### SD-11 Closeout Submittals

Preliminary BRED Template and Report; G, RO

Final BRED Template and Report; G, RO

Final BUILDER Data Upload; G, RO

### 1.5 QUALITY ASSURANCE

#### 1.5.1 Facility Data Project Execution Plan (FDPxP)

Provide the Government with a plan for the collection, organization, and turnover of the Facility Data deliverables to the Government. At a minimum, include the following items in the FDPxP:

##### 1.5.1.1 Front Matter

Provide a Cover Page, Table of Contents, and Executive Summary/Objectives.

##### 1.5.1.2 Project Information

List the Project Owner, Project Name, Project Location and address, Contract Type, Project Description, Project/Contract Number, Project Milestones.

##### 1.5.1.3 Submittal Schedule

Identify delivery schedule for all deliverables in compliance with the submission requirements identified in this specification.

##### 1.5.1.4 Personnel

Identify key personnel involved in the development of the Facility Data deliverables including Contractor and Government personnel.



#### 1.5.1.5 Data Collection Content

Individually list every asset group from the facility data requirements that will require collection. This includes new and existing assets required to be evaluated/validated under this contract. No attribute data is required at this time. Identify any asset groups from the requirements that are not required within the scope of this Contract. Document the versions of forms and documentation standards to be used through the duration of the project.

#### 1.5.1.6 Protocols

Detailed procedures:

- a. Facility Data documentation/collection process.
- b. Facility Data production/development process.
- c. Collaboration procedures including strategy, meetings, communication, and subcontractor/consultant involvement.
- d. Quality Control, including site verification of facility data, as applicable.
- e. File and folder naming structure(s).
- f. Hardware and software being used for collection and organization of Facility Data. Identify type, format, and anticipated organization of digital storage media to be provided as part of required deliverables. Include means and methods for checking deliverables for malicious content.

#### 1.5.2 Meetings

To assure that Facility Data requirements are being met through the duration of the project, organize the following meetings and discuss the subsequent topics:

##### 1.5.2.1 Post-Award Kickoff Meeting

At a minimum, discuss the following:

- a. The requirement for Facility Data deliverables under this contract.
- b. Primary roles and responsibilities associated with the development and delivery of the Facility Data deliverables, and
- c. Identify and agree upon a date and attendance list for the meetings described below:

##### 1.5.2.2 FDPxP Coordination Meeting

- a. Facilitate a meeting following submission and Government review of the FDPxP. Include the Facility Data Preparer(s), Designer of Record (DOR), Quality Control (QC) Manager, Government's Facility Data Proponent, Contracting Officer's Representative, and Facilities Management Specialist (FMS). Also include any Government personnel required for obtaining security clearances and waivers for proper Facility Data collection in this meeting.

- b. The purpose of this meeting is to coordinate the efforts necessary by contract parties to ensure an accurate collection, preparation, quality control, and submittal of these deliverables.
- c. The FDPxP serves as the primary agenda for this meeting. At a minimum, discuss the following:
  - (1) Processes and methods of gathering facility data during construction. Discuss and obtain special permissions and/or waivers as necessary (photo waivers, data encryption, etc.);
  - (2) Contractor Quality Control practices and procedures;
  - (3) Corrective actions necessary for Government approval of FDPxP;
  - (4) Necessity for additional or recurring Facility Data Coordination Meetings outside of those required by this specification, as requested by the Contractor. Intent of these meetings would be to maintain regular contact between responsible parties of the Contractor and Government with regard to development of the facility data deliverables. Conduct status meetings with a frequency agreed upon at this meeting.

#### 1.5.2.3 Submittal Demonstration Meeting(s)

- a. Facilitate a meeting following submission and Government review of each design or progress submittal of the Facility Data. Include the Facility Data Preparer(s), Designer of Record (DOR), Quality Control (QC) Manager, Government's Facility Data Proponent, Contracting Officer's Representative, and Facilities Management Specialist (FMS). Include Mechanical, Electrical, Plumbing, and Fire Protection subcontractors as applicable.
- b. The purpose of this meeting is to demonstrate ongoing compliance with the requirements identified in this specification.
- c. The applicable deliverables, along with Government remarks associated with review of these submittals serve as the primary guide and agenda for this meeting. At a minimum, discuss the following during this meeting:
  - (1) Review assets, applicable attributes, facility, and space data at time of submittal;
  - (2) Demonstrate Quality Control and site verification procedures, as applicable, by Contractor QC;
  - (3) Discuss Government review comments and/or unresolved items preventing completion and Government approval of the submittal.

#### 1.5.3 Facility Turnover and Contract Closeout

Include the Facility Data Deliverables as a submittal in Facility Turnover and Contract Closeout procedures as defined in 01 33 00.32 DESIGN AND CONSTRUCTION DELIVERABLES AND PROCEDURES.

## 1.6 DELIVERY, STORAGE, AND HANDLING

Deliver facility data submittals in an organized, reviewable, and legible manner. Provide submittals adhering to the requirements of 01 33 00 SUBMITTAL REQUIREMENTS and 01 78 23 OPERATION AND MAINTENANCE DATA.

### 1.6.1 Malicious Content

Scan all files for malicious viruses using a commercially available scanning program that is routinely updated to identify and remove current virus threats.

### 1.6.2 Storage Media

Provide facility data on archival disk-based (DVD-R/RW) media. Any deviations from the required storage media must be approved by the Government. Select and apply technology used for electronic data transmission to ensure that the full Facility Data submittal for each facility is provided on one single disk, whenever possible.

- a. Apply a label directly printed to storage media. Do not provide adhesive, paper-based labels. List the name of the facility, Project, Project location, Contract number, Designer of Record firm/Prime Contractor company's name, title of submission, and security classification (in accordance with the appropriate security classification labeling regulations) on the label. If multiple disks are provided, clearly document the contents of each disk on the label.
- b. Include the name and contact information of the individual who produced the final data disk to ensure that any problems with the data or media can be easily resolved.

## PART 2 PRODUCTS

### 2.1 BUILDER Existing and Renovated Building Inventory and Assessment

Conduct and provide a BUILDER Initial Building Inventory and Assessment for the facility to be constructed. Coordinate access and upload of data to the USAFA BUILDER Sustainment Management System (SMS).

Coordinate access to existing facility data with appropriate USAFA BUILDER Sustainment Management System (SMS) personnel. Revisions shall be managed offline via BUILDER Remote Entry Database (BRED) file(s) until final approval by the Government. Upon approval, coordinate access and upload of data to the USAFA BUILDER Sustainment Management System (SMS).

Inventory and assessment shall comply with BUILDER Guide, as amended by Air Force SMS Playbook, attached to this specification. See <https://www.sms.erdcdren.mil/> for the BUILDER Guide and for additional information and resources. A list of BUILDER Systems/Components has been attached to this specification for reference, but shall not limit completion of the full inventory and assessment in compliance with applicable Air Force and Ofutt AFB requirements and formatting standards.

#### 2.1.1 BUILDER Personnel Experience Requirements

The Contractor shall be responsible for planning, management, collection, quality control, and upload of data to the USAFA BUILDER SMS. Provide personnel with experience and qualifications as appropriate for the scope,

scale, and effort required for this deliverable. Personnel shall comply with all training requirements for Antiterrorism, OPSEC, safety, etc, as applicable to their role on the project, and as referenced in the entirety of this contract. Document these personnel with qualifications in the FDPxP. Provide not less than one BUILDER data manager with credentials adequate to obtain a Department of Defense (DoD) Common Access Card (CAC) in order to obtain access and upload facility data to the USAFA BUILDER SMS. The BUILDER data manager shall be present and capable of testing and directly uploading data to the SMS on site at the US Air Force Academy, once approved by the Government. Location and other logistical items will be coordinated after contract award.

#### 2.1.2 BUILDER Equipment Requirements

The Contractor shall be responsible for any and all equipment and processes for collecting the required BUILDER data. Document intended processes, procedures, and equipment in the Advanced Modeling PxP.

#### 2.1.3 BUILDER Implementation Plan

Specifically address the BUILDER Initial Building Inventory and Assessment in the FDPxP - to include (but not limited to) personnel, equipment, project-specific requirements/accommodations, safety, data management, coordination, processes and procedures, quality control, and deliverables.

#### 2.1.4 BUILDER Government-Furnished Materials (GFM)

The Contractor may request GFM to support BUILDER data collections after contract award. This may include the Air Force-specific formatting requirements or an Air Force Builder Remote Entry Database (BRED) template. In the event that the Government chooses not to provide these resources, the Contractor shall provide BUILDER deliverables in compliance with BUILDER Guide and compliance with the most current published BRED template available at <https://www.sms.erdcdren.mil/>.

#### 2.1.5 Preliminary BRED Template and Report

Provide a preliminary BRED Template for Government review and acceptance at approximately 70 percent construction complete. This BRED Template shall include all data available at the time of deliverable submission. The intent of this deliverable is for general quality assurance of content and formatting.

With the template, provide an initial assessment and inventory report including a summary of the planned versus executed scope of the installation, the executed schedule, challenges, safety concerns, critical decisions made, and lessons learned. As appendices to the report provide all supporting documentation for the inventory and assessment - including but not limited to photos, calculations, roof reports, in-brief/out-brief reports, daily reports, sketches, GIS data, and walk sheets.

#### 2.1.6 Final BRED Template and Report

Provide a final BRED Template for Government review and acceptance as soon as all data required is collected, compiled, and assessed - but not later than 60 days after Beneficial Occupancy Date (BOD). One-hundred percent accuracy of BRED data is required for Government acceptance of this deliverable.

With the template, provide an updated, finalized assessment report with appendices as described above.

#### 2.1.7 Final BUILDER Data Upload

Upload the final, accepted BRED data to the USAFA BUILDER SMS, only after full acceptance of the Final BRED Template and Report. The contractor shall work with USAFA personnel to upload the final, approved data to the USAFA BUILDER SMS. The Contractor's BUILDER data manager shall be on site and available for this process and to answer any questions regarding data content and quality.

### PART 3 EXECUTION

#### 3.1 CONSTRUCTION FINAL SUBMITTALS

Submit the Preliminary BRED Template and Report as the project approaches completion and all facility assets are defined. Provide the Final BRED Template and Report submittal only after Government acceptance and approval of the Preliminary BRED Template and Report.

#### 3.2 FACILITY DATA VERIFICATION

Verify the submittals through the quality control personnel and procedures as defined in the FDPxP. One-hundred percent accuracy of Facility Data is required for Government acceptance of the Final BRED Template and Report and prior to Final BUILDER Data Upload.

Attachments: Air Force Civil Engineer SMS Playbook  
BUILDER Systems/Components List

-- End of Section --

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**Updated**  
**10.06.2020**

# **Air Force Civil Engineer Sustainment Management Systems Playbook**





## **SMS – Overview**

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### **Introduction**

We are now sustaining an AF-wide facility condition assessment (FCA) process that follows standard processes throughout the AF for all built infrastructure. The ability to anticipate built infrastructure failures, thereby minimizing emergency response to failures as part of daily operations, has arrived and is changing how we budget, plan, and prioritize built infrastructure requirements. Bases that have embraced this paradigm shift will reap the benefits much earlier than bases that have not. The Air Force Civil Engineer Center Operations Directorate (AFCEC/CO) is actively managing the Air Force-wide sustainment of the Sustainment Management System (SMS), a suite of web-based software applications developed by the Army Corps of Engineers to help leadership, civil engineers, technicians, and Activity Management Plan (AMP) Managers and Sub-AMP Managers influence when, where, and how to best maintain the AF's built infrastructure. Figure 1 below details the different SMS systems and their corresponding applications.





## Sustainment Management System Applications







SMS	Background	Current Deployment	How to use in FY17	End State
 <b>PAVER™</b>	1970s • Airfield Pavements, Pavements • Pavement Condition Index (PCI™)	AF wide implementation	Likelihood of Failure factor from SMS Condition Index & Engineering Assessment	Combination of SMS generated requirements and TRIRIGA programmed requirements will ...
 <b>ROOFER™</b>	1980s • Roof Condition Index	Limited AF use	Integrated with SMS BUILDER System	
 <b>RAILER™</b>	1980s • AF Rail System	DLA funds railroad inspections for rails used by DLA on AF bases, others inspected in-house or by contract		
 <b>BUILDER™</b>	1990s • Bldg Envelope, Water System, Mech System, Fire Protection, Electric / Lighting • Vertical Facility Condition Index (FCI)	AF wide implementation	Likelihood of Failure factor from SMS Condition Index	Replace FSM & 2% PRV as our primary budget drivers
 <b>FUELER™</b>	TBD • Fuel Systems	New module, under development with DLA funding		
 <b>UTILITIES</b>	TBD • Utility Distro Sys	New module, under development by CERL		

Figure 1 Sustainment Management Systems



## **Base-Level Application**

At the installation level, SMS provides scenario, trend, and cost analysis capabilities. SMS automates the means of exploring different action plans under various budget scenarios. SMS's Work Item Cost Analysis tool determines the return and return-on-investment (ROI) for each work activity type (i.e., do nothing, stop gap repair, repair, replace) to identify the most cost-effective options, showing the benefits of repair versus replacement as well as the consequences of deferring work for a given item. This makes multi-year work plans easier to formulate and funding requests easier to justify. Further, base personnel can analyze the total dollar amount attributed to an asset (e.g., an HVAC unit) over its lifespan against its relative condition, perform root cause failure analysis, determine whether a project exists to remedy the current problem, and initiate service requests to best address newly validated requirements.

SMS's condition index trend analysis can search through base inventory to forecast the best time to initiate maintenance or repairs several years in advance, thereby helping bases prepare out-year budgets and lower the total asset lifecycle cost of ownership. Bases can anticipate the optimum time frame (i.e., the "sweet spot") to repair specific components and minimize the penalty cost increases incurred from deferring maintenance, and can later determine whether work performed did actually reduce the number of issues recorded against a given asset resulting in lifecycle cost savings. Work items not completed in one year will be generated the following year at a higher cost due to inflation and additional deterioration. Constrained scenario analysis provides insight into what portion of the inventory will suffer at any given funding level. As a result, bases can achieve optimal facility performance out of the repair dollars invested.

## **Real Benefits**

Even in its early stages, users of an SMS realized the benefits of this powerful tool. To be able to realize the benefits of SMS and implement proactive asset management principles, bases must establish and maintain an updated inventory of their facilities along with current assessments. With the help of AFCEC's Asset Management Team (AMT), installation Operations Engineering personnel worked SMS BUILDER implementation. Prior to SMS implementation, facility assets only gained attention if something broke, while other unidentified issues existed and were left to fester and eventually fail. This drives to the basic principle of SMS: current condition assessments enable proactive corrective maintenance and minimize reactive service requests.

Looking into the future, powerful data visualization tools are on the near horizon. These data visualization tools will automate graphic presentation of the current and predicted conditions of facilities, systems, and potential even components within systems, enabling civil engineer leaders from work team, to shop level, to flight, squadron, group and major command levels to quickly understand the current and future condition of critical infrastructure assets. With this powerful insight, civil engineers will proactively resolve problems before they occur, resulting in highly reliable, right-sized, agile infrastructure that fully supports whatever missions demand.

## **Good Data Rolls Up**

SMS provides enterprise-wide asset visibility of condition and geographic data, enabling higher levels of CE leadership to project long-term built infrastructure requirements. CE can also supplement or validate requirements models for the development of Activity Management Plans (AMPs) that feed the Program Objective Memorandum (POM) process and assist in the development of projects for inclusion in the AF Comprehensive Asset Management Plan (AFCAMP). The Air Force can operationalize asset management principles in its real property built infrastructure portfolio based on refreshed data, which is essential in a highly resource-constrained environment.

## **OSD Requirements**

In addition to the urgency in managing CE's built infrastructure portfolio, the DoD mandated that all facilities and components in the Real Property Asset Database (RPAD) be inspected and rated using SMS or alternate data system which generates Facility Condition Index (FCI) by September 2017 to coincide with concurrent Financial Improvement and Audit Readiness (FIAR) requirements. Historically, the Air Force used different methodologies (ex: E-Comet) for assessing the condition of its assets, but with the 2013 DoD mandate, this approach has changed and become consistent across each of the military Services and DoD Agencies. This resulted in the ability to consistently plan, program, and budget work for facilities throughout the DoD. Further, it enabled the connection between asset management best practices and resulting benefits, such as reduced workloads and better-targeted project funding based on more refined future year requirements. There is an ongoing need to provide guidance (i.e.,





a standard assessment process) to the field to both achieve and sustain the mission of standardizing, collecting, analyzing, validating, and maintaining accurate horizontal and vertical infrastructure data to support resource allocation and operational decisions.

### Implementation Support

To deploy and optimize the use of SMS, comply with the DoD mandate, and ultimately operationalize asset management principles across the AF CE Enterprise, AFCEC/CO has developed this SMS Playbook to provide standardized, base-level guidance for sustaining facility inventories and conducting facility condition assessments. This Playbook incorporates input (e.g., successes, best practices, lessons learned) from Operations Engineering Elements at several bases. Sections on SMS-specific guidance (e.g., BUILDER Supplemental Guidance, etc.) describe roles and responsibilities, desired outcomes, data sources, references, prioritization criteria, and practical examples for leveraging the SMS outputs to inform requirements identification, development, and accomplishment.

### More than a Mandate

As a primary element of CE Transformation and CE's Asset Management philosophy, SMS represents a shift to a proactive versus reactive asset management strategy. Instead of keeping assets operational throughout their lifecycle by relying primarily on corrective repairs (after a system or component has failed due to significant loss of function), this strategy focuses on predicting and completing condition-based repairs. Anticipating and completing repairs can be accomplished prior to system failure with the support of SMS, resulting in higher performing assets at lower lifecycle costs. Base-level users are operating a powerful, user-friendly tool to support improved daily operations, and AFCEC, IMSC, and Headquarters AF/A4C will achieve enterprise-wide asset visibility to inform wide-scale resource allocation and strategic planning efforts. SMS establishes a knowledge base that makes built infrastructure data more complete, consistent, reliable, and accessible to AF CE personnel at all levels. All CE personnel must strive to fully operationalize asset management.

### Policy Adherence

Table 1 below highlights the primary policy drivers of the SMS process. For a more detailed explanation, see the DoD Memorandum, *Standardizing Facility Condition Assessments*, in the References section of this Playbook.

POLICY	APPLICABILITY
Executive Order (EO) 13327, <i>Federal Real Property Asset Management</i> (2004)	<ul style="list-style-type: none"><li>Requires all DoD Components to adopt a common process for conducting FCAs</li><li>Requires a Facility Condition Index (FCI) to be recorded for all real property assets. Per Real Property Inventory Reporting guidelines, Condition Index (CI) is a required data element for all real property assets and is defined as, "a general measure of the constructed asset's condition at a specific point in time. CI (also referred to as Facility Condition Index [FCI]), is calculated as the ratio of Repair (and Maintenance) Needs to Plant Replacement Value (PRV)."</li></ul>
National Defense Authorization Act (NDAA) 2010	<ul style="list-style-type: none"><li>Identified September 30, 2017 as date when DoD financial statements shall be audit ready (FCIs for every asset in the RPAD are a necessary metric for audit readiness). NOTE: This effort continues—some statements missed deadline.</li></ul>
DoD Memorandum, <i>Standardizing Facility Condition Assessments</i> (2013)	<ul style="list-style-type: none"><li>Requires all DoD Components to adopt a common process that incorporates the SMS modules developed by the USACE ERDC's CERL</li><li>Requires all DoD Components to properly record an FCI for each Real Property asset on their installations in their respective real property databases</li></ul>





POLICY	APPLICABILITY
AFI 32-1001, Chapter 4	<ul style="list-style-type: none"><li>Requires Operations Flights to collect, input, maintain, and update data utilizing AF-mandated Information Technology systems.</li><li>Requires data be maintained for Sustainment Management Systems (e.g. BUILDER, PAVER, future designated sustainment management products)</li></ul>

**Table 1 Applicable Policy**

## **Playbook Purpose**

The purpose of this Playbook is to provide standardized and centralized base-level guidance to conduct FCAs, record FCA data into the appropriate SMS or comparable system repository, and utilize the SMS outputs to analyze, plan, and forecast future work requirements for both in-house and contract accomplishment. By adhering to this guidance, base-level civil engineers will comply with EO 13327, NDAA 2010, DoD Memo: *Standardizing Facility Condition Assessments*, and AFI 32-1001. Further, following SMS guidance supports the foundation for operationalizing asset management for the CE Enterprise, which was first articulated in PAD 07-02 and again in PAD 12-03. Executing this transformation will enable the AF and DoD to optimize the service life of all facilities across its entire asset portfolio, thus enabling improved support and resiliency to achieve assigned missions even in the midst of always tightening Congressional budgets.

Note: SMS implementation and sustainment across the Air Force will be an on-going effort for years to come. Portions of the SMS Playbook are still under development as implementation and guidance for several of the systems (e.g., U SMS and RAILER) are fully defined. This "living" Playbook will incorporate updates as both SMS implementation and corresponding SMS modules mature, and it will serve as a prime repository for the latest information on implementation strategy and SMS/asset-specific best practices.

## **Operations Flight Labor Reporting for SMS Activities**

Craftsmen assigned to actual time accounting (ATA) cost centers (Workgroups) and whom perform asset condition assessments in conjunction with performing Preventive Maintenance (PM) or Corrective Maintenance (CM), will charge their assessment time to the respective PM/CM task. When performing condition assessments in support of R&O (e.g., as members of an installation Built Infrastructure Assessment team (BIAT)) function, but while NOT permanently assigned to them, craftsmen will charge their time to Indirect Work Task, [Administrative Task – Condition Assessment](#). More information is available on the [Direct Time or Indirect Time BPL Page](#).

## **Frequency of SMS Assessments**

Installations will sustain and accurately maintain the SMS database on a regular, recurring, and routine basis. Sub-AMP Managers and working groups (at AFCEC and base) will work within their units to accomplish this. Sustainment includes ensuring timely, accurate, and responsive Real Property Capitalization updates to SMS data as a standard process of work order and project closeouts and new equipment installations made during corrective maintenance activities.

SMS data should be updated each time maintenance or repair work has been completed that results in a changed condition which should receive an updated assessment. As craftsmen visit a facility, they should include time as part of their standard process to perform and update condition assessments.

After the original September 2017 deadline for completing initial assessments passed, OSD guidance further mandated that installations complete approximately 20% of their SMS re-assessment cycle per year (i.e., 20% of total square footage). As most installations assessed the majority of their facilities during one or two years initially, the "leveling out" process to achieve a coherent 20% per year requires thoughtful planning, precise execution, and persistent follow-up over a period of several years to achieve the leveling out of the assessment workload.

Sub-AMP Managers and working groups must ensure they maintain their assessment data current which means every facility is reassessed at least once every five years. More frequent assessments may be requested or advisable if needed to validate the probability of failure (PoF) calculation in support of projects competing for centralized funding.

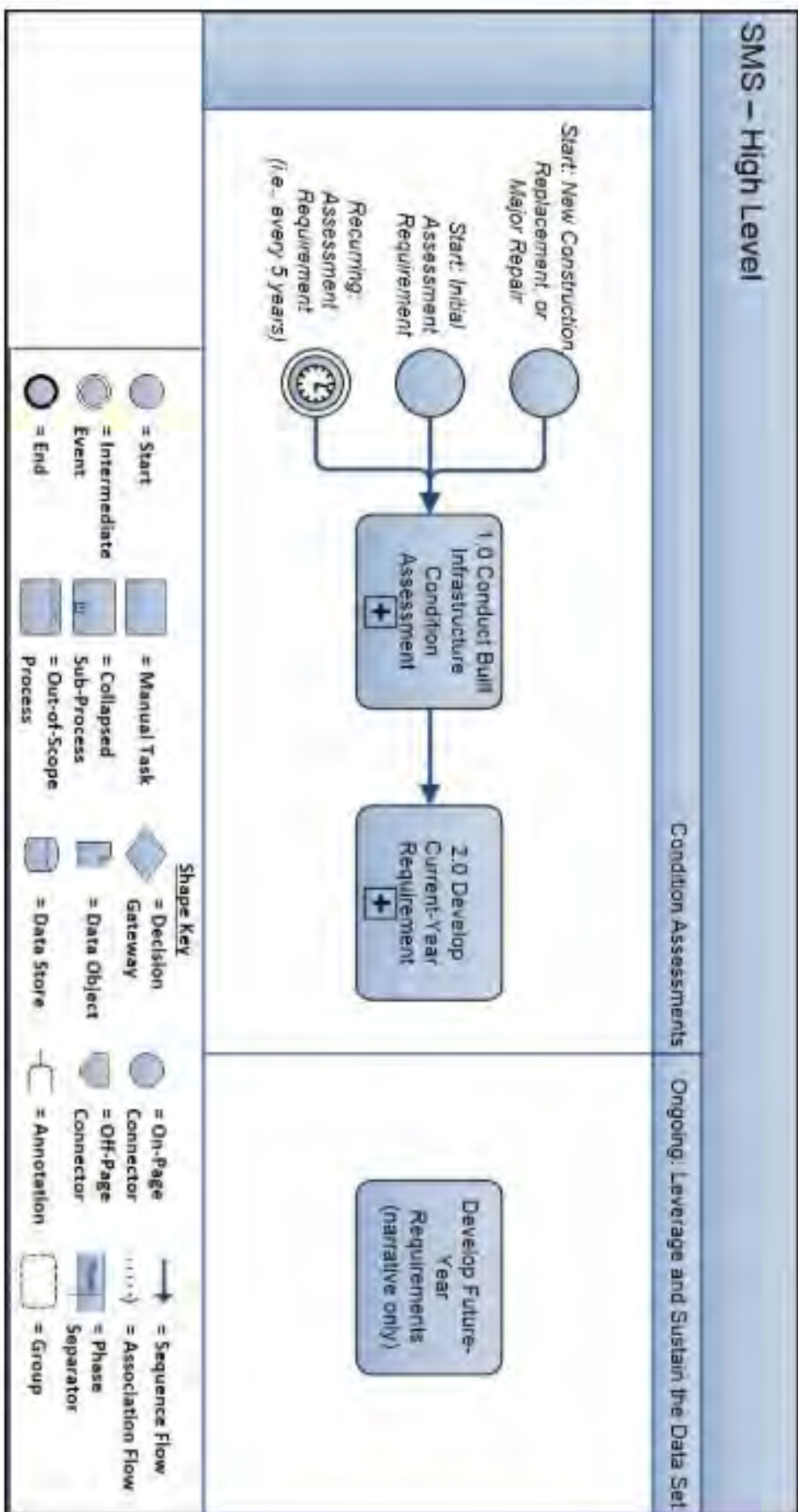
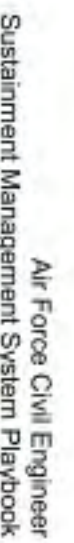


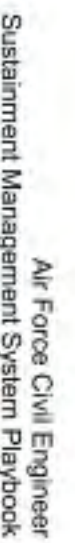
Figure 2 High Level SMS Process





The flowchart illustrates the R&D process, starting with 'R&D Strategy' and 'R&D Budget' leading to 'R&D Objectives'. The process flows through various stages: 'R&D Project Selection', 'R&D Project Initiation', 'R&D Project Planning', 'R&D Project Execution', 'R&D Project Monitoring', 'R&D Project Evaluation', and 'R&D Project Reporting'. Each stage has associated tasks and decision points. Red annotations highlight specific areas of interest, such as 'R&D Project Selection' and 'R&D Project Monitoring'.

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The flowchart illustrates the 'Flowchart of the Design Process' for a 'New Product Development' project. The process is structured as follows:

- Project Initiation (1.0)**: Starts with 'Project Initiation' (1.0) and 'Project Planning' (2.0).
- Project Execution (3.0)**: The main execution phase, divided into three sub-phases:
  - Design Development (3.1)**: Includes 'Design Development' (3.1.1), 'Manufacturing Development' (3.1.2), and 'Production' (3.1.3).
  - Manufacturing Development (3.2)**: Includes 'Manufacturing Development' (3.2.1), 'Manufacturing Development' (3.2.2), and 'Manufacturing Development' (3.2.3).
  - Production (3.3)**: Includes 'Production' (3.3.1), 'Production' (3.3.2), and 'Production' (3.3.3).
- Project Completion (4.0)**: The final phase, including 'Project Completion' (4.0.1), 'Project Completion' (4.0.2), and 'Project Completion' (4.0.3).

Red annotations highlight key milestones and decision points throughout the flow:

- Design Development (3.1.1)**: 'The Design Development phase is the most critical phase of the project. It is the phase where the design is finalized and the manufacturing process is developed. The Design Development phase is the phase where the design is finalized and the manufacturing process is developed. The Design Development phase is the phase where the design is finalized and the manufacturing process is developed.'
- Manufacturing Development (3.2.1)**: 'The Manufacturing Development phase is the phase where the manufacturing process is developed. The Manufacturing Development phase is the phase where the manufacturing process is developed. The Manufacturing Development phase is the phase where the manufacturing process is developed.'
- Production (3.3.1)**: 'The Production phase is the phase where the product is produced. The Production phase is the phase where the product is produced. The Production phase is the phase where the product is produced.'
- Project Completion (4.0.1)**: 'The Project Completion phase is the phase where the project is completed. The Project Completion phase is the phase where the project is completed. The Project Completion phase is the phase where the project is completed.'

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## **SMS – Implementation Plan: Overview**

### Purpose

### Key Milestones

### Roles and Responsibilities

## **Purpose**

Provide guidance and coordinate efforts related to implementing SMS across the Air Force CE enterprise. This implementation plan addresses those issues common to all SMS component systems. Individual implementation plans have been developed to address the specific tasks associated with implementing each of the specific SMS component systems (e.g., BUILDER, PAVER, and those in development such as FUELER). The overall purpose of this plan is to coordinate all SMS efforts to enable all AF personnel to operationalize asset management principles as an integral part of day-to-day business practices. These principles will result in current, accurate and consistent asset data for use across the Air Force portfolio at all levels from the individual shop to the Air Staff.

### **Data Sources and Data Exchanges**

- **Real Property Data:** Real property accountability information required for SMS modules will be sourced only from an authoritative system (e.g., GFEBS, DRRS-A, INFADs, DRRS-N, NexGen, and DRRS-AF). All real property information must be Real Property Information Model (RPIM) compliant.
- **Geospatial Data:** When GIS data is used to represent DoD real property assets, the SMS community/users will use GIS data from the component's designated authoritative source. In most cases, this should be the component Installation Geospatial Information & Services (IGIS) program of record. DoDI 4165.14 will clarify the requirement for GIS data representing the location and extent of real property assets, and references the applicable DoD standards for developing and maintaining such data. All geospatial data shall be compliant with the Spatial Data Standards for Facilities, Infrastructure, and Environment (SDSFIE) in its most current version.
- **Real Property Facility Quality Rate:** SMS modules will become the only authoritative data sources to populate the FCI into the real property inventory system's "Real Property Facility Quality Rate" data field.
- **System Reconciliations:** Before October of each year, DoD Components shall reconcile data between SMS modules and their real property database.

### **Condition Index Reporting**

SMS-computed FCI will be entered in the "Facility Physical Quality Rate" data field for all assets on an installation's real property database. This includes the CIs for facilities occupied/used by tenant organizations per DoDI 4165.70, "Real Property Management." CI data validation is to be annotated by the Real Property Office (RPO) who codes an "Asset Review Type Code" with "INSP" and entering the corresponding review date into the real property asset's record. No recorded inspection data shall be older than five years.

**Real Property Assets Not Supported by a SMS Tool:** Currently, there are SMS modules for Transportation Networks and Airfield Pavements; buildings; roofs; and railways. Modules for other built infrastructure (e.g., utilities and liquid fuel systems) are under various phases of investigation and development by CERL. For assets not presently supported with a SMS module, assessments shall be conducted with qualified personnel to determine existing physical deficiencies, estimate the cost of maintenance and repairs, and/or restore the assets to dependable operation using established industry cost guides to derive the FCI (e.g., Defense Logistics Agency [DLA]) use of the American Petroleum Institute's standard or assessing liquid fuels systems).





**Inspection and Data Update Frequency:** Installations will follow the user manual for each SMS tool to perform BIA. The SMS tools are designed to allow facility maintenance technicians the ability to update facility data as they are performing their normal preventive maintenance rounds or responding to service requests. However, the condition data of each asset shall undergo a comprehensive validation on no less than a five-year cycle at minimum (an average of 20% of installation assets should be re-assessed annually). It is recommended that condition validation coincides with the real property physical inventory requirement described in DoDI 4165.14, *Real Property Inventory and Forecasting*, Enclosure 3, para. 6.

## Key Milestones

Implementation of SMS across Air Force assets will be an on-going effort for years to come since the various SMS components are at differing levels of maturity and it will take some time to fully work through the process changes.

- Ongoing During Annual Cycle:
  - SMS Facilities data are adequately populated to enable generation of infrastructure requirements to support development of the FY XX Integrated Priority List (IPL), the FY XX – XX POM submission, the FY XX – XX Air Force Comprehensive Asset Management Plan (AFCAMP) and the FY XX – XX Air Force Activity Management Plan (AFAMP)
- In Progress, Ongoing:
  - Linear segmentation will be completed for horizontal systems in accordance with the guidance provided in the AF/A7C memo dated 1 Apr 13, Subject: *Air Force Linear Segmentation Implementation Guidance*.
  - Each asset in the Air Force built infrastructure portfolio (i.e., Facilities, Utilities, and Transportation Networks Airfield Pavements (TNAP)) will have a facility condition index properly recorded in the real property data base based on inspections conducted using the SMS standard process completed for all facilities and facility components as required by the Office of the Under Secretary of Defense, Acquisition, Technology and Logistics (OUSD(AT&L)) memo dated 10 Sep 13, Subject: *Standardizing Facility Condition Assessment*.
  - Sustaining, managing, and refining of SMS data will be fully incorporated into daily facility maintenance and repair activities. R&O normally accomplishes sustainment management and refining of SMS data; which includes feedback from the facility maintenance and repair activities (known as Actual Time Accounting (ATA) Workgroups) as issues are identified and/or warranted during the corrective or preventive maintenance visits. Review the AFCEC/COO series of Playbooks for further information.

## Roles and Responsibilities

ROLES	RESPONSIBILITIES
AF/A4C	<p>AF/A4C will provide policy and guidance and advocate for resources as appropriate. Additionally, AF/A4C will provide:</p> <ul style="list-style-type: none"><li>• Sustainment Management System program oversight</li><li>• Geographic Information System (GIS) program oversight</li><li>• Real Property program oversight</li><li>• Integrated information technology solutions</li></ul>



ROLES	RESPONSIBILITIES
AFCEC	<p>AFCEC will ensure that the standard operating procedures contained in this Playbook are compliant with procedures put forth by OSD in addition to the following:</p> <ul style="list-style-type: none"> <li>• Review all proposed changes to the Playbook</li> <li>• Propose revisions to existing AFIs to incorporate SMS</li> <li>• Propose substantive Playbook updates affecting resourcing to the CE Corporate Structure for approval</li> <li>• Provide GIS expertise</li> <li>• Provide Real Property expertise</li> <li>• Track status of program implementation within AFIMSC</li> <li>• Advocate for centralized contract funding</li> <li>• Review and submit proposed changes to business rules and Playbook guidance and directives</li> <li>• Manage centralized contracts as needed</li> <li>• Assist the bases in executing BIA evaluations of real property assets and input data into SMS</li> <li>• Track status of program implementation &amp; compliance with this implementation plan</li> <li>• Manage the centralized pavement evaluation program including programming and budgeting for pavement evaluations and pavement condition index (PCI) surveys</li> <li>• Incorporate language in MILCON project contracts to provide BIA information in the appropriate SMS format at the time of turnover</li> <li>• Obtain, where possible, enterprise-wide authority to operate (ATO) for IT systems associated with SMS</li> </ul>
Base Civil Engineer Organizations	<ul style="list-style-type: none"> <li>• Populate and maintain, with support and assistance of AFCEC, SMS with complete, current, and accurate asset data needed to generate sustainment, maintenance and repair requirements for the installation's built infrastructure</li> <li>• Incorporate ongoing built infrastructure asset data collection, validation, and management into day-to-day operations and maintenance activities</li> <li>• Assist AFCEC, MAJCOM, and IMSC with verifying/addressing SMS data issues</li> <li>• Use requirements identified by SMS to develop and program projects per AFCEC-provided business rules based on gap analysis and risk assessment efforts</li> <li>• Ensure vendors accomplishing maintenance/repair work by contract provide the needed updates to asset inventory/condition, including equipment/components, in the appropriate SMS format</li> <li>• Ensure that Base Maintenance Contracts have the necessary provision to perform BIA and maintain current and accurate data in the SMS databases</li> </ul>

**Table 2 SMS Roles and Responsibilities**





## **SMS – High Level**

### [Introduction](#)

### [Measures of Success](#)

### [Roles and Responsibilities](#)

### [Narrative](#)

## **Introduction**

This narrative describes the standardized and recurring process of conducting Built Infrastructure Assessments, recording assessment data into a SMS tool or comparable information repository, and utilizing the system outputs to analyze, plan, and forecast future work requirements at the base and for Air Force Real Property Assets. The corresponding process map depicts an ongoing process. This process provides the framework for installations to operationalize asset management principles and comply with the DoD Facility Condition Assessment mandate. It also provides a framework to ensure a sustained data set beyond the initial round of assessments.

**Note 1:** This process assumes that installations have a current and accurate inventory of each of their real property assets, and the base is currently addressing the DoD mandate requiring all real property assets be inventoried and assessed. As the Air Force implements the full suite of SMS, the SMS-derived future work requirements and resultant FCIs eventually will become the authoritative source in determining deferred maintenance and repair requirements. Updates to real property records are made, as needed, while performing assessments.

**Note 2:** The CE asset class for Built Infrastructure includes airfields, buildings, building improvements, structures, utility systems, linear structures (e.g., roads, sidewalks, and railways), and Real Property Installed Equipment (i.e., equipment attached to and made part of buildings and structures). References to Built Infrastructure Assessments (BIA) include the three categories of Facilities, Utilities, and TNAP:

- Includes vertical, horizontal, and Real Property Installed Equipment (RPIE)
- Includes buildings, structures, utilities systems, improvements, and appurtenances thereto
- Building: A roofed and floored facility enclosed by exterior walls and consisting of one or more levels that is suitable for single or multiple functions
- Structure: A real property facility that is classified as other than a building, linear asset, or land
- Linear Structure: Infrastructure whose function requires that it traverse land (such as roads, rail, pipeline, utilities, fences, or pavement)
- RPIE: Government-owned or leased equipment that is permanently attached to and made part of buildings and structures (such as heating systems) but not movable equipment (such as plant equipment)
- AMPs, Facilities, Utilities, and Transportation Networks and Airfield Pavements (TNAP).

## **Measures of Success**

AFCEC/CO defined the measures below as indicators of progress towards operationalizing asset management principles, meeting the DoD mandate, and achieving overall data integrity across the SMSs. AFCEC/CO will conduct quarterly base data pulls to monitor and evaluate these measures.

HQ AFIMSC may from time to time establish financial incentives to drive performance towards meeting the established measures. These measures will be publicized separately from this playbook.



MEASURES	CALCULATION	TARGET	BENEFIT
<b>Inventory / assessment completion</b> (as a measure of the initial assessment required to meet the DoD mandate); all assessments are considered "current" if performed within the past five years	<p><b>Prerequisite:</b> A facility is complete when all seven of the applicable key building systems are inventoried/assessed and recorded. If an applicable system is not assessed, then the facility is marked incomplete.</p> <p>If a facility does not have all seven key building systems, Data managers will remove the absent system(s) record from the facility and make corresponding comments within the SMS.</p> <p><b>Facilities:</b> % of the installation's total square footage (as opposed to # of buildings)</p> <p><b>Utilities:</b> % of total unit of measure (e.g., linear feet)</p> <p><b>TNAP:</b> % of total unit of measure (e.g., linear feet, square yards for pavement)</p>	100% complete	Operationalizes asset management principles Enables informed, data-driven decision-making Enables forecasting of work requirements with proactive methodology Enables status tracking and advanced analyses of operating and performance problems Achieves compliance with DoD mandate to standardize Facility Condition Assessments
<b>Data integrity (quality/accuracy)</b>	<p>Percent of quality/accurate data collected as measured through QC reports/data checks from SMS, Sub-AMP Manager validation, and field surveys.</p> <p><b>Quality/Accuracy is comprised of:</b></p> <ol style="list-style-type: none"> <li>Current within five years</li> <li>Validity of ratings (percent of ratings within a given set of parameters)               <ol style="list-style-type: none"> <li>QC5 Report (inventoried but not assessed)</li> <li>Major leaps or drops in CI from year to year</li> <li>MDI-based spot checks</li> <li>Future measures to be developed</li> </ol> </li> <li>Correlation between SMS data and RPAD data (as an indicator of alignment)               <ol style="list-style-type: none"> <li>Percent assets recorded in RPAD vs SMS</li> <li>Percent of assets that match CIs</li> </ol> </li> </ol>	100% current	Operationalizes asset management principles Enables informed, data-driven decision-making Enables forecasting of work requirements with proactive methodology Enables status tracking and advanced analyses of operating and performance problems Identifies data manipulation and other anomalies Ensures financial audit readiness

Table 3 Measures of Success





## Roles and Responsibilities

The roles and responsibilities defined here apply to all processes in this Playbook. More specific descriptions are provided in the respective SMS process narratives.

ROLES	RESPONSIBILITIES
<b>AMP Manager</b>	<p>Each installation will provide a primary and alternate SMS Point of Contact (POC) to work with AFCEC SMS POCs. Installation POCs must be from the Operations and Engineering Flights.</p> <ul style="list-style-type: none"><li>• Determines number of data managers, assessors, and read-only users at their installation</li><li>• Ensures accuracy of SMS data inputs for the installation</li><li>• Responsible for an asset lifecycle management portfolio containing all planning design, construction, operation, maintenance, repair, sustainment, restoration, modernization (SRM), and demolition of assigned AMP assets.</li></ul> <p><b>Note:</b> These responsibilities correspond to the AMP Manager role and responsibilities delineated in AFI 32-1001, Chapter 4; AMP managers must be assigned from the Operations or Engineering Flights.</p>
<b>Sub-AMP Manager</b>	<ul style="list-style-type: none"><li>• Serves as first line of defense in ensuring data quality for each SMS data set</li><li>• Manages the Built Infrastructure Assessment Team (BIAT), ensuring data inputs are accurate, consistent, and understandable</li><li>• Performs quality assurance after the BIAT's quality control efforts</li><li>• Responsible for the asset lifecycle management portfolio containing all systems consistent with their assigned Sub-AMP area</li><li>• Develops the overall operation, maintenance, repair, compliance, sustainment, and recapitalization of Sub-AMP portfolio assets</li></ul> <p><b>Note:</b> These responsibilities correspond to the Sub-AMP Manager role and responsibilities delineated in AFI 32-1001, Chapter 4; Sub-AMP managers must be assigned from the Operations or Engineering Flights.</p>
<b>Installation Built Infrastructure Assessment Team (BIAT)</b>	<p>Conducts condition assessments on recurring basis to maintain data currency</p> <p>Initiates updating of real property inventory, as required</p> <p>Updates asset work history, inputs data into the SMS, and performs initial quality control prior to uploading to the SMS</p>

**Table 4 SMS AMP and Sub-AMP Manager Roles and Responsibilities**

## Narrative

*This section applies to inventory and assessment data entry from:*

- *New construction, replacement, or major repair efforts*
- *Initial Assessment Requirement*
- *Established recurring requirement, such as a minimum of 20% per year*

### Process 1.0 – Conduct Built Infrastructure Assessment

This process provides guidance and instruction for base-level civil engineers to conduct Built Infrastructure Assessments, record assessment data into the appropriate SMS, and, as required, update the real property inventory (RPI). The following triggers initiate this process:

- **Facility changes, to include New Construction, Replacement, or Major Repair yielding a change in condition**
- **Initial assessment to comply with the September 2013 DoD BUILDER mandate to**



### ***"Standardize Facility Condition Assessments"***

- ***Established recurring requirement***, as determined by each base to operationalize asset management and maintain compliance (i.e., meet the DoD mandate)

The Built Infrastructure Assessment Team (BIAT) coordinates assessment logistics with the base Asset Manager and conducts the recurring assessments. After conducting an assessment, the BIAT performs quality control (QC) on the assessment data before uploading it into the appropriate SMS tool or comparable information repository. If required, the BIAT coordinates completion of the Department of Defense (DD) Form 1354, *Transfer and Acceptance of DoD Real Property*, or Air Force Form 123, *Request for Changed Use of Real Property* with the base Real Property Office (RPO) to initiate the update of facility inventory data in the Accountable Property System of Record (APSR), either ACES-RP or NexGen IT. For example, updates to facility inventory data would be required following capital improvement, acquisition, or improvement to Real Property that increases an asset or RPIE unit of measure, as well as following major maintenance, repairs, and renovations. Update to the APSR may be needed if previous acquisition or improvement work was never updated for whatever reason.

*Proceed to Process 2.0 Analyze and Plan Work*

### ***Process 2.0 – Develop Current-Year Requirements***

As the BIAT uploads assessment data into the SMS, the SMS generates various reports to document building, utilities, or pavements condition indices (CI), work items, raw score lists, and consequence analysis models. The Sub-AMP Manager conducts a quality and validation check of the SMS outputs and work with the AMP Manager to coalesce those requirements into actionable service requests or into programmed projects that meet the Work Requirement Review Board (WRRB) and/or Facilities Utilization Board (FUB). The AMP Manager presents the prioritized list of requirements to the WRRB and the WRRB determines approval on execution method for work and assigns execution responsibility (i.e., Operations or Engineering). In-house projects are executed via the Work Management Playbook, while Engineering projects are programmed for year of execution and sent to the FUB for approval and prioritization. When a project is approved and funded, it is executed via the Project Execution Playbook. Approved requirements that are not funded remain in the system as "deferred" requirements and are used to inform the Forecast process. Any requirements deemed invalid will be removed from the system.

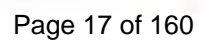
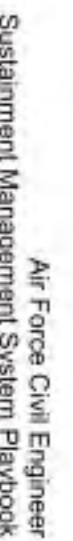
*Proceed to Work Management Playbook, Process 3.0 Plan Work. Step 3.11 Review Draft Facility Project*

### ***Process 3.0 – Forecast Out-Year Requirements***

The Forecast process outlines how the Air Force will forecast future budget requirements, leveraging long-term projections enabled by SMSs. Each SMS will also provide a consequence analysis of investment decisions, which will consider impacts of not funding or deferring funding of requirements. These may include impact to remaining service life and total cost of ownership of the assets, to probability of failure, to consequence of failure, and any resulting mission impacts. Forecasting provides visibility of needed work at the right time BEFORE costly and unrecoverable deterioration occurs. In addition, forecasting provides visibility into the scale of future requirements, which is integral to the process of developing future year budgets and procurement strategies.

*End*







## SMS – 1.0 Conduct Built Infrastructure Assessment

### Introduction

### Roles and Responsibilities

### Narrative

#### **Introduction**

The Built Infrastructure CE asset class includes Facilities, Utilities, TNAP (e.g., roads, bridges, sidewalks, and railways), and Real Property Installed Equipment (i.e., equipment attached to and made part of buildings and structures). This process standardizes the collection and assessment of built infrastructure data, which informs a variety of asset management and investment planning work products (i.e., Activity Management Plans). Failure to follow instructions provided within this guidance may prevent requirements from receiving prioritization and/or funding consideration within the Air Force Comprehensive Asset Management Plan (AFCAMP) development and Integrated Priority List (IPL) execution.

Prior to conducting assessments, base AMP Managers should prioritize assets according to their value to the mission and current condition. The Mission Dependency Index (MDI) reflects each asset's value to the mission, while the condition may need to be estimated at the beginning of this effort. From there, AMP Managers identify, train, and equip a Built Infrastructure Assessment Team (BIAT), staffed either internally or by contract to perform the inventory and assessment. AFCEC will centrally manage assessments of bridges, airfield pavements, rails, and dams, in which case the BIAT will be formed by AFCEC Teams/AFCEC Consultants. The BIAT will be comprised of different roles and experts depending on the asset(s) in need of assessment. The BIAT coordinates their approach with the applicable base Sub-AMP Managers and performs the assessments, collecting and cleaning data prior to uploading to the applicable SMS. If at any time, a new asset is identified (e.g., found-on-base or in need of a "change in use" designation), the Sub-AMP Manager provides the Real Property Accountable Officer (RPAO) the Real Property data from the assessments, as doing so will directly affect the base's ability to qualify for sustainment funding and leverage assessment data to make informed decisions in later processes.

#### **Roles and Responsibilities**

Each of the following roles applies to the installation:

ROLES	RESPONSIBILITIES
<b>AMP Manager</b>	<ul style="list-style-type: none"><li>• Prioritizes the built infrastructure to be assessed based on data provided by the Base Sub-AMP Manager</li><li>• Ensures on-base BIATs are adequately resourced and trained to perform assessments</li><li>• Coordinates support for centrally-managed assessments</li></ul>
<b>BIAT</b>	<ul style="list-style-type: none"><li>• Coordinates with the base AMP Manager and various Facility Managers to arrange logistics and acquire pertinent facility data</li><li>• Conducts inventory and the initial assessment</li><li>• Updates work history as available</li><li>• Performs initial calibration quality control of the inventory and assessment data</li><li>• Records data in the SMS</li><li>• Performs a gap analysis of the SMS data and rectifies any issues following data entry. BIATs may be in-house or contracted personnel/consultants.</li><li>• Pavements, bridges, rail networks, and dams assessments are centrally managed; however, local assessment still may be required to comply with guidance.</li></ul>

Table 5 Installation Roles and Responsibilities

#### **Narrative**

*This section applies to inventory and assessment data entry from:*





- New construction, replacement, or major repair efforts
- Initial Assessment Requirement
- Established recurring requirement, such as a minimum of 20% per year

**Step 1.1 – Generate prioritized list of built infrastructure to assess**

**Role: AMP Manager**

The AMP Manager pulls reports from the applicable SMS component, NexGen IT (Tririga), or the Automated Civil Engineering System (ACES) to identify the assets on the installation that are in greatest need for investment. The AMP Manager creates separate, prioritized assessment lists for each type of built infrastructure based on Mission Dependency Index (MDI) or Tactical MDI, Condition Index (CI), work order history, leadership feedback (e.g., facilities on the flight-line may be a high priority), mission changes, project priorities, etc. Refer to the SMS-specific supplements for additional guidance regarding leveraging existing, canned data reports to aid in the prioritization of built infrastructure types (e.g., Final 9, Facility System Quick View for BUILDER). The output of this process is a prioritized assessment list. In accordance with the Activity Management Plan (AMP), it is recommended that AMP Managers provide asset visibility across the Future Years Defense Program (FYDP) +2.

**Tips/Reminders:**

- To support assessment training, the AMP Manager may suggest the BIAT assess a Facility, perhaps one with a low MDI rating (i.e., a library), to test the assessment process and allow opportunities for practice, feedback, and baselining

*Proceed to Step 1.2.*

**Step 1.2 – Form assessment team(s)**

**Role: AMP Manager**

After prioritizing the built infrastructure needing assessment, and identifying the resources required to conduct the assessment, the installation AMP Manager (or designated rep) will form the BIAT. If the assets being assessed are centrally managed, the BIAT will be formed by AFCEC. In all cases, the teams will reflect the composition of the installation (military, contractor, civilian, mix) and should be selected according to a required skill level (five level or better), craft, and experience (minimum of two years). As needed, the AMP Manager or designated rep will contact the AFCEC Reachback Center (850-283-6995) with requests for support needed to perform the assessments in-house. At the end of this process, the AMP Manager will have identified, trained, and equipped a team necessary to conduct the assessments

**Tips/Reminders:**

- Specific guidance related to identifying, training, and equipping assessment teams is located in the supplemental guidance section of this playbook (e.g., BIATs for pavements, bridges, rails, and dams are formed at the AFCEC level, while BIATs for facilities and utilities are formed at the installation level)
- Refer to the applicable Asset Visibility Workspaces within CE DASH for further information.

*Proceed to Step 1.3.*

**Step 1.3 – Pull inventory and assessment data**

**Role: BIAT**

The BIAT pulls all current data to gather knowledge of the asset prior to conducting the assessments. For initial assessments, the team pulls as-built drawings (from electronic or flat files), GIS information (GeoBase), built infrastructure projects (Automated Civil Engineer System [ACES] – Project Management [PM]), 7115 inventory report (ACES – Real Property [RP]), or work performed on or scheduled for the asset (NexGen IT). For recurring assessments, the team uses the SMS to gather information generated since the last assessment.

**Tips/Reminders:**

- Standard Assessment Preparation Checklists have been developed and are organized according to



asset type and discipline

Proceed to Step 1.4.

#### **Step 1.4 – Coordinate with Asset Manager**

**Role: BIAT**

The BIAT, or in the case of pavement assessments, works with the asset manager to discuss the current condition of facilities to be assessed, time of last maintenance, and any special considerations, such as security requirements, permits requirements, safety issues, photographic restrictions, entry authorizations, or flight line driver's licenses. The BIAT also provides an agreed upon schedule of assessments and locations prior to arrival. Base-based (i.e., non-contracted) BIATs will likely already have access to necessary equipment. After reviewing the detailed information of the built infrastructure assessment needs and coordinating with the asset manager, the BIAT adds any missing inventory to the execution schedule to ensure full coverage of assessment needs.

##### **Tips/Reminders:**

- Asset managers may include Facility Managers, Airfield Manager, Operations Superintendent, Operations Engineering personnel, etc.
- A standard questionnaire may be used to retrieve required information from the asset manager

If 'vertical facilities,' proceed to Step 1.5.

If 'linear facilities,' proceed to Out-of-Scope Process, Migrate Data to GIS 4.0.2 Gold Standard.

#### **Step 1.5 – Perform Facility Condition Assessment**

**Role: BIAT**

The BIAT conducts a physical assessment of the horizontal assets and records data using standard assessment worksheets and data capture tools/software. See the SMS-specific guidance sections of this Playbook for specific assessment instructions and recommendations for data capture support.

If 'RP updates necessary,' proceed to Process 1.12, Draft AF Form 123 or DD Form 1354 and submit to RPAO. If 'RP updates not necessary,' proceed to Step 1.13.

#### **Out-of-Scope Process – Migrate Data to GIS 4.0.2 Gold Standard**

**Role: BIAT**

Data needs migrated to the most current Spatial Data Standard for Facilities, Infrastructure and Environment (SDSFIE) version, which is currently SDSFIE 4.0.2 Gold, prior to conducting assessments and segmentation ESRI conversion tools, crosswalk software, and implementation videos are accessible on the CE Portal. Refer to the Utilities Guidance section of this Playbook for more information.

If 'TNAP,' proceed to Step 1.6 Perform TNAP Facility Mapping.

If 'Utilities,' proceed to Step 1.9 Perform Utilities Facility Mapping.

#### **Process 1.6 – Perform TNAP Facility Mapping**

**Role: BIAT**

Once the RPAO, GeoBase Office, Pavement Engineer, and Airfield Manager have accumulated relevant data from their respective informational sources, the representatives from these offices meet to form the Facility Map Development Team. The Facility Map Development Team conducts a facility-by-facility review of the pavements facility map created by the GeoBase Office. The team updates the map as required to ensure accountability for 100% of the pavements assets in the RP database. The team assigns unassigned assets to a new or existing facility and creates separate pavement facility maps for the airfield, and roads & parking networks. Linear assets are assigned according to usage, or CATCODE. The Real Property Unique Identifier (RPUID) serves as the linkage between RP and GeoBase records, as opposed to facility identification (FACID).

Proceed to Process 1.7, Implement TNAP Segmentation Rules.

#### **Process 1.7 – Implement TNAP Segmentation Rules**





**Role: BIAT**

This process describes the method of assigning segments to a facility number on the GeoBase map and in the pavement management system. In order to ensure the entire pavement inventory is mapped consistently and accurately, pavement evaluation teams and contractors use this process when conducting a structural pavement evaluation or PCI survey. For pavements, bridges, and, in some cases, rails, this process is typically performed by centrally-managed AFCEC teams or consultants. Processes for other non-pavement assets are under development.

*Proceed to Step 1.8.*

**Step 1.8 – Perform TNAP Condition Assessment**

**Role: BIAT**

The AFCEC Team/AFCEC consultant imports a shape file of the pavement facility map provided by the GeoBase Office into PAVER and makes branch and section assignments on the map from within PAVER. Next, the AFCEC Team/consultant generates field inspection datasheets and conducts the field evaluation. Once the evaluation is complete, the AFCEC Team/consultant updates the PAVER database with the field data, including any updated branch and section information, and incorporates any changes to the pavement facility map using either AutoCAD or ESRI software.

*If 'RP updates necessary,' proceed to Process 1.12, Draft AF Form 123 or DD Form 1354 and submit to RPAO. If 'RP updates not necessary,' proceed to Step 1.13.*

**Step 1.9 – Perform Utilities Facility Mapping**

**Role: BIAT**

Once team has accumulated relevant data from their respective informational sources, they conduct a facility-by-facility review of the utilities facility map created by the GeoBase Office. The team updates the map as required to ensure 100% accountability of the linear utilities assets in the real property database. Any unassigned linear assets will be assigned to either a new or an existing facility. Linear assets are assigned according to usage, or CATCODE, the RPUID serves as the linkage between RP and GeoBase records, as opposed to FACID.

*Proceed to Process 1.10, Implement Utilities Segmentation Rules.*

**Process 1.10 – Implement Utilities Segmentation Rules**

**Role: N/A**

After identifying and mapping utility systems, the BIAT assigns segments to utility assets on the GeoBase map.

*Proceed to Step 1.11.*

**Step 1.11 – Perform Utilities Condition Assessment**

**Role: BIAT**

The BIAT collects data by physical examination of assets and, if applicable, determine what discrepancies exist in the existing inventory or assessment data. The GeoBase Office incorporates any changes found by the BIAT on the facility map.

**Tips/Reminders:**

- CE Operations provides support to the BIAT in identifying linear segments and essential non-linear components associated with linear assets.

*If 'RP updates necessary,' proceed to Process 1.12, Draft AF Form 123 or DD Form 1354 and submit to RPAO. If 'RP updates not necessary,' proceed to Step 1.13.*

**Step 1.12 Draft AF Form 123 or DD Form 1354 and submit to RPAO**

**Role: BIAT/Sub-AMP Manager**

If the BIAT identifies a change in use (i.e., change in CATCODE) for a built infrastructure asset, the Sub-AMP Manager completes an Air Force Form 123, *Request for Changed Use of Real Property* and submits to the RPAO to initiate an inspection to confirm that observation. Refer to the Appendix Form Guide of the



Real Estate Transactions, Accountability, and Inventory Playbook for instructions for completing the AF Form 123.

A Department of Defense (DD) Form 1354, *Transfer and Acceptance of DoD Real Property* form is required to document an inventory adjustment (e.g., Found on Site) in the RP inventory. The Sub-AMP Manager drafts the DD Form 1354 and submits to the Operations Flight Commander for review, who reviews and submits to the RPAO to initiate an inspection to confirm the observation. The DD Form 1354 is then finalized through a collaborative review process until it is acceptable to make changes within the RPI.

**Note:** Roles and responsibilities for completing the various types of the DD Form 1354 are found in Chapter 3 of the Unified Facilities Criteria (UFC) 1-300-08, the Criteria for Transfer and Acceptance of DoD Real Property, whereas instructions for completing the form are found in Chapter 4.

*Proceed to RETAI Playbook, Process 11.1 Prepare for Inventory, Step 11.1.3.*

### **Real Estate Transactions, Accountability, and Inventory Playbook Process 11.1 Prepare for Inventory, Step 11.1.3**

This process illustrates the Installation Real Property Accountable Officer (RPAO) preparing the inventory requirements for a given year. The Installation RPAO first ensures that all updates to ACES or NexGen IT have taken place before retrieving a five-year inventory plan (three years for cultural/historical sites). The Installation RPAO reviews the plan and identifies the Real Property (RP) that requires an inspection given a prescribed timeframe. The Installation RPAO identifies who conducts the actual inspection and coordinates with the Civil Engineer (CE) partners, as applicable. The outcome of this process is a scheduled inspection visit with a designated inspector.

*Proceed to Step 1.14.*

#### **Step 1.13 – Perform QC of Data**

**Role:** BIAT

The BIAT performs a quality check of the samples according to the process and confidence levels recommended in the corresponding SMS-specific supplement. If using a remote data collection process (e.g., BRED) this calculation can be determined by running a quality control report (Refer to SMS-specific supplement for additional guidance).

Otherwise, additional, successive collection and analysis processes may be required to reach the level of confidence needed to produce consistent quality in the data. The BIAT corrects any inaccuracies in the data prior to uploading into the SMS.

*Proceed to Step 1.14.*

#### **Step 1.14 – Upload data to SMS (or current system of record)**

**Role:** BIAT

*Entry from Major Facility Changes (e.g., New Construction, Replacement, or Major Repair)*

**For initial or recurring assessments,** the BIAT inputs data into the SMS or current system, either through remote or manual uploads. The Sub-AMP Manager conducts quality checks of the data uploaded to the SMS. Refer to the SMS-specific supplement for specific instructions regarding uploading data and performing quality checks.

**For New Construction, Major Repair, or Preventive Maintenance,** the Sub-AMP Manager uploads inventory information into the appropriate SMS using the as-built drawings, closeout paperwork, and information derived from the project or other available sources.

#### **Tips/Reminders:**

- BIAT members should input the data given their familiarity of the assets and knowledge of system. However, installations may perform data entry in a manner more suitable to the makeup of their team (e.g., use engineering assistants [EA] to support data entry)
- Available sources include Interim/Final DD Form 1354 or AF Form 3.32, and Shop records.





- For replacement by contract, the 1354 is required; if performed in-house, the need for a 1354 will depend on the nature of the work performed. A field visit may be necessary to confirm the inventory data. The Data Manager updates the condition assessment data as necessary.

Figure 5 SMS 1.9 Perform Utilities Facility Mapping





## **SMS – 1.6 Perform TNAP Facility Mapping**

### [Introduction](#)

### [Roles and Responsibilities](#)

### [Narrative](#)

### [TNAP Facility Designation Process and Standards](#)

### [Railway Facility Designation Process and Standards](#)

### [Bridge Facility Designation Process and Standards](#)

### [Signage Facility Designation Process and Standards](#)

## **Introduction**

The objective of the TNAP infrastructure segmentation effort is to ensure we have an accurate accounting of the quantity, location, use, and condition of all TNAP assets. This objective is accomplished in three phases:

1. Creation of a TNAP facility map showing the location of each airfield, road, and parking pavement facility in the RP record. The creation of a TNAP facility map must be a joint effort between the RPO, GeoBase Office, Transportation AMP Manager, Pavement Engineer/sub-AMP Manager, and Airfield Manager. The effort requires relevant data from each of these respective sources. In many cases, available information will be ambiguous or inadequate, which will require the team to make decisions that only the base personnel can make.
2. The second phase is segmentation of these TNAP facilities into branches and sections. This phase is accomplished by the AFCEC Team/AFCEC Consultants for airfield and road and parking networks.
3. The third phase is creation and processing of 1354s to document any changes or updates to the RP record. The base completes this phase of the process by using data generated by the AFCEC Team/AFCEC Consultants.

**Note:** The RPO has final authority to change the facility numbers.

To initiate the mapping process, the GeoBase Office will create a map for all paved and unpaved airfield surfaces, and one for all paved and unpaved road, parking, and driveway surfaces. The RPO will provide a listing of all TNAP facilities in the RP record from ACES-RP or NexGen IT. Other team members will provide additional information, including past pavement evaluation reports or other historical records such as construction drawings. The Facility Map Development Team will meet and conduct a facility-by-facility review of the TNAP assets in the RP record, assigning those facilities to their specific areas on the draft map created by the GeoBase Office. The team updates the map as required to ensure 100% of the TNAP assets in the RP database are accounted for.

When the team encounters unassigned assets or must make changes to the TNAP facilities documented in the RP record, it will follow the recommended standards outlined in this Playbook. If one does not already exist, each TNAP facility will be assigned a FACID by the base RPO. Air Force RP rules require that each of these facilities may only have one CATCODE associated with it. Once a new FACID is entered into ACES or NexGen IT, it will ultimately be assigned a RPUID by OSD. The RPUID serves as the linkage between RP records, PAVER, and GeoBase GIS records.

**Note:** This Process serves as the Standard Operating Procedure (SOP) for Task 1: *Complete Pavement Facility Maps*, in the memorandum, *Air Force Linear Segmentation Implementation Guidance*, dated 1 April 2013.

## **Roles and Responsibilities**





TNAP mapping is a collaboration between AFCEC and the installation with the roles and responsibilities defined in Table 6 below.

ROLES	RESPONSIBILITIES
<b>AFCEC/COAP</b>	<ul style="list-style-type: none"> <li>Provides support to the base facility mapping teams.</li> <li>Available as requested by the base for teleconferences or DCSs to assist the base in the facility mapping effort.</li> </ul>
<b>Facility Map Development Team</b>	<ul style="list-style-type: none"> <li>Assigned by the Base Civil Engineer (BCE)</li> <li>Consists of participants from RPO, GeoBase Office, Base POC and/or Operations Engineer/TNAP AMP Manager, and Airfield Manager. The Airfield Manager participates on an as-needed basis, specifically when airfield assets are involved.</li> </ul> <p><b>Note:</b> Ideally, the team described above is led by the RPO since it is ultimately responsible for the RP records. However, manpower or other considerations may dictate that the BCE appoint another person to lead the effort, with the understanding that all offices listed above will need to participate in the activity.</p>

Table 6 TNAP Mapping Roles and Responsibilities

## Narrative

Entry from Process 1.0, Step 1.4.

### Step 1.6.1 – Review facility assignments

#### Role: Facility Map Development Team

The team will go down the tabular list of TNAP facilities sequentially, identifying the geospatial extents of each on the map based on the description of the facility in the RP record. For instance, if the description of the facility describes a transient apron, the team will mark the current area of the transient apron on the map. The team may discover a discrepancy between the area described in the RP record and the area identified on the map. In these cases, the team will look at other sources such as the old RP record cards (if they still exist), past pavement evaluation reports, previous imagery, or any other sources available to verify the geospatial extents shown on the map are correct.

When determining the authoritative source of information, explicit descriptions in the RP record, as-built drawings, or documented surveys will take precedence. If these are not available, past pavement evaluations or old master plan tabs (e.g., E7) are the next best source of information. In other words, use the most authoritative, time-relevant document available.

There may be cases where the team does not have enough information to clearly define where a facility is located on the map. In these cases, the team will follow the standards outlined in this Playbook for designating TNAP facilities and use its best judgment to determine the geospatial extents of the facilities on the map. The team makes recommendations, but the RPO, as the process owner, makes the final decision in the event of competing recommendations.

Below are the specific tasks, by role, to be completed during the review of facility assignments:

- **RPO:** Recommends facility assignments based on a complete list of TNAP facility numbers and descriptions generated by ACES-RP, NexGen IT, historical RP cards, and any other relevant records.
- **GeoBase Office:** Provides a draft TNAP facility map, imagery (if the TNAP facility map does not already have imagery in the background), and old master plan tabs (especially E7 Tab for airfields).
- **Base POC and/or Operations Engineer/TNAP AMP Manager:** Provides branch and section



maps, as well as construction history from current pavement evaluation reports and other reports that may help provide historical context for the team's decisions on the geospatial extents of each facility

- **Airfield Manager:** Provides recommendations to the team regarding geospatial extents of each airfield pavement facility and information on current use of airfield facilities

*Proceed to Step 1.6.2.*

#### **Step 1.6.2 – Apply TNAP facility numbers to map**

**Role: Facility Map Development Team**

The GeoBase Office representative makes any required adjustments to the map polygons and enters the correct TNAP facility numbers and RPUIDs into the appropriate feature classes (Note: this was the Section feature class in Spatial Data Standards for Facilities, Infrastructure, and Environment (SDSFIE) 4.0.2 Gold and will be Linear\_Structure\_A in SDSFIE 3.1). Advice and Tips section of this narrative contains an example of a TNAP facility map.

*Proceed to Step 1.6.3.*

#### **Step 1.6.3 – Identify unassigned TNAP assets**

**Role: Facility Map Development Team**

The GeoBase Office representative identifies any TNAP assets that do not have an assigned facility number and brings the updated map to the Facility Map Development Team to make facility assignment decisions. The team will follow the standards outlined in this playbook for designating TNAP facilities and use their best judgment to determine the geospatial extents of the facilities on the map. The GeoBase Office representative tracks any changes, updates the appropriate polygons and feature classes, and provides updated maps to the team for review.

*Proceed to Step 1.6.4*

#### **Step 1.6.4 – Verify current RP Inventory data**

**Role: Facility Map Development Team**

The team verifies the CATCODEs for each TNAP assets facility are accurate based on current use. The team should refer to AFMAN 32-1084, *Facility Requirements*, for CATCODE guidance. RPO guidance is to use the closest six-digit CATCODE available.

The installation will provide the final TNAP asset map to the AFCEC Team/AFCEC Consultants to perform the next step in the effort, which is linear segmentation. They will adjust and/or create branch and section polygons and assign these segments to their respective facilities. Note that substantiating documentation for any facility changes will not be completed until after segments are assigned to the facilities and the map is validated with a TNAP condition survey as outlined in Process 1.0. Once Step 1.8 is completed, supporting documentation will be generated and the RP records are updated in Step 1.12.

Below are the specific tasks, by role, to be completed during the verification of current use and CATCODE assignment:

- **RPO:** Verifies that the CATCODEs are correct according to the RP records and designated current use
- **GeoBase Office:** Ensures that the mapping complies with SDSFIE 4.0.2 Gold
- **Base POC and/or Operations Engineer/TNAP AMP Manager:** Identifies any conflicts between the PCI survey/pavement evaluation records and the TNAP facility map. Additionally, the Base POC and/or Operations Engineer/TNAP AMP Manager provides information on current designation/use of TNAP





- **Airfield Manager:** Provides information on current designation/use of TNAP

Once the CATCODEs are verified, and the team has no more changes to the TNAP facility map, the team posts the draft TNAP facility map to the GeoBase system of record and sends to the AFCEC PAVER SMS program manager ([shaun.moya.1@us.af.mil](mailto:shaun.moya.1@us.af.mil)) in an appropriate format.

*Proceed to Step 1.6.5.*

#### **Step 1.6.5 – Review facility map and provide feedback**

##### **Role: AFCEC/COAP**

AFCEC/COAP reviews draft TNAP facility map, provides feedback to the Facility Map Development Team, and discusses with the installation via teleconference or DCS to adjudicate any issues before the TNAP facility map is finalized.

*Proceed to Step 1.6.6.*

#### **Step 1.6.6 – Finalize facility map**

##### **Role: Facility Map Development Team**

Once the team verifies the CATCODEs and has no more changes to the TNAP facility map, the Team finalizes the map with the RPO enters it in the GeoBase system of record and will then send it to AFCEC PAVER SMS program manager ([shaun.moya.1@us.af.mil](mailto:shaun.moya.1@us.af.mil)) in an appropriate format.

*Proceed to Process 1.7 Implement TNAP Segmentation Rules.*

### **TNAP Facility Designation Process and Standards**

- The GeoBase Office will typically use the common installation picture for the base as the starting point for developing the TNAP facility maps for airfield and roads & parking respectively. The map should show all load bearing pavement, as well as shoulders and any roads or parking areas. Showing all pavements on each respective map provides good reference points and helps the team ensure that they do not double count any pavements. Including any known TNAP facility numbers, as well as any information such as apron, taxiway, or runway names, buildings, and building numbers can be beneficial as RP record cards often reference this information. Ideally, create the draft map so it is laid over imagery for the base. If this is not possible, the team should at least have a digital copy of the most current imagery available.
- Other essential information includes a RP report listing all of the TNAP facilities sorted by facility number, facility name, the CATCODE, category name, area, and any descriptions or notes that may be included in the RP database. The team should include a complete list of TNAP CATCODEs with the definition for each category as well as maps and construction history from the last PCI and comprehensive evaluations.
- Installations have interpreted the rules for determining TNAP facilities differently at each base, so there is a lot of variation from location to location. The primary constraint for creating a linear facility is that facilities can only be assigned a single CATCODE. For example, overruns (CATCODE 111115) cannot be combined in a facility with the main load-bearing surface of the runway (CATCODE 111111). The facility may also be created based on other criteria such as construction date as outlined in AFI32-9005.
- **Runway and Overrun Standard:** Create a facility number for the load-bearing surface of each runway. The two overruns for each runway will have one facility number. At a minimum, the shoulders for all runways will have a facility number. Do not create separate facilities for the concrete portions and asphalt portions of the runway, overruns, or shoulders. Overruns can be constructed



with a Type A traffic area to increase the takeoff length for mission aircraft. In these instances, the pavement should be marked with a displaced threshold and classified (CATCODE) as a runway rather than an overrun.

- **Taxiway Standard:** At a minimum create a facility number for all taxiways on the airfield and create a facility number for all taxiway shoulders. If all taxiways are aggregated in one facility, combine all taxiway shoulders into one facility. If each named taxiway has its own facility number, the shoulders associated with each taxiway will be in a separate facility. Do not create facilities based on pavement type. This level of fidelity will be provided in the segments. For instance, Taxiway A will have only one facility number assigned even though it is constructed of both concrete and asphalt pavement. Use the predominant material type for each taxiway facility to populate the construction material code in ACES / NexGen IT. Note that the only pavements that should be included in a taxiway facility are those on a "named" taxiway such as Taxiway A, B, C, etc. Taxi lanes on aprons, pavements that provide access to aprons from adjacent taxiways, or pavements that provide access to other pads or ramps will be included in the associated apron facility. If the base opts to create a multiple taxiway facilities, they should create one facility for each named taxiway while following the other guidance outlined above.
- **Apron Standard:** Create a facility for the load-bearing pavement of each large contiguous apron. Group warm-up aprons and arm/de-arm pads with similar CATCODEs into a single facility even though they are not contiguous. Dispersed parking aprons (pads) along a named taxiway will be included in a single facility. At a minimum, include the shoulders for all aprons in a single facility. Do not create separate facilities for the concrete portions and asphalt portions of an apron or pad or the shoulders associated with these facilities.



Langley Air Force Base FACID

- **Roads, Streets and Access Road Standard:** Create a facility for all contiguous roads under the same CATCODE on a site except where specific Real Property Information Model (RPIM) data element values necessitate a separate RPUID. For example, if a site has all contiguous roads but these roads have RPA





Interest Type Code values of FEE, LEAS, and GVPV, there will be three separate asset records established. In addition, any access road not associated with a parking area that provides access to a building (for example, the road that goes to the front entrance of the Wing Headquarters building) should be considered part of the road facility. Unsurfaced roads are handled in a manner similar to paved roads. Do not create separate facilities for asphalt and concrete roads.

- **Driveway Standard:** Driveways have been a particular issue in linear segmentation efforts to date. UFC 3-250-01FA, *Design of Roads Streets, Walks, and Open Storage Areas* clearly intend for the term driveway to be associated with a residence in housing areas. Bases will modify any existing TNAP facility designations to ensure that the driveway CATCODE 851145 will be used only to refer to "driveway" pavements in housing. TNAP facilities that access parking areas will be included in the associated parking area facility. Any other TNAP facilities such as those that provide access to dumpsters, loading docks or buildings will be included in the associated road facility. Do not create separate facilities for concrete driveways and asphalt driveways. If warranted, the base can create a separate facility for all driveways in each housing area.
- **Parking Area Standard:** Current OSD guidance states that each non-contiguous parking lot or open area storage area is a separate RP asset and is assigned a RPUIID. This mandate may cause issues and requires significant manpower requirements in order to successfully implement. At a minimum, each base should create a facility for each given parking category code. There are currently six different category codes for surfaced and unsurfaced parking areas, which would equate to six facilities. As mentioned previously, parking areas include both the parking area itself and the access roads that serve it. Do not create separate facilities for concrete parking areas and asphalt parking areas.

### ***Railway Facility Designation Process and Standards***

Refer to the SMS-TNAP Guidance, RAILER section for mapping guidance.

### ***Bridge Facility Designation Process and Standards***

Each bridge should have a RPUIID and facility number in the RPAD records as well as the appropriate CATCODE for the bridge type (road, rail, pedestrian, etc.). All bridge components (approach pavements, deck, superstructure, substructure, spans, culvert sections, etc.) required to form the bridge structure should be considered a single facility for designation purposes. The installation's GeoBase map should be updated to indicate location, type and deck area (measured in sf). UFC 3-310-08, *Non-Expeditionary Bridge Inspection, Maintenance, and Repair*, latest edition, should be consulted for the definition of a bridge as it applies to this playbook.

### ***Signage Facility Designation Process and Standards***

Installations shall manage and maintain their own signage inventory. Signage inventories and condition assessments will not be required to be input into the enterprise SMS database.



## SMS – 1.7 Implement TNAP Segmentation Rules

### Introduction

### Roles and Responsibilities

### Narrative

### Additional Directions for AFCEC Teams/AFCEC Consultants

### **Introduction**

This section of the SMS Playbook outlines general business rules for the linear segmentation of TNAP and provides visual examples of network component identification. UFC 3-270-08, *Pavement Management*, provides more detailed guidance for segmentation of road, parking, and airfield pavements. This portion of the playbook will be used primarily by the AFCEC Team/AFCEC Consultants, but is also provided here to provide a source of information for the bases.

Once the TNAP facility map is generated, the evaluation team or one of its consultants can begin the process of assigning pavement management system segments to the facilities. To ensure the entire TNAP inventory is mapped consistently and accurately, TNAP evaluation teams and contractors will use the process described herein when conducting a structural pavement evaluation or pavement condition index (PCI) survey. The AFCEC Team with consultation of the base POC retains final authority in accepting segmentation assignments; the Real Property Office (RPO) has final authority regarding any changes to the facilities/facility map resulting from this process.

**Note:** This Process serves as the Standard Operating Procedure (SOP) for Task 2: Assign engineering pavement segmentation to real property pavement facilities, in the memorandum, *Air Force Linear Segmentation Implementation Guidance*, dated 1 April 2013.

### **Roles and Responsibilities**

Each of the following roles applies to the installation:

ROLES	RESPONSIBILITIES
<b>Real Property Office (RPO)</b>	<ul style="list-style-type: none"><li>• Works with the GeoBase Office, Base POC and/or Operations Engineer/TNAP AMP Manager, and AFCEC Team/AFCEC Consultants to conduct a review of the segment assignments on the Pavement Real Property Report and mapping portion of the PCI Reports</li><li>• Retains final authority regarding any changes to the facilities/facility map resulting from this process</li></ul>
<b>GeoBase Office</b>	<ul style="list-style-type: none"><li>• Participates in reviews of segment assignments and PCI Reports provided by the AFCEC Team/AFCEC Consultants to ensure mapping meets Spatial Data Standards for Facilities, Infrastructure and Environment (SDSFIE) requirements</li></ul>
<b>Base POC and/or Operations Engineer/TNAP AMP Manager</b>	<ul style="list-style-type: none"><li>• Participates in reviews of segment assignments and PCI Reports provided by the AFCEC Team/AFCEC Consultants prior to publication of the final PCI Report</li><li>• Retains final authority in accepting segmentation assignments</li></ul>
<b>Airfield Manager</b>	<ul style="list-style-type: none"><li>• Works with the Base POC and/or Operations Engineer/TNAP AMP Manager to review segment and TNAP rank assignments as well as PCI Reports provided by the AFCEC Team/AFCEC Consultants</li></ul>





ROLES	RESPONSIBILITIES
<b>AFCEC Team/ AFCEC Consultants</b>	<ul style="list-style-type: none"><li>• Collects the data needed to properly assign the segments by performing a field evaluation.</li><li>• Retrieves the latest TNAP facility map, and updates the PAVER database to reflect those changes</li><li>• Participates in the review of the segment assignments and draft the PCI Report</li><li>• Retains final authority in accepting segmentation assignments</li></ul>

## **Narrative**

*Entry from Process 1.6 Perform TNAP Facility Mapping.*

### **Step 1.7.1 – Retrieve latest facility maps for respective TNAP assets from GeoBase office or AFCEC Team/AFCEC Consultants**

#### **Pavements:**

The AFCEC Team/AFCEC Consultant will request the current TNAP facility map from the GeoBase Office.

#### **Railways:**

ERDC/AFCEC Team will request current rail maps from GeoBase office

#### **Bridges:**

ERDC/AFCEC Team will request current bridge maps from GeoBase office

*Proceed to Step 1.7.2.*

### **Step 1.7.2 – Modify PAVER segments to follow segmentation rules**

#### **Role: AFCEC Team/AFCEC Consultants**

The AFCEC Team/AFCEC Consultant updates segment assignments in PAVER to follow the rules described in UFC 3-270-08, *Pavement Management*.

*Proceed to Step 1.7.3.*

### **Step 1.7.3 – Assign segments to facilities**

#### **Role: AFCEC Team/AFCEC Consultants**

The AFCEC Team/AFCEC Consultant categorizes the segments into branches/sections according to UFC 3-270-08 and the Business Rules for TNAP Segmentation and then assigns these segments to their respective facility in the mapping and PAVER database.

*Proceed to Step 1.7.4.*

### **Step 1.7.4 – Conduct segment assignment review**

#### **Role: RPO, GeoBase Office, Base POC and/or Operations Engineer/TNAP AMP Manager, Airfield Manager, AFCEC Team/AFCEC Consultant**

The RPO, GeoBase Office, and Base POC and/or Operations Engineer/TNAP AMP Manager collectively review the segment assignments and update any changes required to the TNAP facility mapping identified by the AFCEC Team/AFCEC Consultant. The RPO, GeoBase Office, and Base POC and/or Operations Engineer/TNAP AMP Manager provide feedback to the AFCEC Team/AFCEC Consultants



on any issues that may need correction prior to any fieldwork.

- **RPO:** Confirms that RP data is assigned correctly and obtains Pavement Real Property Report from AFCEC Team/AFCEC Consultant to determine if assignments affect facility areas on the map
- **GeoBase Office:** Provides input during the review
- **Base POC and/or Operations Engineer/TNAP AMP Manager:** Provides input during the review
- **Airfield Manager:** Provides input during the review
- **AFCEC Team/AFCEC Consultants:** Identifies issues with the pavement facility map that must be resolved by Base

The RPO, GeoBase Office, and Base POC and/or Operations Engineer/TNAP AMP Manager provide feedback to the AFCEC Team/AFCEC Consultant, who makes modifications to the segmentation plan prior to the field survey. The process of assigning segments to facilities may prompt a change in the facility map. In this case, the AFCEC Team/AFCEC Consultant will coordinate with the Facility Map Development team prior to conducting a PCI Survey or Comprehensive Evaluation. In particular, any major mapping changes to the TNAP facility map will be sent back to the base for update.

*If 'No Discrepancies,' proceed to Step 1.7.5. If 'Discrepancies,' proceed to Step 1.7.3.*

#### **Step 1.7.5 – Update GIS mapping**

**Role: GeoBase Office**

The GeoBase Office updates Geographic Information System (GIS) mapping to address any issues with the TNAP facility map identified by the AFCEC Team/AFCEC Consultant. Once updated, the GeoBase Office provides the updated materials to the AFCEC Team/AFCEC Consultant. The RPO, Base POC and/or Operations Engineer/TNAP AMP Manager, and Airfield Manager may be asked to provide input according to Process 1.6 Perform TNAP Facility Mapping.

*Proceed to Step 1.7.6.*

#### **Step 1.7.6 – Review GIS mapping and conduct field evaluation**

**Role: AFCEC Team/AFCEC Consultants**

The AFCEC Team/AFCEC Consultant imports a shape file of the TNAP facility map provided by the GeoBase Office into PAVER and makes branch and section assignments on the map from within PAVER. Next, the AFCEC Team/AFCEC Consultant generates field inspection datasheets and conducts the field evaluation.

*Proceed to Step 1.7.7.*

#### **Step 1.7.7 – Update PAVER**

**Role: AFCEC Team/AFCEC Consultants**

Once the fieldwork is complete, the AFCEC Team/AFCEC Consultant updates the PAVER database with the field data, including any updated branch and section information, and incorporates any changes to the TNAP facility map using either AutoCAD or ESRI software.

*Proceed to Step 1.7.8.*





**Step 1.7.8 – Perform analysis and write draft PCI Report**

**Role: AFCEC Team/AFCEC Consultants**

The AFCEC Team/AFCEC Consultants runs PCI computations and generates a TNAP Real Property Report summarizing the area of each TNAP facility. The AFCEC Team/AFCEC Consultant provides the computations, TNAP Real Property Report, and updated TNAP facility map to the RPO, GeoBase Office, and Base POC and/or Operations Engineer/TNAP AMP Manager for the draft PCI Report. These documents include the AFCEC Team/AFCEC Consultant's recommended mapping changes.

A standard report layout is provided in the statement of work (SOW) for each PCI Survey contract. The AFCEC Team/AFCEC Consultant has standard report templates.

*Proceed to Step 1.7.9.*

**Step 1.7.9 – Review draft PCI Report**

**Role: RPO, GeoBase Office, Base POC and/or Operations Engineer/TNAP AMP Manager, Airfield Manager, AFCEC Team/AFCEC Consultant**

The RPO, GeoBase Office, Base POC and/or Operations Engineer/TNAP AMP Manager, and AFCEC Team (without the AFCEC Survey Consultant) determine if any issues exist in the PCI Report regarding correctness and adherence to guidance described in Process 1.6 Perform TNAP Facility Mapping. If any issues exist in the PCI Report, the RPO, Base POC and/or Operations Engineer/TNAP AMP Manager and the GeoBase Office provide recommended corrections to the AFCEC Team/AFCEC Consultant, who incorporates feedback via Step 1.7.8. At this point, changes should be minimal, but the RPO still maintains responsibility to approve facility assignments/facility map changes.

*If 'No changes,' proceed to Step 1.7.10. If 'Changes,' proceed to Step 1.7.8.*

**Step 1.7.10 – Finalize and publish Structural Evaluation / PCI Report**

**Role: AFCEC Team/AFCEC Consultants**

Once issues with the draft PCI Report are resolved, the AFCEC Team/AFCEC Consultant finalizes the Comprehensive Evaluation/PCI Report and sends the final version to the base points of contact (POCs) and other stakeholders. The AFCEC Team/AFCEC Consultant will also post the report on the Air Force (AF) Airfield Pavement Evaluation Website. The base POC is responsible for distributed all applicable information to the RPO, Operations Engineer/TNAP AMP Manager and the GeoBase office.

*Proceed to Step 1.8 Perform TNAP Condition Assessment*

**Additional Directions for AFCEC Teams/AFCEC Consultants**

- **Runway:** Create a branch for the load-bearing surface of each runway at a base and assign the facility number and RPUID to that branch. At a minimum, create separate sections for the first 1000 feet on each end of the runway and the interior. These sections will have shred-outs where the keel (center 75 feet of the runway) and the outers are further segmented, even though they have the same construction. For example, the keel of section R01A will be designated R01A1 and the outers will be designated R01A2. Ensure that any taxi routes at the end of the runway are included in the keel section segment. Additional sections will be created based on pavement construction as required. In addition, create a branch for the overruns on each runway. Do not break out the keel and outers of the overrun, as done with the load-bearing surface of the runway, but do create sections based on construction. Create a branch for the shoulders on each runway and segment the branch according to changes in condition. Do not assign a traffic area to shoulder pavements as done with load-bearing pavements.
- **Taxiway:** Create a branch for the load-bearing surface of each named taxiway and a branch for the shoulders associated with each named taxiway. Create sections for each as appropriate based on construction. If a section crosses over multiple branches or facilities, use shred-outs

to distinguish between the segments of the section. For example, the portion of section T01A associated with Taxiway B would be designated T01A1 and the portion of the section associated with Taxiway C would be designated T01A2, as long as the pavement and underlying layers are similar. Ensure that section boundaries align with branch boundaries and that both section and branch boundaries align with facility boundaries. In short, ensure there are no errors. If the base has divided a given named taxiway into multiple facilities, work with them to resolve this issue ensuring each named taxiway has no more than one facility associated with it. Every effort should be made to maintain the segmentation hierarchy.

Note that taxi lanes on aprons and pavements that provide access to aprons or pads may have been given a 'T' section designation in past evaluations. Do not include these pavements in taxiway branches or facilities. These pavement sections should be included in the associated apron branch. Current plans are to allow the 'T' designation to remain on these pavements to maintain continuity with past evaluations.

- **Apron:** At a minimum, create a branch for each contiguous main apron. If a main apron is divided into multiple facilities, create a separate branch to align with each of these facilities. Create sections for each branch as appropriate based on construction. If a section crosses over multiple branches or facilities, use shred-outs to distinguish between the segments of the section. For example, the portion of section A01B associated with the main apron would be designated A01B1 and the portion of the section associated with the transient apron would be designated A01B2. At a minimum, create a branch for non-contiguous aprons with the same CATCODE combined in a single facility. For example, dispersed parking pads along Taxiway C are all in one facility. Create a branch to align with that facility. Once again, ensure alignment of facility, branch, and section boundaries to eliminate errors.





## SMS – 1.9 Perform Utilities Facility Mapping

### Introduction

### Roles and Responsibilities

### Narrative

#### **Introduction**

Once the Real Property Accountable Officer (RPAO), GeoBase Office, and Civil Engineer (CE) Operations have accumulated relevant data from their respective informational sources, the representatives from these offices meet to form the Facility Map Development Team. The Facility Map Development Team conducts a facility-by-facility review of the utilities facility map created by the GeoBase Office. The team updates the map as required to ensure 100% of the linear utilities assets in the Real Property (RP) database are accounted for. Any unassigned linear assets will be assigned to either a new or an existing facility. Linear assets are assigned according to usage, or category code (CATCODE); the Real Property Unique Identifier (RPUID) serves as the linkage between RP and Geographic Information System (GIS) records, as opposed to facility identification (FACID). For a complete listing of CATCODEs, refer to the Air Force Category Codes document. Reference the following sections of this Playbook for specific guidance related to performing Utilities Facility Mapping:

- SMS Utilities Guidance
- SMS Utilities Guidance: FUELER SMS
- SMS Utilities Guidance: U.SMS
- SMS Utilities Guidance: Linear Segmentation Rules for Utilities

*Note: This Process serves as the Standard Operating Procedure (SOP) for Task 6: Complete utility maps at installations, in the memorandum, "Air Force Linear Segmentation Implementation Guidance," dated 1 April 2013.*

#### **Roles and Responsibilities**

ROLES	RESPONSIBILITIES
<b>Facility Map Development Team</b>	<p>The Facility Map Development Team is responsible for bringing all relevant material to the facility map development meeting and assigning facilities on the map. This team includes the RPAO, the GeoBase Office, and CE Operations (including Operations Engineering, Shop, the relevant Activity Management Planning (AMP) Managers, and utility engineers). As CE Transformation continues, the role of the AMP Manager and Sub-AMP Manager will increasingly focus on total system operations and accountability and will therefore become a more substantial role in this process.</p> <p>The RPAO provides information pertaining to RPUID data elements, including the total amount of linear feet (LF) reported in RP records and facility number by CATCODE. The GeoBase Office examines existing documentation and assigns RP data to the GIS features. CE Operations provides insight on actual data accumulated in the field and recorded in survey records.</p>

**Table 7 Facility Map Development Team Roles and Responsibilities**

#### **Narrative**

*Entry from Out-of-Scope Process Migrate to Data to GIS 4.0.2 Gold*

**Step 1.9.1 – Review facility assignments**

**Role: Facility Map Development Team**



**Estimated Completion Time: N/A**

The team may complete this step by sequentially going down the tabular list of utilities CATCODEs provided by the RPAO and identifying the geospatial extents of each facility on the map. Alternatively, the team may use the map as a guide, going from top to bottom, left to right, and checking off the CATCODEs as each are identified on the map. Below are the specific tasks by role to be completed during the review of facility assignments:

- **RPAO:** Provides information pertaining to RPUID data elements, including the total amount of LF reported in RP records and facility number by CATCODE.
- **GeoBase Office:** Examines existing documentation and assigns RP data to the GIS features.
- **CE Operations:** Recommends appropriate facility assignments for each utility plotted on GeoBase map.

The team should refer to the Linear Segmentation Rules for Utilities when making and evaluating recommendations. The team may need to determine if the utility asset described on the RP records is greater than or less than the data on the map. To investigate discrepancies, the team should examine old RP records, maintenance records, GeoBase data, surveys, or any other sources available to verify the geospatial extents. When making these decisions, explicit descriptions, such as as-built drawings or documented surveys, take precedence. If these are not available, the team should use the most authoritative document available.

*Proceed to Step 1.9.2.*

**Step 1.9.2 – Apply utility facility numbers to map**

**Role: Facility Map Development Team**

**Estimated Completion Time: N/A**

The team associates RP data by CATCODE with the geospatial data elements on the map. The GeoBase Office ensures that points, lines, and polygons exist for the utilities on the installation, and that the points, lines, and polygons can be linked to RP data (i.e., the correct RPUID is associated with the correct point, line, or polygon for that segment of the utility and is reflected in the Spatial Data Standards for Facilities, Infrastructure and Environment (SDSFIE) 3.1 attribute table). In the event of competing recommendations, the RPAO will make an executive decision.

*Proceed to Step 1.9.3.*

**Step 1.9.3 – Identify unassigned utilities**

**Role: Facility Map Development Team**

**Estimated Completion Time: N/A**

The team identifies any utilities that do not have an assigned facility number using the same procedure outlined in Step 9.2 to assign these areas to an existing facility or to make the determination that they should create a new facility. A new facility will only be created if no facility exists with a given CATCODE. Guidance on making these decisions can be found in AFI 32-9005, Real Property Accountability and Reporting.

*Proceed to Step 1.9.4.*

**Step 1.9.4 – Verify current use and CATCODE**

**Role: Facility Map Development Team**

**Estimated Completion Time: N/A**

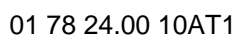
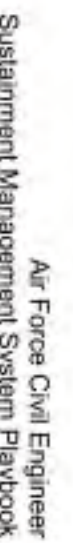
The team verifies the CATCODEs for unassigned utilities from Step 9.3.

- **RPAO:** Verifies that the CATCODEs are correct according to RP records. Additionally, the RPAO should verify with the rest of the team to verify that the assigned CATCODEs correspond to current use.
- **GeoBase Office:** Ensures that the mapping complies with current version of SDFSIE.
- **CE Operations:** Provides information on current use of the asset.

For further guidance on current use, the team should reference AFMAN 32-1084, *Facility Requirements*.

*Proceed to Process 1.10 Implement Utilities Segmentation Rules.*







## **SMS – 1.10 Implement Utilities Segmentation Rules**

### Introduction

### Roles and Responsibilities

### Narrative

#### **Introduction**

This process describes how a base utilities linear segmentation team, composed of the GeoBase Office and Civil Engineer (CE) Operations (Shop and Operations Engineering), assigns segments to Air Force (AF)-owned facilities on the GeoBase map to ensure that all water and electric utilities are mapped consistently and accurately. The segmentation rules for utilities serve to provide a standardized method in attributing segments to utility facilities to be used across all bases. The Utilities Activity Management Plan (AMP) Manager retains final authority in accepting segmentation assignments; the Real Property Office (RPO) has final authority regarding any changes to the facilities/facility map resulting from this process. Reference the following sections of this Playbook for specific guidance related to implementing Utilities segmentation rules:

- SMS Utilities Guidance
- SMS Utilities Guidance; FUELER
- SMS Utilities Guidance; U.SMS
- SMS Utilities Guidance; Linear Segmentation Rules for Utilities

#### **Roles and Responsibilities**

ROLES	RESPONSIBILITIES
Real Property Office (RPO)	<ul style="list-style-type: none"><li>• Determines AF-owned assets and distinguishes between linear and non-linear assets</li><li>• Has final authority regarding any changes to the facilities/facility map resulting from this process</li></ul>
GeoBase Office	<ul style="list-style-type: none"><li>• Identifies geographical/functional area of the linear utilities assets as well as the segment assignments</li><li>• Creates a geometric network of segment groupings if the necessary technology capabilities are available</li><li>• Supports in-house field evaluations</li><li>• Incorporates necessary changes to the facility map following linear utilities assets evaluations</li></ul>
Civil Engineer (CE) Operations	<ul style="list-style-type: none"><li>• Provides input identifying attributes such as ownership, geographical/functional area, and grouping of the linear utilities assets based on maintenance records, and any other knowledge</li><li>• Supports in-house field evaluations</li><li>• Comprises of the Utilities AMP Manager, Operations Engineering, and the Shop, wherein the Utilities AMP Manager retains final authority in accepting segmentation assignments</li><li>• Responsible for designing and/or managing the design of new utilities by ensuring designs meet linear segmentation guidelines and providing as-built drawings of existing utilities (where available) and new facilities upon completion.</li><li>• The Shop assists in the identification of geographical / functional areas and segment grouping based on the linear segmentation rules for utilities</li></ul>





ROLES	RESPONSIBILITIES
Evaluation Team	<ul style="list-style-type: none"><li>Comprises an in-house team of experts or a team of contractors with the necessary expertise</li><li>Collects data points on a facility's current use and compares this information to most recent documentation in order to identify discrepancies</li></ul>

### **Narrative**

*Entry from Process 1.9 Perform Utilities Facility Mapping.*

#### **Step 1.10.1 – Determine if asset owned/maintained by AF**

**Role:** RPO, CE Operations

The RPO examines the real property (RP) records, and CE Operations examines maintenance records to determine which assets are owned by the AF or are their responsibility to maintain.

Some overseas facilities are occupied by the AF but are maintained by the Army or Navy, in which case, these assets will be identified but not further segmented according to this process. Privatized assets, or assets owned by a host nation and not maintained by the AF, are not recorded in the Geographic Information System (GIS), or the system of record.

*If 'Yes,' proceed to Step 1.10.3. If 'No,' proceed to Step 1.10.2.*

#### **Step 1.10.2 – Identify utility system as a segment using acquired geometric data to identify boundaries**

**Role:** GeoBase Office, CE Operations

An entity outside CE that owns the asset in question provides GeoBase data to establish the boundaries of maintenance/construction. These assets are identified on the GeoBase map but are not further segmented at this point. However, the asset's existence in the RP inventory is acknowledged.

- GeoBase Office:** Determines the relevant boundaries and identifies which facilities may affect AF assets
- CE Operations:** Identifies each system as a separate segment

If there are multiple utility systems that are not owned or maintained by the AF, each system is identified as a separate network. This method of identification and documentation will serve to clarify which facilities (e.g., valves, connection points, or backflow assemblies) can affect CE systems, for instance, in maintenance or emergency cases necessitating isolation. These systems identified in this step will not be further segmented at this point.

*End*

#### **Step 1.10.3 – Distinguish linear and non-linear assets based on RPUID, CATCODE, or FACID**

**Role:** RPO, CE Operations

The RPO, Operations Engineering, and Shop identify all linear and non-linear assets based on the Real Property Unique Identifier (RPUID), category code (CATCODE), or facility identification (FACID). Linear assets are measured in linear feet (LF). Non-linear assets are measured in various units of measurement and for the most part are not segmented according to this process. If a non-linear component does not have an RPUID, it is accounted for as a non-linear component of an associated linear asset.

*Proceed to Step 1.10.4.*

#### **Step 1.10.4 – Identify geographical/functional areas in GIS**

**Role:** GeoBase Office, CE Operations

This step is recommended, but not required, and adds value by standardizing communication for referencing



segments. Each base may address this in separate ways, as not all bases have established naming conventions.

The utilities linear segmentation team should identify the geographical/functional area for each utility asset on the facility map. The GeoBase Office records this information in the GIS, or system of record. Geographical/functional areas are defined by the base and can be different from base to base. Common naming of areas on base is Flight line, Cantonment, or Housing. However, the base may have other naming systems to aid its management of the segments, such as North-side, South-side, Campus, etc. The base areas may already be defined at any particular base, and the geographical/functional area naming serves as a management tool to breakup these base areas.

The geographical/functional area can also be identified by utility. The team should refer to the narrative for Linear Segmentation Rules for Utilities for further guidance on naming.

*Proceed to Step 1.10.5.*

**Step 1.10.5 – Identify segments for each asset based on utilities segmentation rules**

**Role: GeoBase Office, CE Operations**

The utilities linear segmentation team assigns/modifies/creates segments according to the linear segmentation naming and numbering rules. Non-linear assets associated with a linear utility RPUID will also be mapped by GeoBase. The team should refer to Linear Segmentation Rules for Utilities for further guidance.

*Proceed to Step 1.10.6*

**Step 1.10.6 – Identify segment grouping**

**Role: GeoBase Office, CE Operations**

A grouping is defined as the smallest amount of linear segment that can be isolated. This identification helps the base isolate and repair areas affected by outages or other emergencies.

- **GeoBase Office:** Identifies the grouping and marks the facility map accordingly. The GeoBase Office also creates a geometric network based on logical groups identified by the team.
- **CE Operations:** Supports the identification of segment grouping.

Not all bases may have the software capabilities to perform this analysis. Most GeoBase offices are working to obtain this functionality. The team should refer to Linear Segmentation Rules for Utilities for grouping details.

*Proceed to Step 1.10.7.*

**Step 1.10.7 – Measure and validate total length of RPUID/CATCODE/FACID assets**

**Role: GeoBase Office, CE Operations**

The GeoBase Office calculates summary statistics of the linear assets comprising a facility and verifies the data with CE Operations.

The GeoBase Office and CE Operations collectively determine if all segment areas have been plotted on the facility map. Non-linear assets associated with a linear utility asset will be included in this discrepancy analysis. If all segments have been identified, the team produces the required documentation to initiate updates to RP records.

*If 'No Issues,' proceed to Process 1.12 Coordinate RP Inventory Updates. If 'Issues,' proceed to Step 1.10.8*





**Step 1.10.8 – Identify scope of discrepancy resolution effort**

**Role: GeoBase Office, CE Operations**

The team compares the total LF documented during the implementation of linear segmentation rules and identifies discrepancies against RP data. The team determines if a discrepancy exists in the quality of the LF data collected or in the accuracy of the RP records. Corrective action may require resurveying the segments if LF data is inaccurate or incomplete or submitting substantiating documentation to adjust the RP records to reflect the actual LF.

Based on manpower, resources, and leadership support, the base determines if an in-house evaluation is feasible. Additionally, the base may not have the expertise to complete an evaluation. If an in-house evaluation is not feasible, a team of contractors performs the evaluation.

*If 'In-House,' proceed to Step 1.10.9.*

*If 'Requires contract work,' proceed to Out-of-Scope Process Program and Fund Contracted Project.*

**Step 1.10.9 – Conduct training or kick-off meeting for Evaluation Team**

**Role: GeoBase Office, CE Operations**

A kick-off meeting is always conducted before the evaluation team begins work. Training is conducted, as needed, in conjunction with the kick-off meeting when substantial base manpower is included in the evaluation effort or when the evaluation team does not have the knowledge necessary to conduct an evaluation.

If dealing with a contracted team for the evaluation, the relevant Project Manager should be asked to train the evaluation team on the specific methodology and format employed for capturing data. Additionally, the following actors will provide support in the case of a contracted evaluation team:

- **GeoBase Office:** Provides necessary information, including existing geometric data, and maps.
- **Operations Engineering:** Demonstrates to the Evaluation Team how to properly employ the specific naming conventions for geographical / functional segments.
- **Shop:** Attends kick-off meeting and training as necessary to provide support for Operations Engineering.

*Proceed to Step 1.10.10.*

**Step 1.10.10 – Collect data based on linear segmentation rules**

**Role: GeoBase Office, CE Operations, Evaluation Team**

The data collection effort involves the following roles:

- **GeoBase:** Provides evaluation team personnel in the case of in-house evaluations.
- **CE Operations:** Provides support to the Evaluation Team in identifying linear segments and identifying essential non-linear components associated with linear assets.
- **Evaluation Team:** Collects data by physical examination of assets to determine what discrepancies exist. If in-house, the evaluation team members are provided by GeoBase and CE Operations.

*Proceed to Step 1.10.11.*

**Step 1.10.11 – Verify segmentation data collected**

**Role: RPO, GeoBase Office, CE Operations, Evaluation Team**

Once the evaluation is complete, the utilities linear segmentation team and RPO meet with the Evaluation Team to verify the changes discovered. The GeoBase Office incorporates any changes found by the Evaluation Team on the facility map.



The RPO, GeoBase Office, and CE Operations determine whether issues exist with the segmentation data, such as a mismatch of database information and physical features of assets (differences in square yards [SY]/LF) utilities appearing in GeoBase data but not on RP data, assets with incorrect CATCODEs or unassigned RPUIDs, etc.

*If 'No issues,' proceed to Process 1.12 Coordinate RP Inventory Updates. If 'Issues,' proceed to Step 1.10.10.*





## SMS – 2.0 Develop Current-Year Requirements

### Introduction

### Roles and Responsibilities

### Narrative

#### Introduction

Based on the data uploaded by the installation's Built Infrastructure Assessment Team (BIAT) following an assessment, the Sub-Activity Management Plan (AMP) Manager, or equivalent role, runs and performs quality control (QC) and validation of the SMS reports to understand maintenance and repair (M&R) requirements within the current-year and submits service requests to CE Customer Service.

#### Roles and Responsibilities

ROLES	RESPONSIBILITIES
<b>AMP Manager</b>	<ul style="list-style-type: none"><li>Coordinates with Air Force Civil Engineer Center (AFCEC) and higher authorities for SMS-related matters (e.g., datacalls)</li><li>Performs analysis using the facility condition index (FCI), remaining service life (RSL), Mission Dependency Index (MDI), Building Condition Index (BCI), PM/corrective maintenance, and defined condition standards and other functionality factors (non-condition based) to identify requirements that need sustainment, restoration, and modernization (SRM) funding and validates built assets' FCI and lifecycle requirements generated by SMS</li></ul> <p><b>Note:</b> These responsibilities correspond to the AMP Manager role and responsibilities delineated in AFI 32-1001, Chapter 4; AMP managers must be assigned from the Operations or Engineering Flights.</p>
<b>Sub-AMP Manager</b>	<ul style="list-style-type: none"><li>Serves as first line of defense in ensuring quality data for each SMS</li><li>Manages BIAT</li><li>Ensures data inputs are consistent and understandable</li><li>Performs quality assurance after the BIAT's quality control efforts</li><li>Validates future work requirements generated by each SMS</li></ul> <p><b>Note:</b> These responsibilities correspond to the Sub-AMP Manager role and responsibilities delineated in AFI 32-1001, Chapter 4; Sub-AMP managers must be assigned from the Operations or Engineering Flights.</p>

Table 8 AMP and Sub-AMP Manager Current Year Requirements Roles and Responsibilities

#### Narrative

Entry from Process 1.0 Conduct Built Infrastructure Assessment.

#### Step 2.1 – Generate reports Role: Sub-AMP Manager

The Sub-AMP Manager runs the custom SMS reports (e.g., condition indices, remaining service life, and work items) to understand proposed corrective maintenance work for the next year. These reports produce lists of unconstrained requirements, or repairs based on an asset's condition and lifecycle expectancy independent of the cost to repair.

Proceed to Step 2.2.

#### Step 2.2 – QC and Validate SMS reports



**Role: Sub-AMP Manager**

The Sub-AMP Manager conducts QC and validation of SMS outputs to ensure there are no anomalies with condition data, the data corresponds with field observations, and SMS is presenting legitimate work requirements. The Sub-AMP Manager works with the BIAT to resolve discrepancies, as needed. For example, a Sub-AMP Manager can identify a discrepancy when an asset only has a five-year service life but knows major repair was just performed on that asset; the Sub-AMP Manager can then check to see if the repair was loaded into the system.

*Proceed to Step 2.3.*

**Step 2.3 – Analyze and prioritize requirements and submit work request**

**Role: Sub-AMP Manager**

Analyzing the SMS outputs, the Requirements and Optimization (R&O) section analyzes and prioritizes the unconstrained requirements. Requirements are developed using the minimum programming requirements and standard project titles in the AMP/Comprehensive Asset Management Program (CAMP) NexGen IT or ACES-PM Data Entry Guide, as well as the data standards and IT systems each AMP and Sub-AMP specific business rules identify.

The AMP Manager discusses the R&O's prioritized requirements during the quarterly working group held with the Operations, Engineering, and Installation Management Flights to identify opportunities for in-house execution or contract mechanisms.

Per Air Force Instruction (AFI) 32-1001, *Operations Management*, Section 4.2, refer to AMP Playbook for guidance on analyzing asset data to align and de-conflict current and future investment requirements.

**Tips/Reminders:**

- Consider comparing BUILDER and NexGen IT or ACES data to determine and prioritize near-term requirements
- SMS Cost Analysis module will aid in determining the benefits of repair versus replacement (i.e., ROI), as well as the consequences of deferring work for a given item

*Proceed to Work Management Playbook, Process 2.0 Create Service Request.*

**Work Management Playbook, Process 2.0 Create Service Request**

This process determines whether the request becomes a Work Task or a Facility Project in NexGen IT and proceeds to the subsequent Process 3.0, Plan Work where the need for WRRB review and scope (i.e., Operations/in-house versus Engineering opportunity). For reference:

**Service Request**

The term "Service Request" replaces the AF Form 332, *Base Civil Engineer Work Request*, which is now obsolete. Each incoming requirement is first identified as a "Service Request" before being approved for accomplishment and routed either as a Work Task (to include Service Contracts) or Facility Project.

**Work Task**

The Customer Service Unit within the Operations Flight approves Service Requests denoting small-scale work and creates Work Tasks, similar to work previously known as Direct Scheduled Work. Work Tasks involve only one task and one shop. Work Tasks rarely require capitalization.

**Facilities Projects**

The Customer Service Unit converts Service Requests denoting large-scale work to a Facilities Project, similar to work previously known as Five Digit Work Order or Work Order. Facilities Projects usually involve multiple Work Tasks and shops. Facilities Projects can vary greatly in scale and may or may not result in capitalization.





## **SMS – 3.0 Forecast Out-Year Requirements**

[Introduction](#)

[SMS Drivers](#)

[Benefits & Practical Applications: What Can You Do with SMS Data?](#)

[Best Practices & Success Stories](#)

### **Introduction**

While asset inventories and assessments are tasks of asset management, the strength of SMS is in the analysis of the assessment data to determine investment or divestiture decisions. This is how we extract value from our data. Budget constraints and reduced resources are driving the need for defensible investment choices. A key factor in determining investment decisions is forecasting requirements in the out years. This out year analysis provides visibility of needed work at the right time BEFORE costly and unrecoverable degradation occurs. It also anticipates when assets will be at the end of life cycle and need replacement rather than continuing with costly repairs. It also provides the framework to create execution strategies and agile procurement mechanisms by better understanding the magnitude of future work. Forecasting also provides compelling data for budgeting and financial planning (POM) at the Air Force level as forecasted data are based on field-verified asset conditions versus intuitive estimates or historical experience.

### **SMS Drivers**

#### ***OSD Standardizing Facility Condition Assessments (10 SEP 2013)***

OSD/IE mandated standardizing the facility condition assessment process to contribute to a more credible DoD asset management program. This will also support more effective application of buying power by allowing Department leadership to better target fiscal resources to those facilities most in need of investment. Further, adopting a standard process will help ensure that condition data will be audit-ready in accordance with Under Secretary of Defense (Comptroller)'s "Financial Improvement and Audit Readiness guidance" (FIAR).

#### ***OSD Policy for Facility Sustainment & Recapitalization (29 APR 2014)***

OSD/IE established "Facility Sustainment and Recapitalization" policy that in part requires the following:

- OSD Goal of FCI of 80 for all facilities
- Mitigation Plans for Facilities less than FCI 60

Intent of the OSD policy is to support facilities through consistent long-term investment to keep facilities mission capable and in good working order. SMS can help identify which facilities are below FCI 60 and can generate what work is needed in the out years. SMS also can predict what facilities are approaching end of life and should be replaced or demolished. Bases can run FCI based reports to assist in programming needed work for facilities with an FCI of less than 60. OSD is also requiring "mitigation plans" for each facility below FCI 60. These plans indicate what kind of work is planned to improve FCI (repair, mothball, sell, demo, caretaker, etc.) and what year the work is expected to take place. Annually, HAF/A4 and AFCEC will collect and submit compiled mitigation plans from the bases in a separate tasking.

#### ***PAD 12-03***

Program Action Directive 12-03 implements CE Transformation and institutes Asset Management Principles across the Air Force. It specifically states that "As CE Transformation evolves over time, the majority of asset "life-cycle requirements" will be identified through the implementation of a sustainability management system (SMS) capability" (para 4.8.2.1, Page 13).

#### ***SMS and the AMP/CAMP Process***

SMS provides requirements to develop the Activity Management Plans (AMP) and assists in prioritizing



projects for the Comprehensive Asset Management Plans (CAMPs). A primary tenet of Asset Management is knowing asset condition and the requirements to maintain effective service life. AMPs are the collection of unconstrained requirements needed to maintain assets to meet a set "Level of Service" and maintain asset service life. SMS can systematically produce needed requirements that can be used to forecast needed funding. These requirements are eventually packaged into projects for prioritization, funding, and execution either locally through ExPlan funding or through a centrally funded process (e.g., Integrated Priority List [IPL]). See AFCAMP Playbook for more information.

#### **AFI 32-1001**

AFI 32-1001, *Civil Engineer Operations*, Chapter 4, *Asset Management*, requires standardized asset data collection and analysis to enable the optimization of current and future resource allocation against RP and RPIE, thereby driving down the life cycle cost of installation and mission support.

### **Benefits & Practical Applications: What Can You Do with SMS Data?**

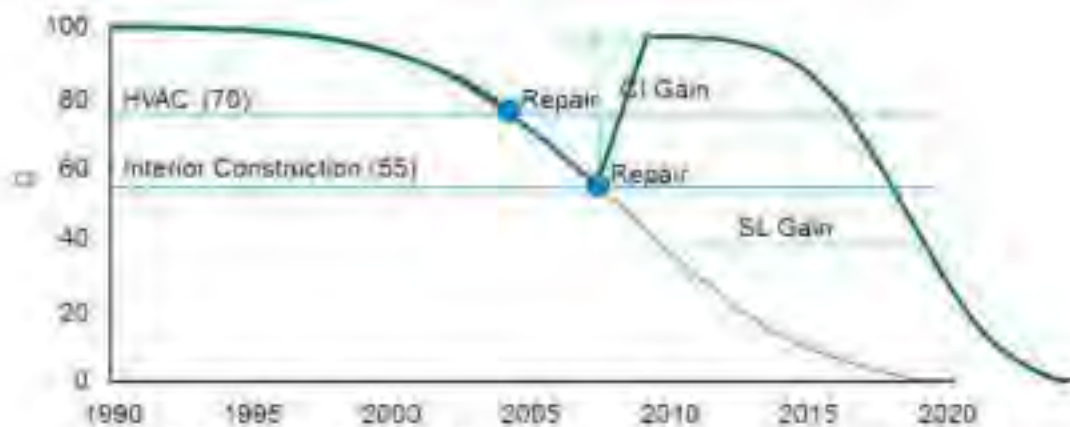
#### **Assess risk**

Risk (financial risk) in the SMS context is potential for the increasing cost of maintaining an asset when investment is not made to fulfil the expected remaining service life (RSL). Not investing will result in shortened service life, increased maintenance/service requests and degraded performance which ultimately increase Total Cost of Ownership. Items not completed in one year re-generate the following year at a higher cost due to inflation and for repair work types and the cost for additional degradation.

SMS data can be used to evaluate the magnitude of the financial risk of asset deterioration. Using the scenarios feature, several "what if" simulations can be evaluated to select the best option to pursue execution. It can evaluate the "do-nothing" option to model the projected effect and time of running an asset to failure. It also can assist in evaluating options in constrained and unconstrained budget scenarios.

#### **Determining requirements to lower lifecycle cost of ownership**

SMSs condition index trend analysis can search through a base's asset inventory to estimate the best time to initiate maintenance or repairs several years in advance. It is moving from "find and fix" to a "model and predict" strategy. This helps bases prepare out-year budgets and lowers the total asset lifecycle cost of ownership. Bases can anticipate the optimum time frame (i.e., the "sweet spot" zone) to repair specific components, minimize the penalty costs incurred from deferring maintenance, and later determine if work performed did in fact reduce the number of issues recorded against a given asset, resulting in lifecycle cost savings. The figure below illustrates how the SMS predicts future work requirements by analyzing condition levels along the service life of an asset. Work requirements will automatically generate when the condition drops below the enterprise policy level for that asset.



**Figure 5 Condition Index Trend Analysis**





### ***Inform resource allocation and investment decisions***

SMSs Work item Cost Analysis tool determines the return and return-on-investment (ROI) for each work activity type (do nothing, stop gap repair, repair, replace) to identify the most cost-effective options, showing the benefits of repair versus replacement as well as the consequences of deferring work for a given item.

### ***Auditing or Validating Project Proposals***

Bases can use SMS outputs to evaluate the best project proposals and requests for funding. SMS can provide hard data and analysis to justify funding actions. Specifically, SMS can predict when an asset's condition will fall below an acceptable threshold, triggering repair actions. Base-level users can leverage data outputs such as these to validate funding needs to local leadership.

For example, the AFCEC Project Scoring Worksheet requires all SMS components identified in the scope of each project proposed for centralized funding to be listed on the worksheet. Each component listed includes the component replacement value, remaining service life, and condition data. This enables the generation of a cost-weighted Probability of Failure (PoF) score that is used to compare risks of various project investments across the AF enterprise. This supports the enterprise ability to make data-driven decisions and further operationalize asset management principles. SMS serves as an advocacy tool ensuring intelligent allocation of available resources.

### ***Local Sustainment Decisions***

Sustainment includes the cyclical maintenance and scheduled repair activities to maintain the inventory of real property assets through their expected service life. It includes regularly scheduled adjustments and inspections, preventive maintenance tasks, and emergency response service requests for unscheduled minor repairs. It also includes major repairs or replacement of facility components (usually accomplished by contract) that are expected to occur periodically throughout the facility life cycle, and any inadequately-sustained components. This work includes regular roof replacement, refinishing of wall surfaces, repairing and replacing heating and cooling systems, replacing tile and carpeting, and similar types of work.

**Note:** Sustainment does not include restoration, modernization, environmental compliance, historical preservation, or costs related to unexpected events, which are funded elsewhere. (See AF 32-1020, Section 3.4.)

### ***Out-Year Forecasting***

Targeting work requirements and priorities for current year execution is the responsibility of AMP and sub-AMP managers, but they are also responsible for programming the long-term capital investment strategy of the infrastructure they manage. In developing a future-year capital investment plan, several policy decisions early in the planning process can wield a drastic influence on the overall lifecycle performance and long-term sustainment cost of facilities. The SMS process helps support these decisions by making the consequences of different investment policies clearer and defensible.

By using scenarios-based modeling, effects of varying condition standards, prioritization schemes, and budgets, AMP managers can analyze the lifecycle results to determine the most appropriate course of action for executing infrastructure sustainment, restoration, and modernization. It also provides a more logical means of identifying and justifying long-term budget requests. Finally, it provides an execution strategy that managers can use to match long-term capital budgets with specific inventory assets.

- **Consequence analysis:** The SMS framework provides analysis tools to identify facility and component level degradation. This tool allows engineers to explore different investment scenarios and evaluate the consequences over a determined amount of time. Forecasting can mitigate these negative future consequences by identifying candidate repair or replacement work items for inclusion in Preventive Maintenance programs, scheduled work prioritizations, and projects. Forecasting tools help illustrate the asset management impact of funding or not funding future work and the impact to the installation asset portfolio.
- **Strategic requirement grouping:** Combining associated requirements leads to scheduling and work efficiencies. Forecasting can identify logically associated work items or projects to promote time and cost savings. The SMS outputs can provide the vision to overlap future requirements for



cost savings and resource efficiencies: For example, a road replacement and utilities upgrades sharing the same fiscal completion year, or work items future schedule date falling into a preventive maintenance window for said asset. This information allows completion of the entire scope of work, for example, both road and underlying pipes can be repaired/replaced in an efficient and logical sequence (i.e., the pipes are fixed prior to road replacement). Having the total picture eliminates the nightmare scenario of repaving the road and later excavating it to complete the utilities project.

- **Streamline Execution Strategies:** As SMS generates requirements, Sub-AMP Managers can determine trends in their Activity and can begin to evaluate procurement or strategic sourcing strategies. An example of this is if SMS analysis reveals several roofs to be replaced in the next 5 years; does a roofing IDIQ contract vehicle need to be established? Can similar work (projects) be bundled in a single contract underfaking (streamlining the contracting process)? Can a greater return on investment be realized? Leveraging this insight can relieve "reactionary" procurement risking inability to execute.

#### ***Future Prioritization and Mission Value Visibility***

Bases create mitigation plans based on SMS-generated lists of worst assets in each component type. In addition, bases can have more complete visibility on high mission value assets as well as maintain condition awareness of lesser mission dependent assets. This visibility provides a better context for work prioritization as requirements across all facilities can be seen.

### **Best Practices & Success Stories**

#### ***Minot Air Force Base: Programming Boiler Replacements***

**Scenario:** Minot Air Force Base has boilers that have significantly reduced service lives due to mineral deposits. The municipal water supply has high levels of Total Dissolved Solids (TDS), or hard water.

**Problem:** Minot had issues conveying their boilers' deteriorating conditions and future needs.

**Solution:** SMS is permitting Minot to show in real time how this hard water is affecting a critical building system (heat generation), and SMS forecasting is projecting how long each boiler will potentially remain in service. This knowledge will allow a broad analysis of options. For example, Minot can decide whether it is best to anticipate funding the premature replacement of boilers or if a project should be funded to pretreat the hard water before it enters the utility grid. Most importantly, any member of the Civil Engineering enterprise with appropriate SMS permissions may log in and learn more about these boilers without ever setting foot in Ward County, North Dakota (Minot's location). SMS has allowed Minot's local knowledge to become enterprise-wide knowledge.

**Go to the SMS Topic Page for links to the SMS Workspaces to find additional Best Practices**

[https://cs2.eis.af.mil/sites/10159/SitePages/Topic%20Page.aspx?Topic=Sustainment Management System \(SMS\)](https://cs2.eis.af.mil/sites/10159/SitePages/Topic%20Page.aspx?Topic=Sustainment%20Management%20System%20(SMS))





## **SMS – Facilities Guidance**

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[Definitions](#)

### **Introduction**

This Facilities Supplemental Guidance expounds on the standard process information in the SMS Playbook particular to buildings and vertical facilities. It also includes specific information on leveraging BUILDER™, the authoritative SMS for facilities data, to support asset management efforts. This guidance aims to operationalize asset management principles, ensure effective BUILDER™ inputs, and help installations achieve compliance with both PAD 12-03, *SMS Implementation*, and OSD SMS mandates.

### **ROOFER**

AFI 32-1051, Roof Management Programs, has been rescinded. Now the authoritative SMS for roofs is BUILDER™, which must be utilized, updated, and maintained by the installation. All long-term roofing data elements/features should be incorporated into BUILDER™. BUILDER™ tracks information on the type and age and assigns a condition to the roof based on a fixed set of criteria, thereby providing a RSL prediction and revealing when to execute corrective maintenance or repair actions.

### **Getting Started**

#### **BUILDER™ POCs**

Each organization (IMSC Directorate, AFCEC Directorate, IMSC Detachment, MAJCOM, and unit/installation) appoints a primary and alternate BUILDER™ POC to work with the AFCEC BUILDER™ Program Manager. It is recommended that the installation BUILDER™ POCs be from the Operations and Engineering Flights. At the organization's option a Tertiary Program Manager may be appointed.

Organization level POCs will determine the number of BUILDER™ data manager, assessors and read-only users at their organizational levels. AFCEC BUILDER™ Program Manager distributes enterprise information on BUILDER™ program updates and changes to organization POCs for further distribution within their organizations.



NOTE! Organizations will submit their POC list/changes to AFCEC/COAF via email to [AFCEC.COAF.SMSBuilder@us.af.mil](mailto:AFCEC.COAF.SMSBuilder@us.af.mil) and include the POC's name, email address, organization/office symbol, and DSN and commercial phone number.

Installation POCs are responsible for ensuring data inputs and changes are accurate and current for all installation inputs. AFRC and ANG units/organizations comply with instructions provided by their headquarters A4C. The AFRC and ANG A4C POCs will disseminate relevant information from the Program Manager to their subordinate organizations.

Organizational BUILDER™ POCs should periodically run the User List report in BUILDER™ - see the BUILDER™ Custom Reports Guide available within the BUILDER software or on the BUILDER™ Workspace. POCs should review the list and request SMS Support, [SMSsupport@edc.dren.mil](mailto:SMSsupport@edc.dren.mil), to make inactive any personnel listed that no longer require access to BUILDER™ to include separated, retired, PCS, contractor, etc. personnel.

### **Data Access Authority**

- **Read-Only:** Permission to view BUILDER™ and export reports of inventory and inspection data.
- **Assessor:** In addition to Read Only, Assessor has permission to add, view, and edit Assessor's own inventory and inspection data. This includes exporting and importing BUILDER™ Remote Entry Data (BRED™) files.
- **Data Manager:** In addition to the above, Data Manager has permission to view and edit their ENTIRE ASSIGNED ORGANIZATION inventory, inspection data, and perform Work Plan execution. They can create/edit work plans and generate multi-year work plan scenarios. The Data Manager has the highest level of User privileges. Data Manager with Read Only Restriction can only GENERATE work plans and multi-year work plan scenarios.

It is recommended that installations appoint NO MORE THAN FOUR Data Managers at each installation. Too many data editors increase the difficulty to maintain data accuracy and quality, and also increases the risk of unintentional data loss.

### **Applicable Training**

The training program has transitioned from training located on the legacy AFCEC BUILDER™ SharePoint Site and that given by AFCEC/COAF to training programs provided by Air Force Institute of Technology (AFIT).

AFIT has developed three levels of training for BUILDER™ access training: Level 1 training is required for Read-Only; Level 2 training is required for Assessor; and Level 3 is required for Data Manager. The completion of each previous level of training is required to advance to the subsequent level of training.

The Level 1 Course has been developed and published. Since Jan 2019, all requests for BUILDER™ Read-Only access using the User Account Request Form USAF (see procedures below) have required POC certification of Training Level completed and the Date Completed from the AFIT WGMGT 131 SMS BUILDER™ Level 1 Course score sheet documenting completion of the course. A final exam score of 70% is required on the course score sheet to complete the course.

The Level 2 Course has been developed and published. All new Assessors must complete





the WMGT 231 SMS BUILDER™ Level 2 (Assessor Access) Course. As a minimum, to complete the course all four Sections of the Level 2 Course must be successfully completed. Students must complete all of the Section 2 Lessons as appropriate for their craft. Structural craftsmen and civil engineers must complete Lessons on B20 Exterior Enclosure, B30 Roofing, C10 Interior Construction and C30 Interior Finishes. Plumbers must complete Lessons on D20 Plumbing and D40 Fire Protection (Fire Suppression). HVAC craftsmen and mechanical engineers must complete D30 HVAC. Electricians and electrical engineers must complete D50 Electrical and D40 Fire Protection (Fire Detection). Those seeking to become Data Managers should take all Craft Specific Lessons. The organization level POC will submit an Assessor access request with POC certification of Level 2 completion and the Date Completed from the AFIT WMGT 231 SMS BUILDER™ Level 2 (Assessor Access) Course score sheet documenting completion of the course. Those personnel currently having Assessor or Data Manager SMS BUILDER™ access are not required to take the Level 2 Course to maintain their current level of access to SMS BUILDER™.

Level 3 Course has been developed and was published in January 2020. All new Data Managers must complete the WMGT 331 SMS BUILDER™ Level 3 (Data Manager) Course. The organization level POC will submit a Data Manager access request with POC certification of Level 3 completion and the Date Completed from the AFIT WMGT 331 SMS BUILDER™ Level 3 Course score sheet documenting completion of the course. Those personnel currently having Data Manager SMS BUILDER™ access are not required to take the Level 3 Course to maintain their current level of access to SMS BUILDER™.

Here is the [link to the AFIT Course List](#) with the BUILDER courses listed.

Course applicants for Level 1 Read Only Course need to select WMGT 131, read the instructions entirely, and select "Apply" at the bottom. Course applicants for Level 2 Assessor Course need to have completed WMGT 131 and need to select WMGT 231, read the instructions entirely, and select "Apply" at the bottom. Course applicants for Level 3 Data Manager Course need to have completed WMGT 231 and need to select WMGT 331, read the instructions entirely, and select "Apply" at the bottom.

Applicants will be able to start the course on the advertised course start date, but may be able to start sooner if they already have a Canvas account. Currently, there are instructions at the end of the course directing the student to print/save their course score sheet. Information from the score sheet is needed by the unit POC when requesting BUILDER™ access.

Contractors having an AF CAC (BOS bases and others) may take the courses at no cost and they follow the same procedures except applicants put their Contracting Officer's Representative (COR) on the registration form instead of their supervisor (this is explained in the application instructions in red). The application instructions also state tuition fees for contractors are waived for the course. Contractors will have to complete the following form which tells them to provide a memorandum from their company / firm Human Resources department certifying employment by the firm and assignment working on the specified contract. These forms are required of all contractors who take an AFIT CE School course.



The Civil Engineer School



*Contractor Attendance*  
*The Civil Engineer School*  
*Air Force Institute of Technology*

**Requestor Information**

Name of attendee: \_\_\_\_\_

Name of Company or Firm: \_\_\_\_\_

Contract and Task Order #s with DoD or Air Force: \_\_\_\_\_

Government Contracting Officer's Name, Phone and email address: \_\_\_\_\_

\_\_\_\_\_

*Must also attach a memo from the Company/Firm Human Resources department or contract/task order manager certifying the employee is employed by the firm and working on the contract/task order specified above.*

**Course Information**

Course Name and Number: \_\_\_\_\_

Course Dates: \_\_\_\_\_

*Note: Attendance will be on a space-available basis. The appropriate course cost will be paid prior to admittance into the class.*





## Access Requirements

All requests for rights to BUILDER™ data (Read-only, Assessor or Data Manager) must be coordinated through SMS Support to AFCEC's Air Force BUILDER™ Account Verifier for approved access rights to BUILDER™ FOUO data. The BUILDER Access Request Form for USAF is accessible from the SMS BUILDER Workspace here: <https://cs2.eis.af.mil/sites/10758/BUILDERSMS/SitePages/Home.aspx> (See sub-page titled "Using BUILDER") Or alternatively the form is available from the CERL SMS website here: [https://www.sms.erdc.dren.mil/Portals/0/BUILDERDownloads/BUILDER\\_Access\\_Request\\_form\\_v9.2.pdf](https://www.sms.erdc.dren.mil/Portals/0/BUILDERDownloads/BUILDER_Access_Request_form_v9.2.pdf)

Ensure you use the latest Access Request form as the form has changed to accommodate documentation of Level of training and Date completed data that must be included with the request. The form is self-explanatory. One of the organization's appointed BUILDER™ POCs must originate all requests (as the Requesting POC), complete the majority of the form, and submit through SMS Support Help Desk to AFCEC's Air Force BUILDER™ Account Verifier for approval. The organizational POC for all AFCENT locations is Rob Padar, [robert.padar.1-ctr@us.af.mil](mailto:robert.padar.1-ctr@us.af.mil). The form is programmed to launch Microsoft Outlook and draft a message to SMS Support once the "Submit" button is clicked. Again, the form must be launched through the email of a POC listed for the organization. The Requesting POC submitting the request is certifying the individuals have an access need at the role requested, understand the protection of FOUO data, and have completed required training in accordance with this Playbook. For organizationally assigned military, civilian, and contractor personnel holding CAC cards, the Comments section on the form must include a comment stating "Required Training for the requested Role has been completed." If access is being requested for contractor personnel conducting an FCA contract, the task order completion date must be included in the Comment section of the form and the contractor is responsible for assigning roles and ensuring their personnel are adequately trained. Organizations should forward any questions to Mr. Bill Valenti, [AFCEC.COAF.SMSBuilder@us.af.mil](mailto:AFCEC.COAF.SMSBuilder@us.af.mil), AFCEC/COAF, or via the AFCEC Reachback Center (850-283-6995).

## Equipment Requirements

### Recommended:

- Personal safety equipment
- Digital camera
- Flashlights
- Infrared thermometers
- FLIR Infrared/thermal cameras

### Nice to have:

- Light intensity meter
- Laser distance meter
- Tablets for field data entry
- HVAC inspection scope (to read hidden/obstructed nameplate data safely)

The above equipment lists apply to direct visual assessment, only. It is recommended that installation personnel not invest in more extensive diagnostic equipment for the purposes of infrastructure assessments since BUILDER™ assessments are visual in nature.



## Tablets

AFCEC highly recommends unit personnel acquire tablet computers for use in conducting facility condition assessments. Experience has shown that tablets are useful to capture and confirm data during field work.

## BRED™

BRED™ software is available to help facilitate the condition survey inspection process. BRED™ will help capture field data and observations into a local computer file that can be imported to the web-based BUILDER™ database. This software is compatible with pen-based electronic clipboards, laptop computers, and desktop computers and can be used with or without an internet connection. Use of this electronic method of data collection is optional, but it offers significant advantages over paper forms including time savings, error reduction, on-screen sample tracking, and on-screen condition checklists to speed data collection. However, there are also some challenges to this approach such as the cost of equipment requirements, battery life limitations, and potential for computer/software malfunctions in gathering or downloading data.

NOTE: HQ AFSPC/A6S previously certified BRED™ version 3.x software as part of the Software Products Approval Process for Software Products Approved for Reciprocity. BRED™ is approved via reciprocity by Certificate of Networthiness (CoN) through the Army Networthiness program. However, the local Designated Approval Authority (DAA) must still update their Authority to Operate (ATO) to include it on the local system or enclave.

## Assessments

Per the DoD Mandate, *Standardizing Facility Condition Assessments*, Military Departments will ensure that the SMS computed FCI for all assets on their installations are entered into the real property database. This includes the FCIs for facilities occupied/used by tenant organizations per DoDI 165.70, *Real Property Management*.<sup>4</sup> The host installation is responsible for ensuring the completion of assessments for all built infrastructure on the installation. It is recognized that other tenant units will be conducting condition assessments on their assets. Table 9 below lists examples of AFCEC-confirmed facilities that would need to be assessed by the Base Civil Engineer staff as well as agencies that will conduct their own assessments. Please contact the AFCEC Reach-Back center, DSN 523-6995, with questions regarding assessment responsibilities.

ASSESSED BY CIVIL ENGINEER STAFF (NOT EXHAUSTIVE)
<ul style="list-style-type: none"><li>• All built infrastructure on the installation (exceptions below)</li><li>• Army Air Force Exchange Service (AAFES) facilities</li><li>• Navy Exchange (NEX) facilities</li><li>• Non-Appropriated Funds (NAF) facilities</li></ul>
NOT ASSESSED BY CIVIL ENGINEER STAFF
<ul style="list-style-type: none"><li>• Defense Commissary Agency (DeCA) facilities</li><li>• Defense Health Agency (DHA) facilities</li><li>• Department of Defense Education Activity (DoDEA) facilities</li><li>• Defense Logistics Agency (DLA) facilities</li><li>• Air National Guard (ANG) facilities</li><li>• Privatized housing</li></ul>

Table 9 Civil Engineer Staff Assessment Responsibilities

### Prioritizing Building Systems and Facilities for Assessment

Facilities to be assessed are "Type B" (buildings), "Type S" facilities (structures) and "Type LS" facilities (linear structures).





In order to optimize manpower efforts, assessment of these facilities should be prioritized based on value to the overall mission as listed in the below Mission Dependency Index (MDI) ranges:

Priority	MDI
High	99 to 86
Med	85 to 70
	69 to 45
Low	44 to 26

#### **Required Building Systems for Assessment**

As a minimum, to have a complete facility assessment for most buildings and structures, the following seven Key Building Systems, if present, are to be assessed to the Component Section Level as defined in BUILDER™ every five years unless required more frequently by other guidance:

B20: Exterior Enclosure

B30: Roofing

C10: Interior Construction

D20: Plumbing

D30: HVAC

D40: Fire Protection

D50: Electrical

A facility assessment is considered complete when all seven of its Key Building systems (or systems as applicable to the facility) have been assessed and the data inputted into the SMS.

Dormitories and Military Family Housing facilities additionally require the C30: Interior Finishes system be inventoried and assessed and the data inputted into the SMS to be considered complete.

Building systems not listed above, (such as A10: Foundations) may not require initial assessments, as these systems typically have longer life cycles with minimum repairs/maintenance and degrade very slowly over their lifecycle. The specific enterprise criteria for evaluating all 14 BUILDER™ Facility Systems have been developed as system Inventory and Assessments Manuals. NOTE: The Manuals are considered attachments to the SMS Playbook and are located in the FCA Toolbox Section 2.

If systems such as foundations (A10), super structures (B10), or other unlisted systems are found in degraded condition or warrant repairs that are likely project candidates, installation personnel must perform a BUILDER™ condition assessment on those affected systems. Additionally, many buildings and structures like hangars, warehouses, munitions storage facilities and pavilions have systems A10 (foundations) and super structure (B10) that are easily viewable and should be inventoried and assessed in BUILDER™.

Aircraft Arresting System Supports are inventoried and assessed in A10 – foundations.

Facilities not having any of the key systems such as Aircraft Sunshelters, Jet Blast Deflectors, various towers, support structures and reviewing stands are inventoried and assessed using B10 – Super Structures. See the B10 Super Structures Inventory and Assessments Manual for details.

Many facilities are considered G20 Site Improvements and can only be inventoried within the G20



system. These include, but are not limited to, billboards, flag poles, various athletic fields, recreational courts, playgrounds, fences, decorative fountains and ponds, and mechanical security barricades. See the G20 Site Improvements Inventory and Assessments Manual for details.

Missile Alert Facilities (MAFs) and Launch Facilities (LFs) have unique inventory requirements of the Real Property facilities at these GSUs. The following Real Property facilities at MAFs and LFs must be inventoried and assessed in SMS BUILDER: MAFs: Missile Ops Buildings (MOB), Fences – both boundary and security fences to include ATRP barriers and bollards - if not a separate Real Property facility, ATRP barriers and bollards - if separate facility, Communications Tower - if present as a separate facility, Vehicle Ops Heated Parking Buildings, Water buildings – structure only, Wells – structure only if the well utility components are protected by a building or structure, and Flag pole - if present. LFs: Electrical Power Station Buildings and Fences and gates. Many components within some of the facilities at MAFs and LFs are considered Weapon System components and are not Real Property to be inventoried in SMS BUILDER. The following details Real Property in the various facilities to be inventoried in SMS BUILDER IAW the HAF/A4C memorandum Request for Real Property Installed Equipment (RPIE) Determination for Intercontinental ballistic Missile (ICBM) dated 10 Feb 16 and AFGSCI 32-1005, *Intercontinental Ballistic Missile (ICBM) Real Property/Real Property Installed Equipment (RP/RPIE) Responsibilities And ICBM Infrastructure And Equipment Responsibilities*:

MAFs include the Missile Ops Building (MOB), Vehicle Ops Heated Parking Buildings, & Water Buildings (if present in Real Property records). Inventory/assess the seven key systems above ground IAW the system inventory and Assessments Manuals. NOTE: C30 and other systems are optional (E, F, and G systems are not inventoried with Buildings). Include

<i>Missile Facility for Inventory/Assessment:</i>	<i>Systems:</i>
MAF: Overhead Doors	B20
MAF: Storage Tank TK123, Water Heaters	D20
MAF: Air conditioners, Energy Management Control Systems – IAW D30 Manual instructions, Oil-Fired Furnaces, Gas-Fired Furnaces, Electric Unit Heaters, Electric Boilers, Heat Pumps, Hydronic Heaters, Evaporators, Roof Exhaust Fans (optional), Condensing Units, Baseboard Heaters, Electric Unit Heaters, Exhaust Fans	D30
MAF: Fire Alarm (FA) Control Panel and Devices, Fire Suppression Systems	D40
MAF: Electric Utility Meters, if only for the MOB or other buildings, otherwise utility, Diesel Electric Units (DEU) (generators), Disconnect Switch (if for Automatic or Manual Electrical Power source Transfer Switch), Power and Lighting Panels, Power System Alarm and Control Panel (if for Automatic or Manual Electrical Power source Transfer)	D50
Elevator Shaft (Considered underground part of MOB):	
Elevator Concrete Shaft: Floor, Cast In Place (CIP) Concrete Floor	B101003
Elevator Concrete Shaft: Walls	A202001
Elevator Concrete Shaft: Ceiling (Roof Decks & Slabs-CIP Concrete Slab)	B102003
Launch Control Center (LCC) (Considered underground part of MOB):	
LCC Concrete Structure: CIP Concrete Floor	B101003
LCC Walls: Basement Walls Construction, CIP Concrete	A202001
LCC Ceiling: Roof Decks & Slabs CIP Concrete Slab	B102003
LCC Escape Tunnel and Hatch (ETH):	
ETH Floor: CIP Concrete Floor	B101003
ETH Walls: Basement Walls Construction, CIP Concrete	A202001
ETH Ceiling: Roof Decks & Slabs CIP Concrete Slab	B102003



<i>Missile Facility for Inventory/Assessment:</i>	<i>Systems:</i>
ETH Hatch: Doors	B20
Launch Center Electric Building (LCEB) (Considered underground part of MOB)	
LCEB Concrete Structure: CIP Concrete Floor	B101003
LCEB Walls: Basement Walls Construction, CIP Concrete	A202001
LCEB Ceiling: Roof Decks & Slabs, CIP Concrete Slab	B102003
Fencing (fence)	G20
Vertical Gates (gates)	G20
Crash Barrier: Inventory as separate facility in Real Property or as part of the Real Property Fence, as appropriate.	G20
Barriers and Bollards: Inventory under fences.	G20
Radio Tower (Communications Tower): Inventory as separate Real Property facility or attached to MOB, as appropriate.	A10, B10
Wells: Inventory only the structure, if present, protecting the utility assets. Also inventory key systems present, as required.	Various
Flagpole	G20
Launch Support Building (LSB) Usually referred to Electrical Power Station Building (Underground building)	
LSB Concrete Structure: Floor (CIP Concrete Floor)	B101003
LSB Concrete Structure: Walls, Basement Walls Construction (CIP Concrete Walls)	A202001
LSB Concrete Structure: Ceiling, Roof Decks & Slabs (CIP Concrete Slab)	B102003
Fences and Gate, HICS Gates	G20
Bollards: Inventory as part of fence facility if not separate facility	G20

For other regularly occurring inspection programs, such as fire protection or roofing, data from required forms (e.g., AF Form 1487, Fire Prevention Visit Report) should be copied into the BUILDER™ SMS.

### **Standardized Method of Performing Assessments**

Any condition assessment executed by the installation, MAJCOM, AFCEC, or contractor working on their behalf will follow the BUILDER™ SMS methodology. Inventory collected will be entered into the USAF BUILDER™ database utilizing the American Society for Testing and Materials (ASTM) E-1557 UNIFORMAT-II methodology.

Assessments will be carried out using the BUILDER™ SMS Facility Condition Assessment (FCA) methodology that utilizes the Direct Condition Rating criteria. Further details regarding the standardized BUILDER™ methodology can be found in the BUILDER™ Getting Start Guide and BUILDER™ Inventory Guide at the SMS BUILDER Workspace here:

<https://cs2.eis.af.mil/sites/10758/BUILDERSMS/SitePages/Home.aspx> and at the CERL SMS website here: <https://support.sms.ercd.dren.mil/downloads>

Additionally, Air Force specific technical guidance for standardized inventory and assessment criteria is contained in system specific Inventory and Assessments Manuals contained in the FCA Toolbox here: <https://cs2.eis.af.mil/sites/10041/CEPlaybooks/SMS/Pages/Overview.aspx> and are considered attachments to the SMS Playbook.

For missing components or Fire Safety Deficiencies (FSD), Risk Assessment Codes (RAC), Waiver and Compliance issues:





The BUILDER™ Direct Condition Rating Assessment Matrix has been rescinded and is no longer valid. Consult the latest AF Comprehensive Asset Management Plan (AFCAMP) Playbook and Playbook Toolbox for guidance on entering data into BUILDER™. The latest Matrix may also be found at: [https://cs2.eis.af.mil/sites/10542/page/Pages/AF\\_CAMP.aspx](https://cs2.eis.af.mil/sites/10542/page/Pages/AF_CAMP.aspx)

### ***Installations with Base Operations Support (BOS) Contracts, Base Maintenance Contracts (BMC), or contracted Operations Flights***

These installations will have to evaluate current contract provisions for inclusion of built infrastructure assessments. Installations with contracted operations and maintenance activities can also elect to contract or sub-contract out initial or recurring assessments. However, the long-term objective is to establish the organic assessment capability integrated into the day-to-day shop level activities to complete all FCAs and future reassessments on a five-year cycle. These installations are encouraged to reach out to AFCEC for a technical consultation regarding integrating standard BUILDER™ implementation capabilities into their respective performance work statements. Bases should contact AFCEC/COAF if they require assistance with incorporating BUILDER™-specific verbiage into their BMC contracts. AFCEC/COAF POC's are Mr. Bill Valenti and Mr. Bob Hill, [AFCEC.COAF.SMSBuilder@us.af.mil](mailto:AFCEC.COAF.SMSBuilder@us.af.mil).

## **Metrics**

### ***Calculating Assessment Completion Rates***

A facility assessment is considered complete when all of the required systems measured at the Component Section Level that exist in the facility have been inventoried and assessed and the data inputted into BUILDER™.

When determining the assessment completion percentage of an installation, the total number of facilities and the total square footage of facilities, as documented in the Accountable Property System of Record (APSR), which is the authoritative data source for real property records, will be utilized as the baseline. Thus, 50% of the square footage of an installation assessment completed means 50% of the total installation square footage has been assessed (as opposed to the number of buildings or the number of assessed building systems). Similarly, 50% of the facilities complete means that 50% of the total installation facilities by count have been assessed. BUILDER™'s QA 13A Report provides the status of each of the 14 Building Systems for each facility/base and shows base completion according to both number of facilities (count) and square feet (SF).

When determining the assessment currency completion percentage of an installation, the total number of facilities and the total square footage of facilities, again as documented in the APSR, will be utilized as the baseline. The OSD Mandate requires assessments on all real property at least every five years. Thus, for a facility to be current, at least 75% of the inventoried sections of each system must have an assessment within the past five years for the system to be current. All of the required systems must be current for the facility to be considered current. BUILDER™'s QA 13B Report provides the status of each of the 14 Building Systems for each facility/base and shows base currency according to both number of facilities and square feet.

## **Schedule of Assessment Completion**

Once an installation's facilities have been completely assessed, they must be re-assessed at least every five years as they become due. AFCEC recommends that every installation immediately begin their 5-year reassessment cycle if not already underway. This means that approximately 20% per year by both count and by SF must be reassessed in order to continue to maintain BUILDER™ condition assessment data current. Routine update inputs should continue as part of ongoing day-to-day business operations for each work center responsible for sustaining inventoried assets. Many bases have developed customized methods for strategically scheduling reassessment work to maximize results while minimizing unnecessary labor effort.

Two primary approaches have developed from experience: The first is the Maintenance-Based Assessment strategy which involves completing annual reassessments in conjunction with every annual preventive maintenance task that is performed across the civil engineer in house work centers. Although this approach





does not cover all inventoried assets that require reassessing, it does enable capturing important condition changes for all of the most critical and valuable assets in service because those will be on the preventive maintenance task list. The second strategy requires the work centers to loan personnel to the Requirements and Optimization (R&O) work center to form an assessment team and focus their efforts full time on performing reassessments. In either case the R&O personnel maintain oversight of the assessment data update process as agreed upon between assessors and data managers. Either approach can achieve the required assessment completeness and currency results, and both are therefore deemed acceptable.

### ***Accomplishing the Task by Manpower Alignment***

Every base is different – size, composition, and mission all affect the types of built infrastructure on base and feasible methods of conducting ongoing assessments. The information below reflects the various approaches, results, challenges, and best practices that have occurred at various locations across the AF.

**Typical Team Construct:** (Facility Condition Assessment [FCA] Team). A full-time FCA team should include at least one each of the specialists listed below. The lead can be “dual-hatted” as one of the assessors.

- Lead – Requirements and Optimization (R&O) Non-Commissioned Officer in Charge (NCOIC)
- Electrical Systems Specialist and/or Electrical Power Production Specialist
- Water/Fuel Systems Specialist
- Structures Specialist
- HVAC Systems Specialist
- Engineering Assistant (Optional)

#### ***Approach:***

As noted above, there are two primary approaches for sustaining complete and current inventory and assessment data. Assuming the Operations Flight has established an R&O work center as a part of the CE transformation, the team approach can be used to focus technicians full time on performing assessments. This manpower alignment allows the capability to rapidly conduct Built Infrastructure inventories and assessments. The R&O engineers and technicians must be trained on BUILDER™ fundamentals to facilitate getting good results. Experience has shown that loaning technicians to the R&O section for at least a one year duration worked best at developing a competent and trustworthy BIAT team utilizing craftsmen, typically from the four work centers—HVAC, Electrical or Power Pro, Structures, and Water/Fuels. During the inevitable turnover of personnel, the FCA team personnel should be overlapped for at least two weeks during the transition phase allowing for one week of training and one week of shadowing to provide continuity. This teaming concept also supported the base's long-range plan to train shop personnel to conduct inventories and assessments in order to integrate BUILDER™ into day-to-day operations.

At another location, the Facilities AMP Manager led the Facility Assessment Team in conducting the initial assessments. They used as-built drawings, and if a component was not straight forward in terms of its direct rating deficiency, the AMP Manager consulted with the shop supervisors and shop leads (typically retired Air Force craftsmen) to complete the assessment. If the shop supervisors were unsure, the AMP Manager would defer to the organization's engineers as a final reach back resource. The AMP Manager reviewed as-built drawings and entered data into BUILDER™.

As the inventories and initial assessments were completed, the ratings were submitted to the shop supervisors for their input and review. This process was successful and, after a few rounds, the shop supervisors began asking for inventories and would assist in the assessment process as they performed their day-to-day operations. The team grew as time progressed and relationships developed. The monthly AMP meetings where the assessment process was discussed quickly turned into many spirited debates about the importance



of the ratings, the quality of BUILDER™ inputs, and how everyone could use the data going forward.

Building assessment schedules and priorities were developed using a weighted system that calculated MDI, Age and M&R data to include backlog work items. The R&O technicians were responsible for oversight of all assessment scheduling and BUILDER™ management to include data quality control and upload. The FCA team conducted inventories and assessments using Real Property Inventory records within BUILDER, building drawings, and computer tablets configured with BRED™ software. The R&O technicians were responsible for collaborating with the RPO and providing RP record updates with any Found on Base (FoB) assets or adjustments by establishing a DD Form 1354 utilizing UFC 1-300-08 guidance.

During the analysis process, the R&O sub-AMP managers continually updated BUILDER™ by generating work items for each assessed building to create work items analysis tools and reports. All reports from BUILDER™ and NexGen IT were analyzed to identify degraded asset conditions, RSL schedules, and backlog work tasks to target "worst-first" systems. Once degraded and at-risk systems were identified, BUILDER™ output data was used to validate projects in NexGen IT while establishing new opportunities, requirements, and service requests. The R&O work center developed stand-alone or bundled requirements for either in-house or Sustainment, Restoration, and Modernization (SRM) contract project execution.

### **Results:**

- Data collected allowed a more straightforward ranking for projects or work orders to undermine the current "I'm the most important thing on this base" issue
- Data collected allowed identification of sections within buildings that were in dire need of repair or replacement that wouldn't have been identified due to the systems still "working"
- Scores allowed direct identification of the truly worst systems in need of repair or replacement
- Revealed that the current process for identifying projects and opportunities was not sufficient to meet AFCAMP requirements
- Revealed three facilities that were under the radar but in desperate need of attention (e.g., FCIs < 60), resulting in an unexpected amount of project opportunities
- Data-driven model demonstrated to leadership what was common knowledge at the shop: the facility infrastructure was degrading as soon as replacements were completed
- Using the new SMS model allowed to plan development and funding for future large projects in the most mission critical facilities. The SMS system allowed the team to allocate funding where it was truly needed
- Commanders appreciate the data-driven recommendations informed by the trend and root cause analysis enabled by SMS when considering and approving opportunities
- BUILDER™ SMS has "armed" squadron leadership with a site picture of RPIE across the base. This enabled Commanders at the Group level to see immediate funding needs (i.e., ability to prioritize "the needs" over "the wants") during facility boards

### **Challenges and Lessons Learned:**

- Leave/TDY/Deployments/Appointments can make it difficult to keep a coherent FCA team functional and productive
- Personnel transitions within the R&O section coupled with the amount of knowledge needed in these positions makes for a steep learning curve in an environment that does not slow down.





Careful planning of turnover to ensure continuity and detailed turnover procedures are essential.

- Having tablets that cannot connect to either the network or a Wi-Fi signal make getting information from BUILDER™ and loading the BRED™ files back into BUILDER™ a hassle with several steps (download to local computer, move to external hard drive, connect hard drive to tablet, move file to tablet and reverse for getting the file back to BUILDER™).
- Institutional knowledge of the craftsmen that have been on base for a while is extremely valuable.
- Shift the assessment process to maintain the database and have the follow-on assessments completed by the shops as part of their PMTLs. Train the craftsmen on how to assess the components and then "calibrate" the craftsmen so everyone's assessment will be as close to the standard as possible and minimize personal bias.
- Allow all team members to voice their opinions or they may become disenchanting and disengage from the process making completion almost impossible
- Determination and perseverance are essential especially when starting the process. The shops may hesitate to give all the information needed but upon realization that the program is permanent, they will give the R&O team a wealth of information and data

#### **Best Practices:**

- Keeping a list of all shop personnel who have been on the FCA team provides the capability to backfill positions for a short time without having to train a new person.
- Teaching the FCA team members what R&O's mission is provides a keen insight to CE transformation and the importance of SMS. The team understands how the inspection process relates to future requirements and allows communication from the technicians in the field. This collaborating provides key information about Built Infrastructure systems that might have degraded since previous inspections and potentially require re-inspection.
- Using tablets with BRED™ allowed for more accurate data collection and detailed inspections
- Having all the positions filled (AMPs and SUB AMPs) is the only way to truly move forward through CE Transformation and allow for the most efficient use of people and materials
- Weekly coordination with RPO to ensure RP updates were reconciled in a timely fashion
- Provided BUILDER™ analysis to Engineering to ensure BCIs were legitimate and to validate RPIE replacements (i.e., prove a RPIE item would not be better served with a PM update or funding a project based on an out of date (invalid) SMS entry)
- R&O attends weekly Civil Engineering (CEN) project review meetings to assist in BUILDER™ validation. Its role at the meetings includes tracking completed facilities for assessment; identifying erroneous data used to start projects; reviewing BUILDER™ SMS data and secondary assessments; participating in discussions relevant to the SMS or project processes. R&O also helps CEN find the correct condition indices (i.e., BCI, CSCI, etc.) so CEN can estimate project funding
- Added BUILDER™ SMS validation to the work order closeout process. This provides a documentation trail displaying what work is being completed on base, whether in-house or contract, and identifies the need for SMS equipment data updates or new inspections
- BUILDER™ SMS is a living data base. Maintenance and upkeep is essential when new situations/updates



arise to keep accurate and current data. To combat this issue, R&O has integrated into the schedulers' meetings. R&O identifies systems that are called into question and provides BUILDER™ SMS data updates to reflect repairs in the system. Often, this calls for a new assessment, in which case, the squadron has a BUILDER™-trained person in each shop able to assess the repaired RPIE item. Alternatively, R&O can perform an inspection with the AMP Manager, Sub-AMP Managers or planners. The R&O section "triple hats" these duty positions as current staffing levels do not provide the personnel to fill the current P-Plan manpower allocation

## BUILDER™ Outputs

Table 10 below shows BUILDER™ outputs and their end use. Please note that this table does not show all possible alignments of BUILDER™ outputs, rather it is intended to illustrate the minimum connections.

Table 10 BUILDER Outputs

FUNCTIONAL AREAS RELYING ON BUILDER OUTPUTS								
	CONDITION INDEX	REMAINING SERVICE LIFE	WORK ITEM	FUNCTIONALITY INDEX	FACILITY CONDITION INDEX	RAW SCORED LIST	MODELING	WARRANTY
OPERATIONS FLIGHT	X	X	X	X	X	X	X	--
OPERATIONS ENGINEERING ELEMENT	X	X	X	X	X	X	X	
ENGINEERING FLIGHT	X	X	X	X	X	X	X	-
MAJCOM	X	-	-	X	X	X	X	-
PLANNING AND INTEGRATION (AFCEC/OP)	X	X	X	X	X	X	X	--
ASSET VISIBILITY TEAM (AFCEC/COA)	X		-	X	-	-	-	-
IWI							X	-
WORK PRODUCTS INCORPORATED IN BUILDER OUTPUTS								
INTEGRATED WORK PLAN	-	-	X	-	-	-	-	-
BASE IPL	-	-	-	-	-	X	X	-
PROJECT	X	X	X	X	X	X	-	-
INSTALLATION DEVELOPMENT PLAN	-	-	-	-	-	-	X	-
MAJCOM IPL	-	-	-	-	-	-	X	-

## Definitions

**BCI:** The BCI measures the condition of the building as a whole. It is computed by averaging the condition indices of the building systems, weighted by the replacement costs of the systems.

**FCI:** The (FCI) is the industry standard index calculated by dividing the total cost of necessary repairs in the building divided by the replacement cost of the building. In BUILDER™, the total cost of necessary repairs is estimated by summing the individual section repair costs.

**CSCI:** The component-section is the "management unit" upon which asset management decisions are made, and the CSCI is the fundamental index metric in BUILDER™. As the fundamental condition metric for building assets, the CSCI is aggregated using a bottom-up approach to determine a Building Component Condition Index (BCCI), a System Condition Index (SCI), and a Building Condition Index (BCI). This





hierarchy is illustrated in the figure below. Likewise, the BCIs can be average or aggregated for groups of buildings, complexes, or entire installations (or portfolios) to represent an overall condition indicator. BUILDER™ contains the programmed algorithms to compute the CSCI metric and all higher corresponding CI metrics from the condition survey data that is entered.

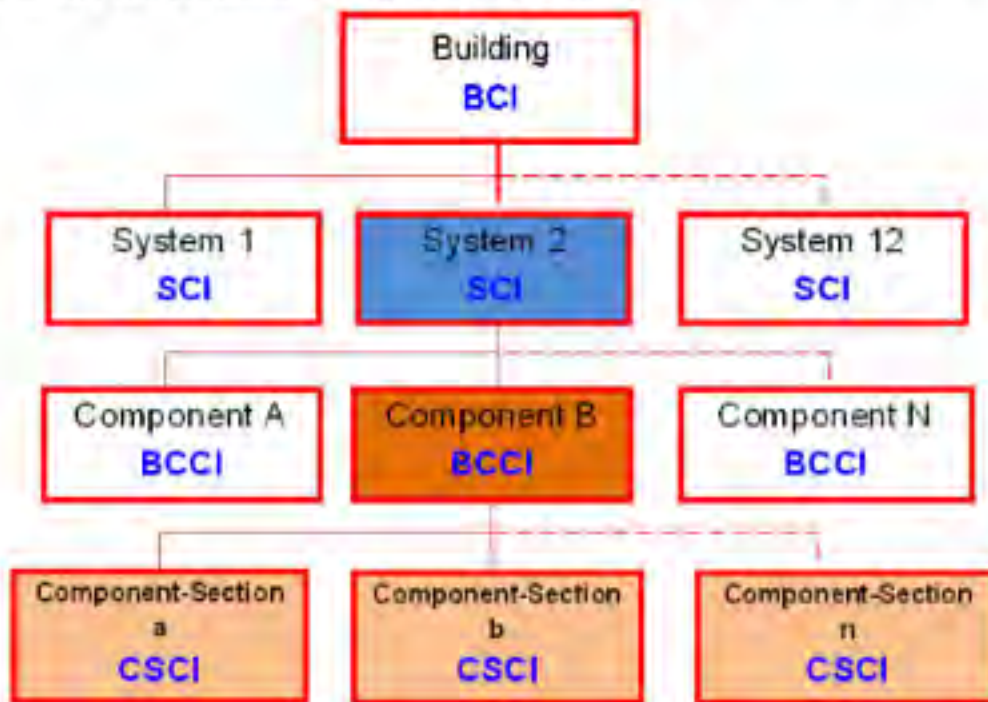


Figure 7 Condition Index Hierarchy



## **SMS – TNAP Guidance**

[Overview](#)

[Asset Management](#)

[TNAP SMS Background and Systems Description](#)

[Data Access Authority](#)

### **Overview**

This TNAP Supplemental Guidance provides an overview of the Air Force Transportation Network and Airfield Pavement (TNAP) Asset Management Program and how Sustainment Management Systems (SMSs) and other pavement and non-pavement evaluation tools are used to meet Air Force operational requirements, manage Air Force TNAP assets, and achieve the standardized facility condition assessment objective outlined in the Under Secretary of Defense, Acquisition, Technology and Logistics 10 Sep 2013 Policy Memorandum for SMS implementation. This memorandum mandates that the Air Force properly record a facility condition index for each asset at each installation.

The Air Force pavement community has collected pavement inventory and condition data by conducting Pavement Condition Index (PCI) Surveys for airfield, road, and parking pavements. Additionally, structural data for airfield pavements has been collected. Currently, the Air Force has PCI and structural data for 100% of airfield pavements and 100% of PCI data for road and parking pavements at our main operating bases. We have limited pavement condition data for road and parking pavements at geographically separated units (GSUs) and ranges which constitutes approximately 9% of the entire pavement inventory. The PAVER SMS is available for managing the airfield pavements and the road and parking pavements and is currently being updated to manage other non-pavement TNAP assets as determined by the TNAP AMP community.

The RAILER SMS is available for managing rail systems but not used consistently across the AF. There is currently no SMS specifically established for other non-pavement TNAP assets, but there is condition data on bridges, arresting systems and other TNAP assets in disparate decentralized data sources. This document outlines the plan to capture inventory and condition data on TNAP assets where it exists, define criteria to rate the condition of TNAP assets if such criteria does not exist, define procedures and processes for collecting data where they do not exist, and identify the SMS to be used to collect and house this data for use in managing all TNAP assets.

### **Asset Management**

The Air Force has established a goal to reduce the amount of infrastructure in accordance with AFPD 32-10. AFPD 32-10 states "Provide and retain the minimum number of installations and facilities necessary to effectively support Air Force missions and people at the lowest life-cycle cost and in a sustainable way. The Air Force will inactivate or dispose of installations and facilities that are excess to requirements." SMSs provide data on funding required to maintain / repair essential infrastructure at a prescribed level of service at the lowest possible life cycle cost to accomplish this goal.

Infrastructure is divided into five activities: Transportation Networks, Utilities, Facilities, Real Estate, and Natural Infrastructure. The transportation networks include asset groups such as airfield pavements, roads and vehicle parking areas, curbs and gutters, drainage structures, culverts, bridges, sidewalks, markings, traffic signals, signs, airfield lighting, rail systems, and ports (wharfs and piers).

Activity Management Plans (AMPs) developed for each of these major CE activities. These plans include information on Real Property inventory, Levels of Service (LOS), Key Performance Indicators (KPI), and the planned investments (projects/requirements) identified to achieve the required LOS.





## ***TNAP SMS Background and Systems Description***

### ***Air Force TNAP Management Tools History***

The DoD began in the 1940s performing periodic inspections to manage its airfield pavement assets. The Air Force started doing standardized pavement condition index (PCI) surveys over 40 years ago and began using software tools to manage transportation assets in the 1980s. These tools include the Pavement-Transportation Computer Aided Structural Engineering (PCASE) program for structural evaluation and design, PAVER, for determining surface condition and projecting deterioration and maintenance and repair (M&R) requirements for both airfield and road and parking pavements, and RAILER for determining the condition and projecting M&R requirements for rail systems.

**PAVER 7.0.11 System Description:** The current version of PAVER (7.0.11) is a desktop application. PAVER is used to calculate the surface condition and deterioration rate of the pavement using the work history and PCI inspection data on the type, severity, and quantity of distresses on the pavement surface. Assessors conduct PCI surveys using statistical sampling procedures outlined in ASTM standards. PAVER uses this data to predict the future condition and both the short and long-term maintenance and repair requirements of each pavement asset using cost-by-condition curves developed for each location. It is important to note that PAVER is not only used as asset management tools but perhaps more importantly, as a contingency planning tool. Several functional users use the PAVER analysis results for mission and investment decisions. For example, Combatant Commanders use the information to make mission bed-down decisions; airfield managers use it to make daily operational decisions, and civil engineers use it to prioritize pavement repair requirements at forward operating locations. Since PAVER is used in contingency planning, it will be maintained with both a stand-alone and on-line capability.

**PAVER 7.1 Description:** Development of PAVER 7.1 is currently underway. It will have both a standalone and on-line capability with a similar look and feel as the current stand-alone version. PAVER 7.1 will be centrally hosted and in the near term will provide access to centrally hosted on-line PAVER databases for both airfields and roads & parking. In the longer term, it will provide access to the enterprise TNAP database for all Air Force users. AFCEC is currently investigating hosting options for all SMSs as well as centralized SMS data. Note that AFCEC has already rolled up all existing pavements data and is using this data to test PAVER 7.1.

**PCASE (PCASE 2.09 and 7.0) System Description:** PCASE is the DoD mandated software tool for designing all airfield pavements and for designing roads & parking areas under specific circumstances for all DoD installations. PCASE is structured to share inventory with the PAVER program. Inventory includes the pavement network, branch and section data as well as work history, but does not currently share other key data elements such as the traffic, PCI, Pavement Classification Number (PCN), or Friction Index between the applications. In combination with PAVER, it provides a comprehensive set of tools that automates complex pavement design, evaluation, and management calculations for rigid and flexible pavements using both conventional and layered elastic methodologies. PCASE 2.09 is a stand-alone application used by pavement evaluation teams to collect airfield pavement characteristics data and use that data to compute the load bearing capacity of the airfield pavement. PCASE 7.0 is currently under development with beta versions expected to be released in late 2015. In the future, both PCASE and PAVER data will be merged into a single database accessible to other applications such as NexGen IT and GeoBase.

AF engineers and other functional users use PCASE data at all levels as an asset management tool to objectively quantify and prioritize recommended repair requirements and build airfield repair projects. Contingency planners use PCASE reports/data to make bed-down decisions for forward operating locations, and to track the condition and risk as operations progress. The Operations (A3) community uses PCASE data as part of the Airfield Suitability and Restrictions Report (ASRR) process and by airfield managers at both forward operating locations and main operating bases to make daily local airfield operational decisions.

**RAILER System Description:** RAILER is currently a stand-alone desktop application for documenting rail system inventory, collecting and consolidating distress data, computing the condition of rail system components, and projecting the repair requirements for the rail network at each base. RAILER data is used to



prioritize repair requirements for the rail network based on the condition and importance of those components. Army's ERDC CERL developed RAILER to capture data on rail systems on military installations. Over the last several years, rails on AF installations used by DLA have been inspected by the ERDC Airfield and Pavements Branch using PAVER. Bases have used other tools for capturing and analyzing rail condition data. The intent is to aggregate inventory and inspection data on all AF rail assets in a RAILER database. CERL is in the process of moving the RAILER SMS to a web-based version and include it in the future Enterprise SMS. Once complete, CERL will migrate existing rail databases into the new web based RAILER version. Legacy RAILER (the old desk top based system) will eventually go away completely. RAILER's sister program, RAILER Remote Entry Database (RED) will be not be supported at the completion of the new RAILER SMS and will no longer be available for use.

***RAILER Remote Entry Database (RED) System Description:*** RAILER RED software allows for electronic collection of rail inventory and inspection information by multiple teams in the field. Over time, this program became difficult to use and less effective. As the new version of the RAILER SMS comes online, RAILER RED will no longer be supported and not necessary for inspections.

***SMS Support for Other TNAP Assets:*** Other than in real property records, the Air Force has not historically centrally tracked other assets such as bridges, navigational aids (NAVAIDS), sidewalks, curbs and gutters, traffic control devices, airfield lighting, and ports (wharfs and piers) in an SMS. AFCEC Sub-Activity managers have been working to identify the data and IT systems for inventorying and capturing condition of these assets. The objective is to determine which SMS will be used and updated to capture these data elements and make the updates required so the inventories and conditions can be captured.





## SMS – TNAP Guidance: PAVER

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[Roles and Responsibilities](#)

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[Implementation Support](#)

[TNAP Resources](#)

[Inventory/Assess](#)

[Analyze/Forecast](#)

### Overview

#### Process Overview

AFCEC centrally manages Pavement Condition Index (PCI) surveys and structural evaluations for airfields and PCI surveys for road and parking areas. PCI surveys are conducted every four years. Every twelve years airfields will receive a full structural, full PCI, and friction characteristics evaluation.

In between these regularly scheduled evaluations, the base is responsible for maintaining the PAVER database. Base personnel should update the construction history whenever a project or significant in-house work is completed. Installation personnel are also responsible for developing a Preventive Maintenance Plan (PMP), which is part of the TNAP Asset Management Plan (AMP). The PMP is updated annually and involves using the data available from the current PAVER database, structural evaluation report, and Friction Characteristics report. The goal is to translate the requirements in PAVER, and information in these other reports, into executable, prioritized projects to maintain the base's TNAP assets at an optimal level. Refer to TNAP resources below for a link to the Tri-Service Pavements Working Group (TPSWG) 3-270-08.14-03: Preventive Maintenance Plan (PMP) for Airfield Pavements, which outlines the overall process for generating the PMP.

#### Process Overview Map





### ***Process Steps***

- Complete/Update Pavement Facility Maps - Define Network Inventory
- Update Facilities Segmentation (Update Branches and Sections)
- Obtain Structural Evaluation/Pavement Condition Index Survey
- Identify Base-Level Requirements and Parametric Costs
- Rack and Stack Requirements using TNAP Business Rules
- Bundle Requirements into Projects with detailed estimates.
- Prioritize Projects at Base Using TNAP Business Rules
- Validate and Prioritize Projects at MAJCOM/AFCEC using TNAP Business Rules
- Prioritize Projects on Integrated Priority List (IPL) based on the Business Rule scoring process
- Prioritize IPL
- Repeat Process

### ***Management Overview***

AFCEC/CO is the focal point representing the Air Force on the Tri-service PAVER User Group and is the lead for the implementation and incorporation of PAVER into Air Force enterprise asset management activities. The PAVER Tri-Service User Group in turn provides information and input to the DoD Installation Support Panel. The Air Force Member of the PAVER Tri-Service User Group is also a member of the Air Force Sustainment Management Systems (SMS) Implementation Working Group (SMSIWG). The Chair of the SMSIWG is the official Air Force Representative to the DoD Installation Support Panel for all SMSs. A similar structure will be used for other non-pavement TNAP assets to manage overall SMS requirements and develop any required SMS tools needed to collect and maintain inventory and condition data on TNAP assets.

### ***Installation Points of Contact***

Each installation should provide a primary and alternate Point of Contact (POC) to AFCEC for all issues related to PAVER/TNAP data and tools. AFCEC recommends that these POC's be the TNAP AMP and BCAMP Manager. They will be the guardians of the data at the installation and will have overall responsibility for the integrity of the data. The installation POCs will be made aware who at the MAJCOM Detachment (DET) and Field Operating Agency (FOA) has permission to alter the data. All requests for rights to data (Read-Only, Assessor, or Data Manager) must be coordinated with the base POC, whose name will go in the Requesting POC block of the PAVER User Account Request Form. The approval authority at AFCEC is the "Account Verifier" and will typically approve assessor or data manager rights to requests validated by the appropriate base POC.

### ***MAJCOM DET Points of Contact***

Each MAJCOM DET should provide a primary and alternate POC to AFCEC and to each of their installations for all issues related to PAVER/TNAP data and tools. They should keep the base informed of who at the MAJCOM DET has permission to make changes to data, (i.e., Data Managers). They should inform the base about any changes the MAJCOM DET has made to the database. The approval authority at AFCEC will typically approve assessor or data manager rights to requests validated by the appropriate MAJCOM DET POC, whose name will go in the "Requesting POC" block of the PAVER User Account Request Form.





### **AFCEC POCs**

The following are also the Account Verifiers for the PAVER User Account Request Form:

- Mr. Shawn Moya, PAVER SMS Program Manager  
[Shawn.moya.1@us.af.mil](mailto:Shawn.moya.1@us.af.mil), DSN 523-6488
- Ms. Sara Bierman, Transportation and Pavements AMP Manager  
[sara.bierman@us.af.mil](mailto:sara.bierman@us.af.mil), DSN 969-8844
- Mr. Pat Kelly, Chief, Transportation Branch, AFCEC/COAT  
[patrick.kelly.26@us.af.mil](mailto:patrick.kelly.26@us.af.mil), DSN 523-6448

### **Roles and Responsibilities**

#### ***Pavements (Airfields and Roads/Parking***

##### ***Lots): Base Responsibilities:***

- Create a pavement facility map for airfields and for roads & parking
- Update real property records using DD Form 1354 to reflect what was in the PCI survey RPAD/PAVER validation report
- Develop preventive maintenance plans and generate projects to address requirements in PCI report
- Update construction history and PCI for projects completed between 4-year evaluations
- Provide support to AFCEC comprehensive evaluation teams and AFCEC PCI consultants performing surveys

##### ***AFCEC Responsibilities:***

- Review facility maps and work with base to make any needed adjustments
- Centrally manage PCI programs for both airfields and roads & parking on a 4-year cycle. This includes completing linear segmentation and validating actual areas, performing analysis, and generating report that outlines issues, budget scenarios, and requirements
- Centrally manage structural and friction testing program on 12-year cycle and anchor testing as required

#### ***Other Pavements (Curbs and Gutters, sidewalks, hiking, jogging trails, troop walks, and covered walkways, etc.):***

PAVER is under development. Continue to use local procedures to collect inventory and condition data until further guidance is established.

##### ***Traffic Control Devices (Signage):***

Installations shall manage and maintain their own signage inventory. Signage shall be defined as all signs used to regulate, warn, or guide traffic, placed on, over, or adjacent to installation streets. The Manual on Uniform Traffic Control Devices (MUTCD), 2009 edition including Revision 1 (May, 2012) and Revision 2 (May, 2012) shall be the guiding reference document.

##### ***Traffic Control Devices (Traffic Signals):***

For real property installed equipment (RPIE) assets associated with Traffic Lights use BUILDER (see



"22\_SMS\_Facilities Guidance"). Follow the guidance for direct assessment provided in the current year AFCAMP Facilities Guidance for the electrical system. Use BUILDER Section G204005, Signage, for the pole structure. Do not assess the pole structure twice if it is supporting more than one utility. Assess the foundation in BUILDER Section A102005. Since the foundation is tied directly to the floor slab, it should be assessed by observing the slab, which the signal pole is bolted to. Particular points of observation should be the anchor bolt connection and the slab directly adjacent to those connections.

#### ***Mechanical Security Barricades***

For real property/RPIE assets associated with the Mechanical Security Barricades use BUILDER (see "22\_SMS\_Facilities Guidance"). Follow the guidance for direct assessment provided in the current year AFCAMP Facilities Guidance. Use BUILDER Section G204004, Security Structure, for the specific barricade. For Mechanical Security Barricades, follow the CoF section in the Facilities Guidance for justifying repair or replacement of real property.

#### ***Bridges (Includes pedestrian bridges and culverts with width 20' and greater):***

PAVER add-in tool is under development. Continue to use local procedures to collect inventory and condition data until further guidance is established.

##### ***Base Responsibilities:***

- Keep accurate real property records; update real property records using DD Form 1354 to record actual inventory found in RailInspections.
- Develop preventive maintenance plans and program projects to address requirements in bridge inspection reports.
- Ensure required inspections are completed IAW guidance; support centralized inspection efforts.
- Review bridge inspection report data for accuracy. Coordinate data corrections with AFCEC.

##### ***AFCEC Responsibilities:***

- Centrally manage the bridge inspection program and provide guidance to the Federal Highway Administration (FHWA).
- Analyze inspection data to determine work required to maintain bridge assets throughout the lifecycle.
- Review railroad inspection data. Coordinate adjustments with base and FHWA.

#### ***Railroads:***

##### ***Base Responsibilities:***

- Keep accurate real property records; update real property records using DD Form 1354 to record actual inventory found in RailInspections.
- Develop preventive maintenance plans and program projects to address requirements in Railroad inspection report.
- Ensure required inspections are completed IAW guidance; support centralized inspection efforts.
- Update construction history within RAILER for projects completed between centrally managed railroad evaluations.

##### ***AFCEC Responsibilities:***

- Review railroad inspection data and maps and coordinate adjustments with base.
- Centrally manage railroad inspection program; validate inspection data and project to maintain rail assets throughout the lifecycle.





### ***Aircraft Arresting Systems (AAS):***

For real property assets associated with the AAS use BUILDER (see "22\_SMS\_Facilities Guidance"). Follow the guidance for direct assessment provided in the current year AFCAMP Facilities Guidance, such as the building envelop, electrical, lighting, etc. Also assess the raft foundation in BUILDER Section 102005. Since the foundation is tied directly to the floor slab, it should be assessed by observing the slab, which the brake is bolted to. Particular points of observation should be the anchor bolt connection and the slab directly adjacent to those connections. The equipment associated with AAS includes brake engines, cables, tapes, fairlead beams, etc. AAS equipment inventory database and brake engine maintenance schedule is being developed and will be managed by AFIMSC/IZB.

### ***Navigational Aids (NAVAIDS):***

Navigational Aids is under Facilities in the BUILDER SMS.

### ***Airfield Lighting:***

Airfield lighting is under Electrical in the Utilities SMS. Utilities SMS is under development. Continue to use local procedures to collect inventory and condition data until further guidance is established.

### ***Ports (Wharfs and Piers):***

For real property/RPIE assets associated with the Waterfront facilities, there is an agreement being developed that will assess the waterfront facilities that are aligned with direct-mission support. For the other waterfront facilities there will be guidance developed for the bases to assess them. In the future, the data from both contracted and base assessments will be loaded into BUILDER Section H.

## ***Training***

### ***PAVER training:***

- **PAVER I:** offered on-line and on-location throughout the year for learning the fundamentals of pavement management using PAVER software.
- **PAVER II:** offered on-site throughout the year
- **PCASE:** offered on-line and 3-day on-site workshop covering pavement design and evaluation

PAVER/PCASE training schedule can be found at:

<https://transportation.wes.army.mil/triservice/>

Air Force Institute of Technology (AFIT) training:

WENG 550 Airfield Pavement Design and  
Maintenance WENG 555 Airfield Pavement  
Construction Inspection WMGT 417 Activity  
Management

WMSS 301 Intro to Asset Management

AFIT schedules can be found at: <https://www.afit.edu/CE/>

AFIT is currently developing PAVER Level I and II courses with an anticipated release of Fall 2020.

## ***Implementation Support***



Websites to assist with implementation:

RESOURCE	LOCATION
Tri-service Website	<a href="https://transportation.wes.army.mil/triservice/">https://transportation.wes.army.mil/triservice/</a>
AFCEC Portal	<a href="https://app.eis.af.mil/a7cportal/CEPlaybooks/OPS/OE/FCA/default.aspx">https://app.eis.af.mil/a7cportal/CEPlaybooks/OPS/OE/FCA/default.aspx</a>
Pavements Community of Practice	<a href="https://cs3.eis.af.mil/sites/00-EN-CE-A6/24048/00-EN-CE-55">https://cs3.eis.af.mil/sites/00-EN-CE-A6/24048/00-EN-CE-55</a>
PAVER SMS Workspace	<a href="https://cs2.eis.af.mil/sites/10758/PAVERSMS/SitePages/Home.aspx">https://cs2.eis.af.mil/sites/10758/PAVERSMS/SitePages/Home.aspx</a>
AFCEC Planning and Integration milBook Page	<a href="https://www.milsuite.mil/book/groups/afcec-planni">https://www.milsuite.mil/book/groups/afcec-planni</a>
AFCEC Reach Back Center	DSN: 523-6995 COMM: 1-850-283-6995; Toll Free: 1-888-232-3721 Email: <a href="mailto:afcec.rbc@us.af.mil">afcec.rbc@us.af.mil</a>

## TNAP Resources

RESOURCE	LOCATION
PAVER SMS Workspace	<a href="https://cs2.eis.af.mil/sites/10758/PAVERSMS/SitePages/Home.aspx">https://cs2.eis.af.mil/sites/10758/PAVERSMS/SitePages/Home.aspx</a>
Pavements and Airfield Damage Repair	<a href="https://cs3.eis.af.mil/sites/00-EN-CE-A6/24048/00-EN-CE-55">https://cs3.eis.af.mil/sites/00-EN-CE-A6/24048/00-EN-CE-55</a>
PAVER Download	<a href="https://transportation.erdc.dren.mil/paver/Downloads.htm">https://transportation.erdc.dren.mil/paver/Downloads.htm</a>
USACE PAVER Manual and Training Slides	<a href="https://cs3.eis.af.mil/sites/00-EN-CE-A6/24048/00-EN-CE-55/PAVER/Forms/AllItems.aspx">https://cs3.eis.af.mil/sites/00-EN-CE-A6/24048/00-EN-CE-55/PAVER/Forms/AllItems.aspx</a>
APE Gateway	<a href="https://cs2.eis.af.mil/sites/10758/pavereports/SitePages/apegateway.aspx">https://cs2.eis.af.mil/sites/10758/pavereports/SitePages/apegateway.aspx</a>
AFI 32-1041, Pavement Evaluation Program	<a href="http://www.e-publishing.af.mil/">http://www.e-publishing.af.mil/</a>
Unified Facility Criteria	<a href="http://www.wbdg.org/ccb/browse_cat.php?o=29&amp;c=4">http://www.wbdg.org/ccb/browse_cat.php?o=29&amp;c=4</a> <ul style="list-style-type: none"> <li>• UFC 3-260-03</li> <li>• UFC 3-260-16FA Airfield Pavement Condition Survey Procedures</li> <li>• UFC 3-270-05 &amp; 06 Airfield PCIs</li> <li>• UFC 3-270-08</li> </ul>
TSPWG 3-270-08, 14-03, Preventive Maintenance Plan (PMP) For Airfield Pavements	<a href="https://www.wbdg.org/ffc/dod/supplemental-technical-criteria/tspwg_m_3-270-08_14-3">https://www.wbdg.org/ffc/dod/supplemental-technical-criteria/tspwg_m_3-270-08_14-3</a>
Tri-Service Transportation: Pavements- Transportation – Community of Practice	<a href="https://transportation.wes.army.mil/triservice/">https://transportation.wes.army.mil/triservice/</a>
TNAP Business Rules	See SMS - TNAP Guidance: Business Rules for TNAP Segmentation for additional information

## Inventory/Assess

### Pavement Data Collection and Inspection Approach

The approach to collecting inventory and condition data for TNAP assets differs from the approach used for vertical facilities. While the main effort of data collection for vertical facilities is by base personnel, historically, the collection of pavement condition data has been centrally accomplished through AFCEC's Airfield Pavement Evaluation (APE) Team, one of its consultants, and/or the USAFR S-Team. AFCEC's





intent is for this process to continue in the future with additional support from the bases. In the past, the base's role has been to provide data to the APE team, the USAFR S-Team, or contractor to update work history, provide input on current issues, and provide a point of contact (POC) that coordinates the field survey schedule and access requirements for the evaluation team. In the future, the bases will use PAVER to actively maintain the TNAP database between PCI surveys/structural evaluations. This includes updating construction history and condition data, but does not require the bases to do PCI surveys. The APE Team will conduct comprehensive evaluations for each airfield on a 12-year cycle. AFCEC plans to centrally fund and execute PCI surveys for airfields, roads, and parking areas every four years. AFCEC plans to use consultants that specialize in pavement management and PCI surveys to execute this work. The final deliverables include the PCI report, PAVER database, and mapping products including file geodatabase, as well as all source documents for the report. This report data will be updated in the central database for AFCEC, MAJCOM DETs, and bases to plan and prioritize projects that compete for funds at the enterprise level.

**Airfield PCI and Structural Evaluations:** PCI Surveys will be conducted on 4-year cycles for all airfield pavements, alternating between COAP/APE team and AFCEC consultants. PAD 12-3 established centralized funding for all Airfield pavement evaluations to standardize processes, manage data, and have a 95% confidence level of condition. PCI Surveys conducted by the APE Team has established a twelve-year schedule for conducting structural evaluations for 100% of all airfield pavements. These evaluations include PCI inspection, coring, dynamic cone penetrometer (DCP) testing, concrete and soil testing as well as Heavy Weight Deflectometer (HWD) testing, friction testing, and anchor testing as required. PCI surveys by AFCEC contract consultants will provide PCI evaluations. In between these surveys, the base is responsible for maintaining their condition data by ensuring construction history is updated when projects become complete as part of the capitalization process and as outlined in TSPWG 3-270-08.14-03, *Preventive Maintenance Plan (PMP) for Airfield Pavements*.

**Road and Parking PCI Surveys:** As mentioned above, PAD 12-03 established centralized funding for both airfield and road and parking PCI surveys to eliminate significant inefficiencies with the old process. The current objective is for AFCEC to conduct a centrally funded and executed, 95% confidence level PCI survey at each base by contract to update linear segmentation implementation process and the condition and deterioration rate baseline. As with airfield PCI surveys, each base is responsible for maintaining their PCI data in between these regularly scheduled surveys by updating construction history and condition data as projects are completed. ***Specific guidance for maintaining PCI data and using it to develop road and parking pavement management plans is currently under development.***

**Other Pavement Inspections:** Other pavements include: curbs and gutters, equipment pads, sidewalks, hiking, jogging trails, troop walks, and covered walkways, etc. Inventory of curb and gutter assets are collected in the AFCEC managed Road and Parking PCI Surveys. Quantities and locations are updated within the GeoBase database. These surveys do not assess condition, only inventory. Installation personnel are responsible for inventory of other pavement including equipment pads, sidewalks, hiking and jogging trails, troop walks, and any other miscellaneous pavement within the GeoBase database. Installation personnel are also responsible for condition assessments using the Condition Index (CI) values described in Table 11.

**Table 11. Definitions of CI Ratings for Other Pavements**

Rating	Condition Index	Definition
GOOD	85	Pavement is serviceable with routine maintenance.
FAIR	65	Pavement will need replacement in the next 2 years.





POOR	41	Pavement has deteriorated to the point that it is not functioning as designed or poses an immediate safety hazard.
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**Traffic Control Device Inspections:** Data does exist at some MAJCOMs and bases regarding signage and retro-reflectivity compliance. There are also traffic management studies that document the number and, in some cases, condition of other control devices. The intent of these inspections is to identify tools and procedures currently used to collect and maintain this data; to develop standard tools and condition ratings (if there is variability); and to determine key data elements for tracking at the enterprise level.

**Bridge Inspections (Includes pedestrian bridges and culverts with width 20' and greater):** In the past, bases used in-house labor or contract labor to accomplish their periodic bridge inspections using Federal Highway Administration (FHWA) inspection criteria and funding. The current plan is to have the FHWA retain the funding and execute the bridge inspections for the Air Force on a rotating cycle (50% of CONUS bases each year, including Alaska and Hawaii). OCONUS bases will continue to inspect their bridge facilities using current practice. FHWA will provide detailed reports that not only identify condition but also define repair requirements and costs for use by the respective bases to develop projects to compete on the IPL.

Once bridge inspections have been completed, the National Bridge Inventory (NBI) database is updated by FHWA and a spreadsheet containing inspection data is generated for USAF use. This spreadsheet contains the FHWA calculated Sufficiency Rating (SR) used as a condition rating for bridge assets and for project scoring on the IPL. A copy of this spreadsheet will be posted on the CE Dash site for bases to download for tracking their own assets. Any discrepancies should be reported to AFCEC as soon as possible so the NBI database and SR can be corrected, if necessary. Bridge inspection reports provide requirements and cost estimates to be used for potential projects. If using the report cost estimate, programmers should be cautious and perform their own IGE as unit prices are not adjusted for locality and federal contracting work.

In the near term, AFCEC/CO is developing an add-in module for PAVER that will import the NBI data and associated RPAD data. Bridge data will then be associated with the corresponding roadway, providing a comprehensive picture of a network and installation health.

**Drainage Structures (Under pavements; includes culverts with width under 20'):** Drainage Structures are considered Utilities and guidance is located in the Utilities section of the SMS Playbook.

**Aircraft Arresting Systems (AASs):** For real property assets associated with the AAS use BUILDER (see SMS Facilities Guidance). Follow the guidance for direct assessment such as the building envelop, electrical, lighting, etc. Also assess the raft foundation in BUILDER Section 102005. Since the foundation is tied directly to the floor slab, it should be assessed by observing the slab, which the brake is bolted to. Particular points of observation should be the anchor bolt connection and the slab directly adjacent to those connections. The equipment associated with AAS includes brake engines, cables, tapes, fairlead beams, etc. AAS equipment inventory database and brake engine maintenance schedule is being developed and will be managed by AFIMSC/IZB.

**Navigational Aids (NAVAIDS):** The Communications community owns NAVAIDS. Facilities supporting NAVAIDS are within the BUILDER SMS database. Refer to the Facilities SMS Playbook for further guidance.

**Airfield Lighting:** Airfield lighting is under Electrical in the Utilities SMS.

**Ports (Wharfs and Piers):** The intention is to use the ERDC's well-defined inspection criteria for port facilities to the maximum extent possible. AFCEC will investigate and define existing data sources to inventory and assess condition of port assets. Where it exists, AFCEC will consolidate data into a central data repository and define/modify processes for maintaining this data.

## Analyze/Forecast





***Pavements Data Analysis and Forecasting Approach: Airfield Pavements/ Roads & Parking Lot***

***Pavements/ Other Pavements*** (Other pavements include: Curbs and Gutters, equipment pads, sidewalks, hiking, jogging trails, troop walks, and covered walkways, etc.)

Asset management requires knowing the inventory, condition, and criticality of the asset to the mission. PCI surveys and pavement evaluations only provide some of the total requirements. Installations and TNAP working groups should meet to determine all of the requirements and formulate cost-effective solutions for PM, minor and major M&R, and reconstruction.

***Assessment Purpose:*** A pavement assessment is required to develop a pavement PMP.

***Team Composition:*** The assessment team should consist of experienced personnel from airfield operations (for airfield pavements) and civil engineering. At a minimum civil engineering should be represented by the pavements engineer, community planner, and an Operations pavement/equipment shop person.

***Procedure:*** The assessment process is a three-part procedure that involves gathering requirements from the various tools, visually assessing the pavements to validate known requirements from data in AFCEC reports, and identifying new requirements. These requirements will be prioritized using the same TNAP business rule processes that are used to evaluate projects on the IPL. Next, work with base programmers to develop project scopes and costs for the pavements. The requirements and projects applicable to PM will be included in the PMP.

***Airfield Pavements/Roads & Parking/Other Pavements Management Process***

- Develop, maintain, and organize the pavement inventory
- Assess the current condition of pavements
- Record M&R history in PAVER database
- Use/Develop models to predict conditions
- Report on condition performance
- Develop scenarios for M&R based on budget (Work Planning)
- Plan projects

***Data Collection and Analysis Processes***

See SMS - TNAP Guidance: Business Rules for TNAP Segmentation for additional information

***Traffic Control Devices (Markings, Signs, Signals) Data Analysis and Forecasting Approach***

***Assessment Purpose:*** Assessments on traffic control devices are required to develop PMPs. Installations shall manage and maintain inventory of their own Traffic Control Devices as they will not be included in the enterprise SMS databases.

***Team Composition:*** The assessment team should consist of experienced personnel from civil engineering. At a minimum, the civil engineering team should be represented by the pavements engineer (or assigned engineer), community planner, and operations personnel from the pavement and equipment shop and sign shop.

***Procedure:*** The assessment process is a three-part procedure that involves gathering requirements from the various tools, visually assessing the traffic control assets to validate known requirements, identifying new requirements, and developing project scopes and costs for traffic control devices. The requirements and projects



applicable to PM will be included in the PMP.

#### ***Traffic Control Device Management Process***

- Develop, maintain, and organize the inventory for the traffic control devices
- Assess the current condition of the traffic control devices
- Keep track of M&R history
- Use/Develop models to predict conditions
- Report on condition performance
- Develop scenarios for M&R based on budget (Work Planning)
- Plan projects

#### ***Data Collection and Analysis Processes***

Installations are responsible for managing data and analysis. SMS databases will not include Traffic Control Devices. ***Bridges Data Analysis and Forecasting Approach (Includes pedestrian bridges and culverts with width 20' and greater)***

***TNAP*** is under development. Continue to use local procedures until further guidance is established.

#### ***Railroads***

***Assessment Purpose:*** Baseline assessments on AF owned railroad is necessary to determine the best way forward for managing the asset.

***Team Composition:*** The assessment team should consist of certified railroad inspectors. At a minimum, the inspection team should be trained in the requirements of the UFC 04-860-03. Typical personnel who would perform these inspections include operations personnel from the pavement and structures shop.

***Procedure:*** The assessment process is a multi-part procedure that involves gathering inspection data through various methods to include visual and ultrasonic inspection. Once complete this data can identify new requirements and lead to developing project scopes. The requirements and projects applicable to PM will be included in the PMP.

#### ***Aircraft Arresting Systems (AASs) Data Analysis and Forecasting Approach***

***TNAP*** is under development. Continue to use local procedures until further guidance is established.

#### ***Navigational Aids (NAVAIDS) Data Analysis and Forecasting Approach***

Navigational aids are under Buildings in the BUILDER SMS. Guidance is found in the Facilities SMS Playbook.

#### ***Airfield Lighting Data Analysis and Forecasting Approach***

Airfield lighting is under Electrical in the Utilities SMS. Guidance is found in the Utilities SMS Playbook.

#### ***Ports (Wharfs and Piers) Data Analysis and Forecasting Approach***

***TNAP*** is under development. Continue to use local procedures until further guidance is established.





## **SMS – TNAP Guidance: Business Rules for TNAP Segmentation**

[Overview](#)

[Segmentation Hierarchy](#)

[Pavement Management Segmentation Rules](#)

[Advice and Tips](#)

### **Overview**

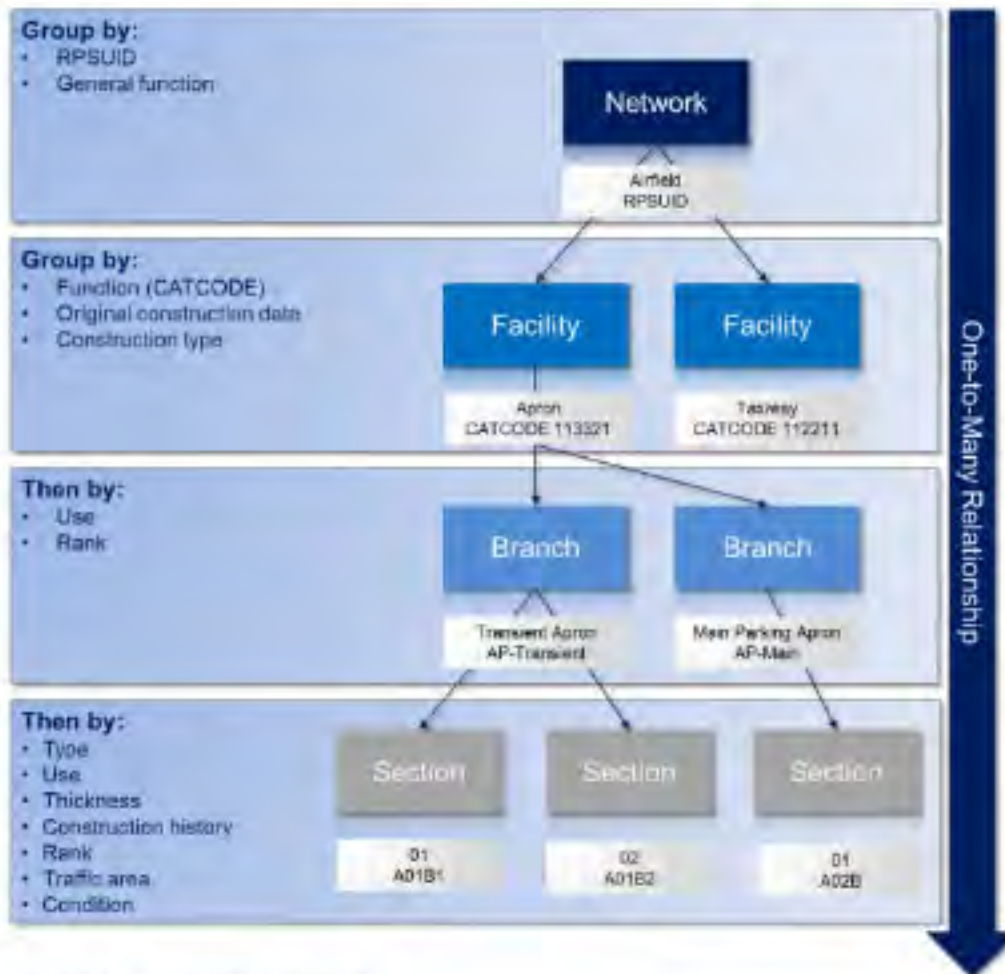
This section outlines general business rules for the linear segmentation of pavements and provides visual examples of network component identification. Air Force Instruction (AFI) 32-1041, *Airfield Pavement Evaluation Program - Chapter 3, Linear Segmentation of Pavements* provides in-depth guidance for roads and airfield pavements. Please note that there is significant variability in how Real Property Office (RPO) has implemented the rules for designating pavement facilities. This poses a challenge for anyone assigning segments to these facilities. The examples below outline possible scenarios and suggest how they can be handled.

### **Segmentation Hierarchy**

The Segmentation Hierarchy represents a one-to-many relationship among linear segments moving down the hierarchy. A facility can consist of many branches, which can consist of many sections. Sections are the most specific segment type and are identified by a unique combination of physical and usage characteristics. The hierarchies shown below are based on business rules established to maintain a structured relationship between real property data elements and pavement engineering data elements. It is important to note that the Real Property Unique Identifier (RPUID), facility number, Facility Analysis Category (FAC), and category code (CATCODE) associated with each facility are all assigned at the section level in PAVER to provide maximum flexibility for data analysis and to accommodate potential changes to business rules or requirements in the future. It should also be noted that FAC is included for analysis because sustainment costs are based on FAC rather than CATCODE. In most cases, there should be no problem maintaining this hierarchy. Instances may arise where the facility was assigned in a way that compromises the ability to manage the asset from an engineering perspective. In these cases, engineers should work with the RPO to modify the facility designation to resolve the conflict. If this is not possible, the hierarchy may be disregarded to maintain the integrity of the branch. An example of this would be a runway that has two facility numbers, one for the reconstructed portion of the runway and another for the original runway. Ideally, there should only be one facility number for the load bearing surface of the runway. From the engineering perspective, the team should consider the entire load bearing surface of the runway as a branch. Creating two runway branches to align with the facilities would cause issues in evaluating and reporting the runway condition and capability as a whole. If the RPO cannot combine the two runway facilities, the runway sections should be aligned as separate facilities, but only one branch should be created for the runway since the hierarchy cannot be maintained.



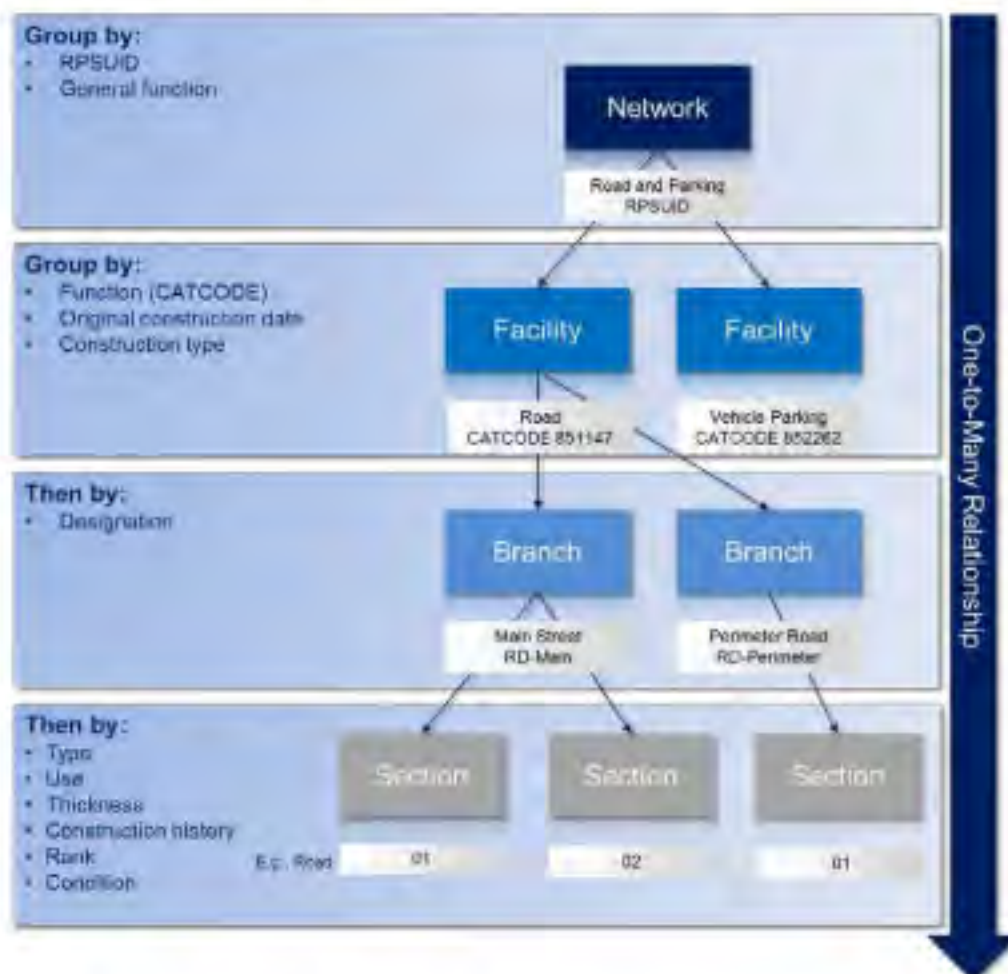
### Airfield Segmentation Hierarchy



### Airfield Segmentation Hierarchy



## Road and Parking



## Road and Parking Segmentation Hierarchy

### Pavement Management Segmentation Rules

UFC 3-270-08 delineates specific pavement segmentation business rules. Table 12 below summarizes that guidance.

SEGMENT	DESCRIPTION	CONSTRAINT	DATA ELEMENTS	AUTHORITATIVE SOURCE
Network	Pavement group based on general function, such as airfield pavement network or paved road, drive, and parking area network	Network can only be associated with one RPSUID	PAVER Network ID, RP network, RPSUID	OSD Real Property Information Model (RPIM) Version 5.0





SEGMENT	DESCRIPTION	CONSTRAINT	DATA ELEMENTS	AUTHORITATIVE SOURCE
Facility	An area of pavement with a specific single function, such as a runway, apron, taxiway, road, driveway, or parking area	For linear assets, a facility can have only one FAC and CATCODE	CATCODE, FAC, facility number, RPUID	AFI 32-9005
Branch	A logical subset of the network, such as a named taxiway or a named road	Branches are confined to a single pavement use for airfields, road name for roads, and facility supported or use for parking areas	Branch name, PAVER Branch ID	UFC 3-270-08
Section	A subset of a branch that is assigned based on specific physical and/or usage characteristics	Sections are confined to a unique combination of physical or usage characteristics	PAVER Section ID, pavement type, use, thickness, construction history, rank, traffic area, surface condition. Note that RPUID, facility number, FAC, and CATCODE are all assigned at the section level in PAVER	UFC 3-270-08

**Table 12 Pavement Management Segmentation Rules**

The following examples illustrate segmentation rules for airfield, road, and parking pavements.

**Army and Air Force Compass Calibration Pad**



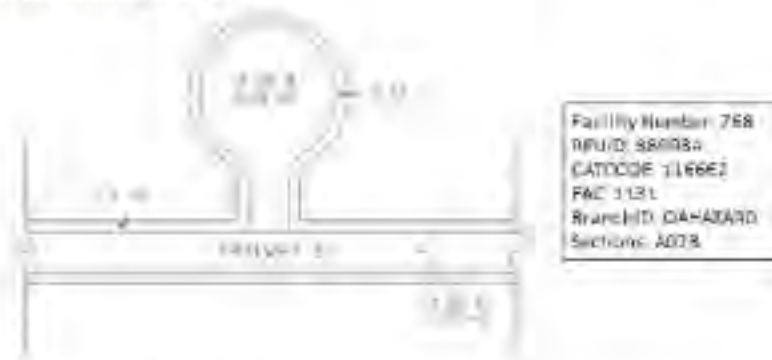
**Calibration Pad Segmentation**

In the figure above, the compass calibration pad facility is made up of one branch, Other Apron, OACompass. The branch is made up of three sections; the access taxiway to the compass calibration pad services no other aprons or pads and consists of two sections. One is constructed of asphalt and the other of concrete. The pad itself is a separate section constructed of concrete. All three sections are assigned the RPUID and facility number for the compass calibration pad at this base. They are also assigned the FAC.

1161 (Compass Calibration Pad, Surfaced) and the CATCODE 116667 (Calibration pad). The shoulder section for both the access taxiway and the pad are part of a separate facility and apron shoulder, and they are assigned to the FAC 1165 (Aircraft Pavement, Shoulder) and CATCODE 116642 (Paved Shoulder). The shoulder associated with Taxiway C has the same category code and FAC as the apron shoulder, but it should be broken out as a separate facility with its own RPUID and facility number. In some instances, bases may combine all shoulder pavements into one facility, but ideally, they should be separated into separate facilities based on branch use; one for apron shoulders, one for taxiway shoulders, and one for runway shoulders.



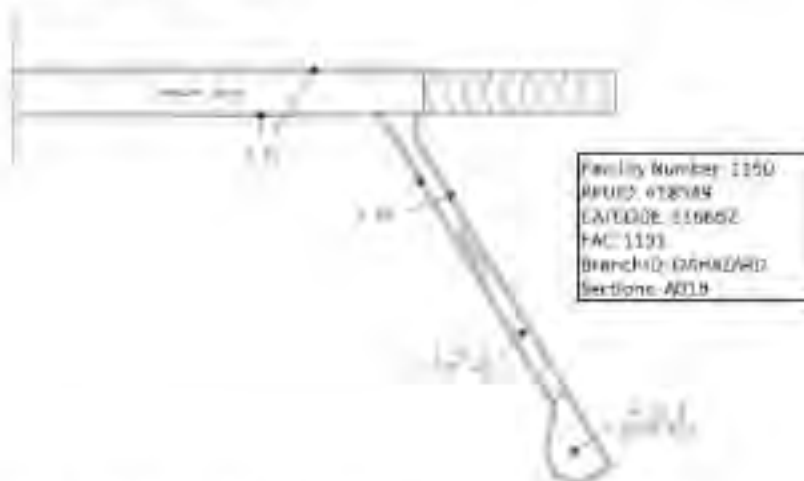
### Hazardous Cargo Pad



### Hazardous Cargo Pad Segmentation

In the figure above, the Hazardous Cargo Pad facility is made up of one branch, OAHAZARD. The branch is made up of one section. Since the construction is the same for both the access taxiway to the Hazardous Cargo pad and the pad itself, and it serves no other pads or aprons, they are considered one section. The section is assigned the RPUID and facility number for the Hazardous Cargo Pad at this base. It is also assigned the FAC 1131 (Surfaced Aircraft Apron) and the CATCODE 116662 (Dangerous Cargo Pad, Load/Unload). Note the terms 'Dangerous' and 'Hazardous Cargo' are used interchangeably in the pavement Unified Facility Criteria (UFC). The shoulder section is handled the same way as described in the Calibration Pad example.

### Hazardous Cargo Pad

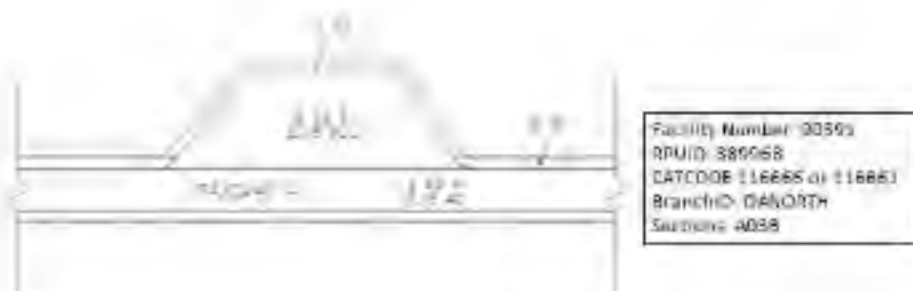


### Hazardous Cargo Pad Segmentation

In the figure above, the Hazardous Cargo Pad facility is made up of one branch, OAHAZARD. The branch is made up of one section, A01B. The section is assigned the RPUID and facility number for the Hazardous Cargo Pad at this base. It is also assigned the FAC 1131 (Surfaced Aircraft Apron) and the CATCODE 116662 (Dangerous Cargo Pad, Load/Unload). The taxiway to this hazardous cargo pad was given the alpha designation G, so in this instance, T01C should be assigned to the taxiway facility. The shoulder around A01B should be assigned to the apron shoulder facility; the shoulder associated with T01C should be assigned to the taxiway shoulder facility; and the runway shoulder should be assigned to the runway shoulder facility. As noted previously, some bases may have all shoulders assigned to one facility, in which case, all shoulders should be assigned to that facility. Separate shoulder facility assignments are preferred.

### Warm-Up Aprons and Arm / Disarm Pads

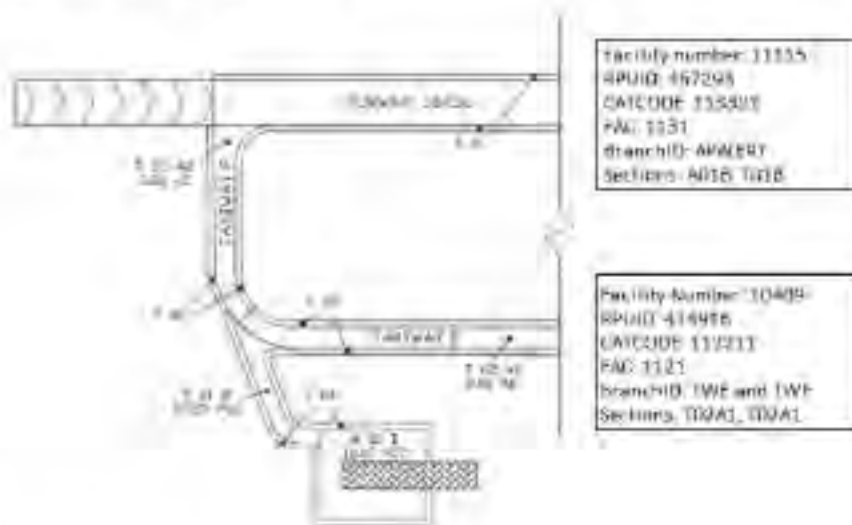




### Warm-up Apron Arm / Disarm Pad Segmentation

FAC 1131 also includes Warm-Up Aprons (CATCODE 116666) and Arm/Disarm Pads (CATCODE 116661). In some cases, there may be multiple Warm-up Aprons or Arm/Disarm Pads at opposite ends of the runway. In these instances both pads (with a given category code) may be included in the same facility. If so, each will be considered a separate branch (e.g., 01NORTHWARM and 01SOUTHWARM). Each of these branches may have one or more sections depending on construction characteristics. The shoulders are handled in the same way as the previous example.

### Alert Apron and Taxiways



### Alert Apron and Taxiway Segmentation

- Alert Apron:** The figure above shows an alert apron with an access taxiway. The access taxiway does not have an alpha designation, so it is considered part of the alert apron facility. The facility has one branch Apron, APALERT, which is made up of two sections: the access taxiway T01B, which is constructed of 12.25 inch concrete pavement, and the main alert apron A01B, constructed of 12.00 inch concrete pavement. Both sections are assigned FAC 1131 and CATCODE 113321. If there are any shoulders present on either the access taxiway or the alert apron itself, they will be handled the same as described in the compass calibration pad example.
- Taxiways:** Ideally each named taxiway will have its own facility number. In practice, however, taxiways are sometimes included in one facility, or multiple taxiways are included in one facility. In this graphic, even



though the construction is similar for both T02A1 and T02A2, they are divided into two separate segments: one assigned to Taxiway E and one to Taxiway F. Taxiway E and F should both be separate branches, but both of these branches are assigned to Facility Number 10409. Named taxiways assigned to multiple facility numbers (e.g., parallel taxiway) should be broken into two parts. The team should work with the base RPO to see if these facilities can be combined. If not, the team should create sections that align with the facility boundaries.

#### **Alert Area**

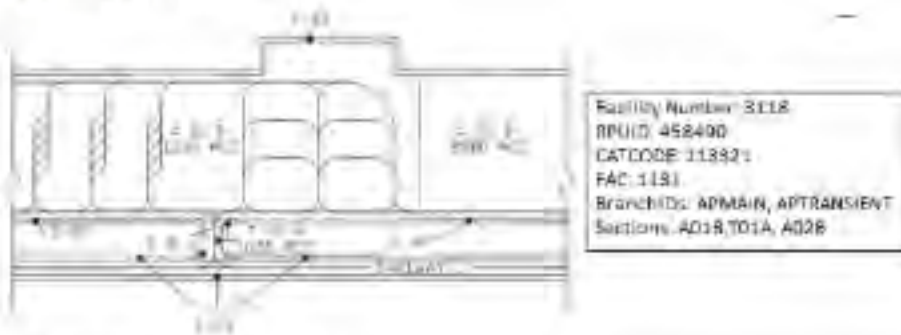


#### **Alert Area Segmentation**

The alert pads and the access taxiway, which does not have an alpha designation and only services the alert pads, are treated as one branch APALERT. The branch has three sections (A01B, A02B, T01A) that are structurally different. They are assigned the FAC 1131 and CATCODE 113321. Ideally the alert apron would have its own facility number but, in practice, it may be included in a facility with other aprons. In the latter case, each of these aprons will be assigned a different branch designation. Shoulders should be handled as described previously.



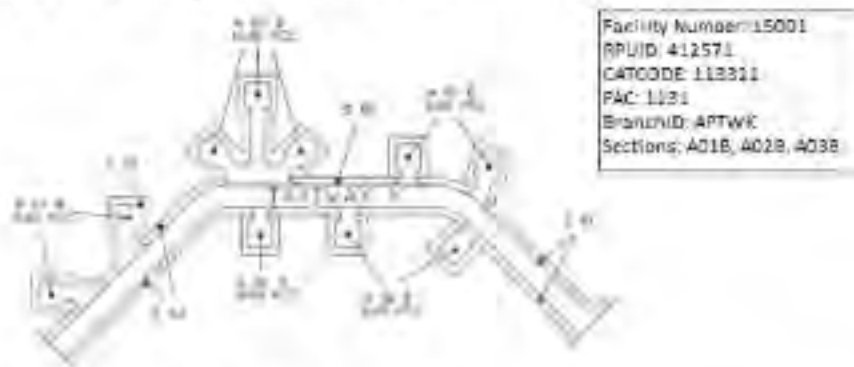
## Parking Apron



### Parking Apron Segmentation

The figure above shows a main parking apron facility. The facility has two branches, the main parking apron (A01B and T01A) and the transient parking apron (A02B). Note that the taxiways on the main apron are not broken out as separate sections; they are considered part of the apron. Shoulders are handled as described previously.

### Dispersed Parking Aprons (Pads or Hardstands)



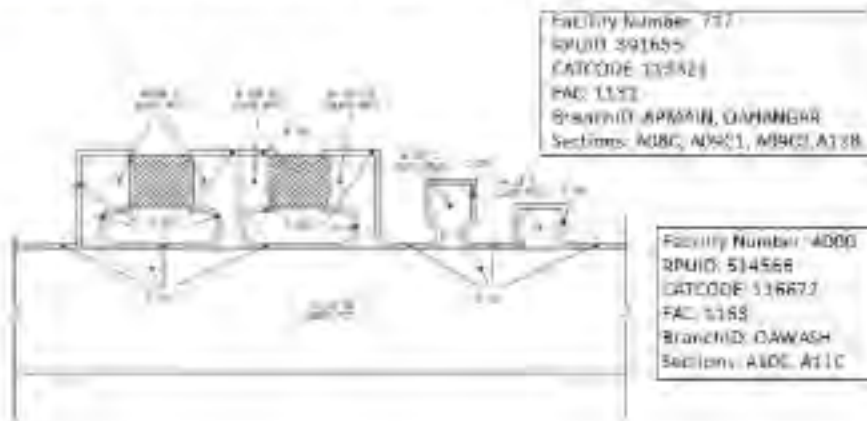
### Dispersed Parking Apron Segmentation

In the figure above, all the dispersed aprons on taxiway K are in one facility (15001). They are all assigned to a single branch (APTWK). The branch consists of three sections A01B, A02B, and A03B. Taxiway K is a separate facility with its own branch and sections. The shoulders for Taxiway K, S01, S02, and S03 are all part of the taxiway shoulder facility and the taxiway K shoulder branch. The shoulders for the dispersed parking aprons are all part of the apron shoulder facility. In this example, they are all included in one section S14, which is part of the taxiway K shoulder branch. Dispersed parking pads or aprons can become complex. If the team encounters a base where each pad has been given a facility number, they will need to assign a section number to each pad. If the pads are structurally similar, as shown in the figure above, they would shred out the sections (e.g., A01B1, A01B2). Each of the separate facilities should also have its own branch.





## Hangar Access Aprons and Washracks



### Hangar Access Apron and Washrack Segmentation

- Hangar Access Aprons:** Hangar Access Aprons are typically tow-only areas that include the apron surface and the access taxiway. Ideally, all hangar access aprons should be included in a separate facility, but in the figure above, the hangar access aprons are part of a facility that includes the main apron. The main apron should have a branch designation, APMAIN, and the hangar access aprons should have a branch designation, OAHANGAR. The main apron has an "AP" prefix, because it is for parking aircraft. The hangar access apron is given an "OA" designation, because its main purpose is not parking aircraft but rather to provide a surface for maneuvering aircraft into/out of the hangar. The Hangar Access Apron Branch has three sections: A08C, A09C1, and A09C2. Note A09C1 and A09C2 are structurally similar but are shredded out because there is a significant (>15-point) difference in the pavement condition index (PCI) (Note: the base may have given the Hangar Access Aprons a separate facility number. In that case, the facility would have only one branch in this example).
- Washracks:** Washracks are handled the same way as compass calibration pads or hazardous cargo pads. In the figure above, both washracks are included in one facility (4000) with FAC 1163 and CATCODE 116672. Both washracks should also be assigned to one branch (OAWASH). The branch should have two sections, A10C and A11C. In the event the base has given each washrack a separate facility number, the team should create a separate branch for each washrack, and each branch should be assigned a single section number. Shoulders should be handled as described previously.

### Runways and Overruns



### Runway and Overrun Segmentation

- Runways:** Typically, each runway on a base has a facility number. This facility (001) consists of the load bearing pavement, FAC 1111, CATCODE 111111. The load-bearing surface of the runway also has one



branch (RW1836). This branch typically has multiple sections. In the example provided, R01A1 and R01A2 are structurally the same. R01A2 is created because it may not receive the same level of traffic as the keel section, will likely have a different deterioration rate, and may not be considered as critical as the keel section. R02C is treated in a similar manner. Note: not all sections for this runway are shown. The keel section is typically considered the center 75 feet, although, this may be adjusted to align with joint spacing or if the keel section is structurally different than the outer portions of the runway. Ideally, runway shoulders are assigned to a runway shoulder facility. That facility should have one branch for runway shoulders. In the event all shoulders are combined into one facility at a base, shoulders should still be broken out as separate branches.

- **Overruns:** Typically, the overruns for each runway on a base should be assigned a facility number (002 in this example). All overruns for the runway should be included in one branch (OR1836). The branch should be divided into at least two sections (one for the overrun at each end of the runway O01C and O02C). Overruns do not typically have shoulders, but if the team encounters this situation, they should include these shoulders in the runway shoulder facility.

## Roads



## Road Segmentation

- **RDSIMPSON-02:** This section is part of the Simpson Road Branch (RDSIMPSON). The branch can have from one to "x" number of sections depending on its length and physical characteristics. As mentioned previously, each named road on a base should be assigned a branch name, which in turn is assigned to a facility. In this case, Simpson Road is just one of the branches that are in facility 3100. The team may find that the base has one facility for all paved roads or multiple facilities.
- **RDBAKKE-01:** This section transitions from the cantonment area into the housing area. Housing areas may be created as separate networks (and as separate facilities), especially if they are privatized. If this housing area were in a separate network/facility, the section would need to be divided at the point where the transition from cantonment to privatized housing takes place. The respective sections should be placed in the appropriate facility.
- **GR09-03:** This section is an unsurfaced road that is part of the unsurfaced road network. Note the branch name will need to be changed from GR09 to UR09 to reflect the current naming standard. Unsurfaced roads are handled the same as paved roads. Each named road is typically a branch. These branches are assigned to the facility(ies) for unpaved roads. In many instances, unsurfaced roads are not named. In these cases, the team lists them as Unnamed Road 01 to Unnamed Road XX or, as in this case, gives the road a number 09. As with paved roads, the branch can have one to many sections depending on its length and physical characteristics.





## Parking Areas



### Parking Area Segmentation

**PA1 (formerly PL1):** PA1 has three sections. Even though these sections are not contiguous, they all service the same building and are part of the same facility (30011). Note that unpaved islands have been identified and excluded from the area included in the section.

**PL90320:** The branch name should be changed from PL90320 to PA90320 to reflect current standards. PA90320 has four sections. Sections 03 and 04 divide the contiguous area based on physical characteristics. Note that the access drives from the road to the parking are included as part of the parking area. In some instances, these access drives may be divided into separate sections if they have different physical characteristics.

## Driveways



### Driveway Segmentation

The figure above shows the driveways in a privatized housing area. All the driveways on a given road are included in a branch with the DR prefix for driveway and the name of the road. For example, DRWalters includes all of the driveways on Walters Street. Multiple driveways may be included in a section to get a sufficient sampling size or to simplify the segmentation. For example, all the driveways on the north side of Walters Street may be section 1 and all of those on the south side will be included in section 2.

Unpaved roads typically have a prepared surface whether it is compacted gravel or simply a graded soil surface. In some instances trails are shown on maps. The team should work with the RPO to determine the proper categorization or to determine if it should be included in the unpaved road network. The image of the



unpaved trail below is an example that would not be considered a facility.



#### **Unpaved Trail**

- **Templates**

- N/A

- **Policies and Regulations**

- AFI 32-1041, *Airfield Pavement Evaluation Program*
- AFI 32-9005, *Real Property Accountability and Reporting*
- OSD RPIM Version 5.0
- UFC 1-300-08, *Criteria for Transfer and Acceptance of Real Property*
- UFC 3-260-01, *Airfield and Heliport Planning and Design*
- UFC 3-260-03, *Airfield Pavement Evaluation*
- UFC 3-270-08, *Pavement Management*
- TSPWG 3-270-08, *Preventive Maintenance Plan (PMP) For Airfield Pavements*

- **Forms**

- N/A

- **Documents**

- Air Force Category Codes



- **File Directories / Systems**

- ▷ N/A

- **Websites**

- Air Force Publications Website
  - Whole Building Design Guide

- **Related Playbooks**

- N/A

## **Advice and Tips**

- Facility numbers should follow a pattern at each base, but there is no standard numbering scheme for assigning facility numbers across the Air Force. The RPUIID provides the unique number that identifies each facility.
- Unpaved roads typically have a prepared surface, whether it is compacted gravel or simply a graded soil surface. In some instances, trails are shown on maps. The team should work with the RPO to determine the proper categorization or to whether it should be included in the unpaved road network.





## **SMS – TNAP Guidance: RAILER**

[Overview](#)

[Roles and Responsibilities](#)

[Training](#)

[Implementation Support](#)

[TNAP Rail System Resources](#)

[Inventory/Assess](#)

[Analyze/Forecast](#)

### **Overview**

#### **Process Overview**

Railroad System Assessments: In FY16, AFCEC/CO embarked on a multi-year effort to baseline Air Force railroad asset inventories and their associated condition to determine the enterprise way-forward for maintaining/sustaining this asset. In FY16, USACE/ERDC was provided funding to inspect 100 miles of railroad at 10 installations. In FY17, AFCEC/CO provided USACE/ERDC funding to inspect another 92 miles at 9 installations. The request for funding to finish the baseline inspections of all Air Force railroad in FY18 was approved. With these inspection of the remaining 58 miles that were not covered with the FY16 and FY17 programs all AF owned Railroad assets will be inspected by EOY FY19.

By the end of 2019, all data from these baseline inspections of Air Force owned rail assets will be entered into the RAILER database. Once consolidation of these RAILER databases is complete, the base will be responsible for maintaining the RAILER SMS data. AFCEC has hopes to centrally manage and fund the 5 year requirement for Ultrasonic inspection testing of the Active railroad in the future. At this time the base is ultimately responsible for inspection of their railroads in accordance with the UFC. The baseline inspections conducted from 2016-19 will provide the bases a current inspection of their rail assets, and can also provide backing for potential projects to repair rail lines not within current operating standards. AFCEC will review and update current rail inspection guidance to incorporate any modifications, particularly those regarding determining probability of failure and consequence of failure. As mentioned previously, an online version of RAILER to be available in late 2018, at which time the consolidated rail database will be hosted on CERL servers along with most other TNAP asset inspection data.

This railroad inspection program follows the guidance and recommendations specified in Unified Facilities Criteria (UFC) 4-860-03, "Railroad Track Maintenance and Safety Standards," 13 February 2008. RAILER is a knowledge-based track management program that gives planners decision support in the sustainment, restoration, and modernization (SRM) of their track network. It combines condition assessment, work plan generation, and spatial analysis through a companion Geographical Information System (GIS) program to help provide support and informed decisions to managers.

#### **Process Overview Map**

- Complete/Update Rail Facility Maps - Define Network Inventory
- Update Facilities Segmentation (Update Segments and Nodes[Stationing])
- Perform Track Structure Condition Index (TSCI) Survey
- Identify Base-Level Requirements and Parametric Costs
- Rack and Stack Requirements using TNAP Business Rules



- Bundle Requirements into Projects and do Detailed Estimates
- Prioritize Projects at Base Using TNAP Business Rules
- Validate and Prioritize Projects at MAJCOM/AFCEC Using TNAP Business Rules
- Combine Projects on Integrated Priority List (IPL)
- Prioritize IPL
- Repeat Process

### **Management Overview**

AFCEC Operations Directorate (AFCEC/CO) is the focal point representing the Air Force on the Tri-service RAILER Working Group and is the lead for the implementation and incorporation of RAILER into Air Force enterprise asset management activities. The RAILER Tri-Service Working Group in turn provides information and input to the DoD Installation Support Panel. The Air Force Member of the RAILER Tri-Service Working Group is also a member of the Air Force Sustainment Management Systems (SMS) Implementation Working Group (SMSIWG). The Chair of the SMSIWG is the official Air Force Representative to the DoD Installation Support Panel for all SMSs.

### **Installation Points of Contact**

Each installation should provide a primary and alternate point of contact (POC) to AFCEC for all issues related to PAVER/TNAP data and tools. AFCEC recommends that these POC's be the TNAP AMP and BCAMP Manager. They will be the guardians of the data at the installation and will have overall responsibility for the integrity of the data. In addition, they will have overall responsibility for the integrity of the airfield pavement structural evaluations and PCI survey data. The installation POCs will be made aware who at the MAJCOM Detachment (DET) and Field Operating Agency (FOA) has permission to alter the data. All requests for rights to data (Read-Only, Assessor, or Data Manager) must be coordinated with the base POC, whose name will go in the Requesting POC block of the RAILER User Account Request Form. The approval authority at AFCEC is the "Account Verifier" and will typically approve assessor or data manager rights to requests validated by the appropriate base POC.

### **MAJCOM DET Points of Contact**

Each MAJCOM DET should provide a primary and alternate POC to AFCEC and to each of their installations for all issues related to PAVER/TNAP data and tools. They should keep the base informed of who at the MAJCOM DET has permission to make changes to data, (i.e., Data Managers). They should inform the base about any changes the MAJCOM DET has made to the database. The approval authority at AFCEC will typically approve assessor or data manager rights to requests validated by the appropriate MAJCOM DET POC, whose name will go in the "Requesting POC" block of the PAVER User Account Request Form.

### **AFCEC POCs**

The following are also the Account Verifiers for the RAILER User Account Request Form:

- Ms. Jane Davis, Railroad Program Manager  
[jane.davis.3@us.af.mil](mailto:jane.davis.3@us.af.mil)  
DSN 523-6794
- Mr. Anthony Duty, Railroad Program Manager backup  
[anthony.duty.2@us.af.mil](mailto:anthony.duty.2@us.af.mil)  
DSN 523-6790
- Mr. Pat Kelly, Transportation sub-AMP





Manager [patrick.kelly.26@us.af.mil](mailto:patrick.kelly.26@us.af.mil)  
DSN 523-6304

## **Roles and Responsibilities**

### ***Rail System (Includes Railroad Bridges) Base Responsibilities:***

- Create a rail facility map for the rail system
- Update real property records using the DD Form 1354 to reflect what was in the RCI survey Real Property Report
- Develop preventive maintenance plans and generate projects to address requirements in the RCI report
- Update construction history and RCI for projects completed between 4-year evaluations between 5-year Ultrasonic Testing evaluations
- Provide support to rail system evaluation teams and AFCEC RCI consultants performing surveys

### ***AFCEC Responsibilities:***

- Review facility maps and work with base to make any necessary adjustments
- Centrally manage RCI program for rail system on a 4-year cycle. This includes completing linear segmentation and validating actual rail system inventory; performing analysis; and generating reports that outline issues, budget scenarios, and requirements

## **Training**

The following outlines RAILER training:

- **Assessor Training:** Data Collection and QC/QA training to be developed for RAILER
- **Data Managers:** Training to be developed for analyzing track inventory and inspection data, work planning, and generating reports
- **Evaluators:** AFCEC/USAERDC Certified Track Inspector training is forthcoming
- **Read Only Access:** None

AFCEC recommends that base programmers and MAJCOM personnel who have direct involvement with the information contained in the TNAP Database have assessors' rights.

As new versions of RAILER come online, AFCEC will develop training programs for base personnel to manage their data files. With the completion of the online version of RAILER all information will be hosted at an enterprise level with PAVER pavements database, bridge inspection data, and all other TNAP asset inspection data.

Computer-based AFCEC/USACE Training is currently under consideration for development.

## **Implementation Support**

Several websites assist with implementation:



RESOURCE	LOCATION
AFCEC Reach Back Center	DSN: 523-6995 COMM: 1-850-283-6995, Toll Free: 1-888-232-3721 Email: <a href="mailto:afcec.rbc@us.af.mil">afcec.rbc@us.af.mil</a>

## TNAP Rail System Resources

RESOURCE	LOCATION
Unified Facility Criteria	<a href="http://www.wbdg.org/ccb/browse_cat.php?c=29&amp;c=4">http://www.wbdg.org/ccb/browse_cat.php?c=29&amp;c=4</a> <ul style="list-style-type: none"><li>UFC 4-860-01FA Railroad Design and Rehabilitation</li><li>UFC 4-860-03 Railroad Track Maintenance and Safety Standards</li></ul>

## Inventory/Assess

### Rail System Data Collection and Inspection Approach

With these inspections all track will be segmented and entered into the RAILER SMS system. The base will be responsible for maintaining this data.

If the base had to develop their own Rail track inventory the first step in the RAILER implementation process is the creation of track inventory. Track inventory is a physical survey of the track network, and includes pertinent information about the rail, ties, switches, culverts, curves, grades, grade crossings, etc. A key part of this inventory process involves establishing a track naming convention and stationing scheme. The stationing helps to establish a reference point and location for each track, makes it easier to locate defects during the inspection and subsequent repair. Once the inventory is collected, a detailed inspection of the track structure is performed to identify, locate, and record track defects. The inspection process includes a complete visual inspection of the track including, rails; fasteners and other track materials (F&OTM); ballast; ties; turnouts; grade and rail crossings; bridges (from stringers up); and geometry. RAILER takes the defects entered and, based on preset criteria, rates each defect and the resulting RAILER maintenance table and cost estimates, informing the user of the requirements to remedy all defects found in the track system. The user can then prioritize the maintenance work, fixing the "close-to-traffic" defects first.

For training on rail system data collection and inspection, refer to the USACE RAILER training link above.

## Analyze/Forecast

### Rail System Data Analysis and Forecasting Approach

Asset management requires knowing the comprehensive condition and criticality of the asset. RCI surveys and rail bridge evaluations only provide elements of the total requirements. A comprehensive assessment by a working group is needed to pull together all of the requirements and formulate cost-effective solutions for Preventive Maintenance (PM), minor and major M&R, and reconstruction.

**Assessment Purpose:** A track structure assessment is required to develop a rail system Preventive Maintenance Plan (PMP).

**Team Composition:** The assessment team should consist of experienced personnel from civil engineering. At a minimum, the civil engineering team should include the assigned engineer, a community planner, and operations personnel from the roads and grounds shop and the equipment shop.

**Procedure:** The assessment process is a three-part procedure that involves gathering requirements from the various tools, visually assessing the track structure to validate known requirements, identifying new requirements, and developing project scopes and costs for rail system. The requirements and projects applicable to PM will be included in the PMP.

### Rail System Management Process





- Develop and organize the rail system inventory
- Assess the current condition of rail system/track structure
- Keep track of M&R history
- Develop models to predict conditions
- Report on condition performance
- Develop scenarios for M&R based on budget (Work Planning)
- Plan projects

#### ***Data Collection and Analysis Processes***

RAILER helps the base POCs and data managers responsible for rail assets answer the following questions:

- What rail assets exist?
- What defects and deficiencies exist, and how much do these cost to fix?
- What restrictions are imposed due to defects, and what is the effect on rail operations and readiness?
- What is the physical health and condition of the track?
- What are the best short and long-term maintenance strategies under limited budgets?

RAILER links each recorded defect to operations restrictions and maintenance levels based on governing standards, RCI metrics relating physical quality and condition, and local work actions to correct the defect.

Base POCs and data managers can use this information to make informed decisions in the development of efficient short and long-range work plans. Using the RCI and the track standards and customized set of business rules and prioritization schemes, managers can use RAILER to narrow down a long list of deficiencies to a filtered list of the most important work based on the condition and operations for the track.

For training on rail system data collection and analysis, refer to the USACE RAILER training link above. TNAP Business Rules for RAILER are complete and are updated yearly as needed.



## **SMS – Utilities Guidance**

[Introduction to Utilities](#)

[General Process Description](#)

[Roles and Responsibilities](#)

[Desired Outcomes](#)

### **Introduction to Utilities**

This Utilities Guidance expounds on the standard process information in the SMS Playbook particular to utilities. This guidance provides instruction to continue efforts to meet the intent of the SMS OSD mandates. This section describes how linear segmentation (LS) requirements support the condition assessment process and includes specific information on leveraging installation GeoBase GIS data to use the future Enterprise Utilities SMS (U.SMS) and Enterprise FUELER SMS currently in development to support Air Force asset management efforts.

Each utility system (electric, gas, water, wastewater, storm water, thermal systems (steam and chill water) and fuels) contains assets with an independent physical and functional identity. Effective management of these important utility systems requires a framework to assess and achieve sustainable infrastructure. This section of the Utilities Guidance outlines the processes for the LS of utilities and serves as the standard operating procedures (SOP) for the 2012 OSD directive to segment linear assets.

### **General Process Description**

#### **Data Migration Background**

Installation GeoBase GIS data needs to be migrated to the most current Spatial Data Standard for Facilities, Infrastructure and Environment (SDSFIE) version, which is currently SDFSIE 3.1. ESRI tools are available at the following links:

ESRI conversion tools, crosswalk software, and implementation videos on the CE

Portal: <https://cs1.eis.af.mil/sites/ceportal/ProgramGroups/Resources/GeoBase%20Documents/Forms/Data.aspx>

Additional videos can also be found at: <https://www.milsuite.mil/book/groups/wgqio-afcec-qio-training>.

#### **Linear Segmentation and Condition Assessments**

**SMS Implementation and Audit Readiness Timelines:** The USD (ATL) September 10, 2013 policy memo states,

"...ensure that a facility condition index for each asset ...is properly recorded ...with inspections using the SMS standard process completed for all facilities and facility components within 5 years of the date of this policy document."

The intent of the "5-year" guidance was to establish a review/validation cycle that matches the real property review cycle required by DoDI 4165.14, as paragraph 5 of the Implementation Guidance points out. Paragraph 1 of the Implementation Guidance states,

"All real property assets shall have a validated Facility Condition Index (FCI) by September 2017."

The 2017 date corresponds to the audit readiness target date of the Financial Improvement & Audit Readiness (FIAR) Act. As asset condition is an auditable data element (see <http://comptroller.defense.gov/fiar> (page C-28, Line 17)), it's suggested that Components strategize to meet audit readiness by focusing inspections on buildings first, leaving structures and lineal structures toward the end so at minimum building assets meet the FIAR schedule.

The Operation Program Group (OPG) approved the AFCEC implementation approach to execute LS with in-house staff and contract augmentation support as the best option. The CE Board was briefed 10 June 2015 for the required resources needed to support LS for Active AF installations.





The AF implementation process involved AFCEC/COAU government civilians as Utilities Sub-AMP Managers (SAMs) to facilitate base visits by a centrally managed GIS LS contractor. This support was concluded after the four-year contract ended in September 2019. Asset conditions were determined through a knowledge-based data collection approach through interviews with base civil engineer personnel. Direct condition ratings were used to assess AF owned and operated utility assets at 96 installations. This course of action best supports Asset Management implementation and Real Property Inventory validation to meet the intent of the LS policy.

The initial phase of linear segmentation considers the standardization for identifying linear segments and ensuring the real property (RP) records reflect the inventory at the segmented level. This will require coordination with the Real Property Accountable Officer (RPAO), GeoBase, and CE Operations. AFCEC/COAU is the AF Lead office for Linear Segmentation of Utilities Systems.

#### **Data Maintenance**

This step-by-step process provides simplified guidance for fulfilling the minimum GeoBase data field entry requirements. Failure to follow instructions provided within this guidance may prevent requirements from receiving prioritization and/or funding consideration within the Comprehensive Asset Management Plan (CAMP) development and Integrated Priority List (IPL) execution. Utilities requirements not assessed as part of the AMP will not be considered during the IPL process.

##### **Step 1: Focus on Inventory and Assessment of Worst and Most Important Requirements First**

SAMs and Sub-AMP working groups should continue to strive to collectively identify the installation's worst and most important utilities requirements. It is recommended that SAMs focus priorities on Critical Infrastructure Tier 1 assets that have a preponderance of repairs and outages, leaks, service calls, or failures, as defined in the *Categories and Definitions Critical Infrastructure Mission Dependency Index (MDI)* workbook. All italicized references in this document can be found in the Wastewater/Storm Water Toolbox located on the right side of this CE Portal Playbook page.

The *Operations Engineering Playbook* provides instructions for pulling various Automated Civil Engineering System (ACES) and NexGen IT reports that may facilitate focus in the outlined areas.

##### **Step 2: Establish Installation Geospatial Information System (IGIS) Asset Record and Minimum Data**

The Air Force will use GeoBase to establish inventory and condition data for linear utilities assets. The installation's GIS data will be the authoritative data source for use by the SMS. Verify that the all utility assets are segmented according to the standards set forth in the *Linear Segmentation Playbook* (link found in the Toolbox on the right side of this CE Portal page). If the installation has the results from a recent utility survey, CE personnel should migrate that data into GeoBase for use in the AMP process. Update the geodatabase to account for the increase in the numbers of utility segments and to comply with the upcoming *SDSFIE 3.1 Standards*. At a minimum, perform surveys and/or assessments to collect the AMP-identified attributes, referred to in the *Utilities Condition Index AMP Scoring Worksheets*, on the identified priorities.

##### **Step 3: Sustain and Maintain Data**

The Air Force will use GeoBase GIS data to establish inventory and condition data for linear utilities assets. Verify that the utility requirement(s) selected are segmented according to the standards set forth in the *Linear Infrastructure Playbook*. If Sub-AMP Managers are in possession of the installation's most recent utility survey results, that data should be migrated into GeoBase for use in the AMP process. Update the geodatabase to account for the increase in the numbers of utility segments and to comply with the upcoming *SDSFIE 3.1 Standards*. At a minimum, perform surveys and/or assessments to collect the AMP-identified attributes, referred in the *Utilities Condition Index AMP Scoring Worksheets*, on identified priorities.

##### **Step 4: Utilize Data to Analyze and Fine-Tune Work Programs**

While GeoBase data enables the Air Force Civil Engineer Center (AFCEC) to develop long-range infrastructure investment plans for AF enterprise use, collecting and maintaining additional attribute data is of great importance to base civil engineers and mission owners as well. This practice enables



Work Order supply budgeting, benefits scheduling and planning strategies, improves business case analyses for capital investments, and/or facilitates the advocacy for project funding. Local condition assessment ratings and scoring algorithms can be adjusted to consider finer level of details for Preventive Maintenance or Priority Action programs. Procedures for generating AMP Utility Condition Indexes directly within GeoBase have been developed called the Utilities UCI Tool. This tool is available at this link:

<https://maps.af.mil/geoportal/home/group.html?id=c3650edebf5a46a0832e5a89ed05179c>. For performing manual calculations of AMP Utility Condition Indexes, refer to the Utilities Condition Index AMP Scoring Worksheets.





## Roles and Responsibilities

ROLES	RESPONSIBILITIES
<b>AMP Manager</b>	<ul style="list-style-type: none"> <li>Anticipate and manage water supply, wastewater/storm, thermal/mechanical (Steam and Chill Water), electrical, and liquid fuels services. This includes the management of supporting infrastructure networks and coordination with sub-AMPs to meet regulatory requirements, such as Environmental Quality (EQ) and public health permitting</li> <li>Retains final authority in accepting segmentation assignments</li> </ul>
<b>Utilities Sub-AMP Manager (SAM)</b>	<ul style="list-style-type: none"> <li>Provide day-to-day operational support and guidance at the base as it relates to specific AF utility systems and governance documents</li> <li>Responsible for all installation facilities and systems that are for the sole purpose of providing transmission, monitoring, and maintenance support of base utility systems. Specific responsibilities include review/validation of installation comprehensive planning support, system design and modeling, development of projects for utility systems, and validating scope and project requirements.</li> </ul>
<b>Real Property Accountable Officer (RPAO)</b>	<ul style="list-style-type: none"> <li>Determines AF-owned assets and distinguishes between linear and non-linear assets</li> <li>Has final authority regarding any changes to the facilities/facility map resulting from this process</li> </ul>
<b>GeoBase Office</b>	<ul style="list-style-type: none"> <li>Identifies geographical/functional area of the linear utilities assets as well as the segment assignments</li> <li>Creates a geometric network of segment groupings using technology capabilities in ArcGIS.</li> <li>Supports in-house field evaluations and sustainment of the accuracy of base utility maps</li> <li>Incorporates necessary changes to the facility map following linear utilities assets evaluations</li> </ul>
<b>Civil Engineer (CE) Operations</b>	<ul style="list-style-type: none"> <li>Provides input identifying attributes such as ownership, geographical/functional area, and grouping of the linear utilities assets based on maintenance records, and any other knowledge</li> <li>Supports in-house field evaluations</li> <li>Comprises of the Utilities AMP Manager, Operations Engineering, and the Shop, wherein the Utilities AMP Manager retains final authority in accepting segmentation assignments and Operations Engineering proposals for design/project development and/or manages the design of new utilities</li> <li>Ensures design meets linear segmentation guidelines and provides as-builts of existing utilities (where available) and new facilities upon completion</li> <li>Receives assistance from GeoBase office areas and segment groupings based on the linear segmentation rules for utilities</li> </ul>
<b>BIAT</b>	<ul style="list-style-type: none"> <li>Composed of an in-house team of experts or a team of contractors with the necessary expertise</li> <li>Collects data points on a facility's current use and compares this information to most recent documentation in order to identify discrepancies</li> </ul>

Table 13 Utilities Roles and Responsibilities

## Desired Outcomes

The overall outcome for inventory is to collect and log detailed asset inventories from the Real Property utility systems in GeoBase using SDSFIE 3.1, GIS mapping standards.

This guidance supports the desired outcome of collecting and logging detailed utility asset inventories and assessments on utility systems for each real property facility in GeoBase using SDSFIE 3.1. Utilities assets include all Air Force-owned electrical power production and transmission systems within the base boundary (normally up to the five foot line of serviced structures) and service contract oversight for electrical distribution systems within base boundaries that have been privatized in accordance with 10 United States Code (USC) 2688.

The goal of the linear segmentation program is to use GeoBase maps to associate linear and non-linear segments of real property facilities to facilitate asset management of the infrastructure at the sub-AMP

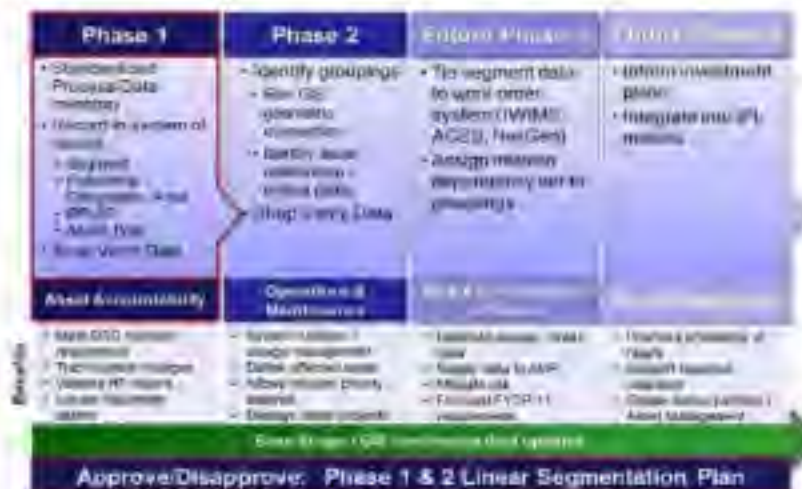
manager level and focus infrastructure assessment to all areas. The implementation of linear segmentation is an ongoing process across the enterprise. Linear Segmentation supports data accuracy recorded in the installation's real property records. Capital improvements must be recorded in the installation maps. Base engineers are responsible for keeping installation maps current.

Bases should ensure GeoBase, Sustainment Management Systems (SMS), and NexGen IT data are complete, accurate, and up to date.





### Utilities Segment Prefix Conventions



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## **Sub-AMPs**

### **Electrical Systems and Generators**

The Electrical Systems and Generators Sub-Activity Management Plan (AMP) encompasses all Air Force-owned electrical power production and transmission systems within the base boundary normally to the secondary taps of the transformer(s) supplying a facility and service contract oversight for electrical distribution systems within the base boundaries that have been privatized in accordance with 10 United States Code (USC) 2688. Electrical activities encompass overhead and underground distribution lines, transformers, substations and switching stations, generation plants, poles, lightning protection, grounding and bonding systems, and cathodic protection. This Sub-AMP is also responsible for the airfield lighting systems.

### **Mechanical Distribution**

The Mechanical Distribution Sub-Activity Management Plan (Sub-AMP) encompasses all Air Force-owned facilities that exist for the sole purpose of providing transmission monitoring and maintenance support to the distribution system, including natural gas, hot water and steam transmission systems, facility-specific heating and ventilation, and centralized Heating, Ventilation, and Air Conditioning (HVAC) plant systems. It also includes service contract oversight for Mechanical distribution systems within the base boundaries that have been privatized.

### **Potable/Non-Potable Water**

The Potable/Non-Potable Water Sub-Activity Management Plan (Sub-AMP) encompasses all Air Force-owned potable water, non-potable water, and Fire Emergency Services (FES) systems up to the five-foot line of serviced facilities, including wells, distribution lines, potable water treatment plants, pumps, valves, hydrants, storage, and service contract oversight for Potable distribution systems within the base boundaries that have been privatized.

### **Wastewater/Storm Water**

The Wastewater/Storm Water Sub-Activity Management Plan (Sub-AMP) encompasses all Air Force owned industrial and domestic wastewater systems up to the five-foot line of serviced facilities and service contract oversight for Wastewater distribution systems within the base boundaries that have been privatized. It also includes the edge of paved surfaces for storm water, including lift stations, collection lines, manholes, wastewater treatment plants, oil/water separators, other wastewater pre-treatment units, storm water pipes, swales, detention/retention areas, and outfalls.



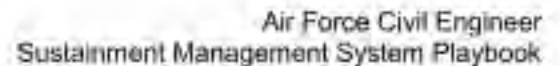
## Segmentation Hierarchy

The utilities segmentation hierarchy represents a one-to-many relationship among linear segments moving down the hierarchy (Figure 9). A facility can consist of many branches, which can consist of many sections. Sections are the most specific segment type and are identified by a unique combination of physical and usage characteristics.



Figure 9 Segmentation Hierarchy





Asset type and Real Property Unique Identifiers (RPUIDs) are already established by real property (RP) records and should be the starting point for linear segmentation. The below business rules provide descriptions from the highest level (Asset Type) to lowest level (Segment).

```

graph TD
    A[Network Facility System (Potable Water)  
Identified by Asset Type Code and Asset Subtype Code] --> B[Non-Linear Facility Component  
e.g., Reservoir (RPLAD assigned)]
    A --> C[Linear Structure Component  
e.g., Pipeline (RPLAD assigned)]
    C --> D[Segment 1  
e.g., Differing elevation and pump  
(treated as a node)]
    C --> E[Segment 2  
e.g., Same elevation (pump and lifting  
(treated as a node))]
  
```

**Network Facility System (Potable Water)**  
Identified by Asset Type Code and Asset Subtype Code

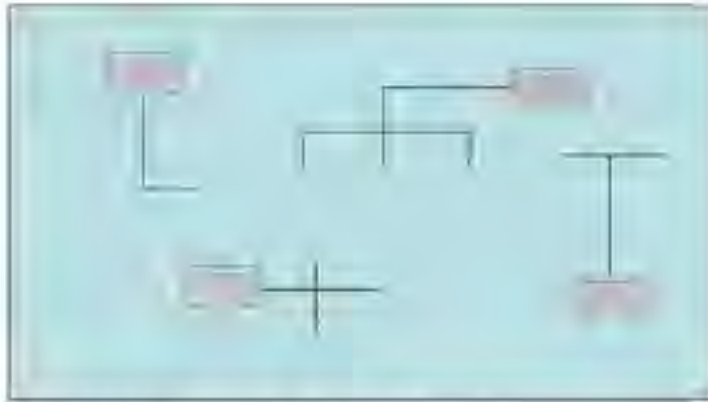
- Non-Linear Facility Component  
e.g., Reservoir (RPLAD assigned)
- Non-Linear Facility Component  
e.g., Pump (RPLAD assigned)
- Non-Linear Facility Component  
e.g., Bypass (RPLAD assigned)
- Linear Structure Component  
e.g., Pipeline (RPLAD assigned)
  - Segment 1  
e.g., Differing elevation and pump  
(treated as a node)
  - Segment 2  
e.g., Same elevation (pump and lifting  
(treated as a node))

The largest level or most encompassing level of segmentation is Asset Type. The above diagram shows an example of the complete hierarchy for linear segmentation based on the protocol described in previous sections.

RPUIDs are the specific facility/asset identification number under the DoD Real Property systems. RPUIDs are assigned to a complete and separate facility, or assets with a CATCODE. RPUIDs can be non-linear facilities (vertical construction) or linear structures (water distribution lines, wastewater collection, electrical distribution lines, etc.).

It is important to note that for linear assets, there can be multiple RPUIDs for each CATCODE. Bases will need to work with existing RP records for official RPUIDs listings. Each linear segment must contain the appropriate segment ID and that information must be available through GIS to link the linear structure segment information to the RPUID. This information will be important to the future U SMS as well.





**Figure 12 Four Separate and Isolated Lines**

The protocol for RPUIDs are as follows:

- Use existing RPUIDs
- Facility or asset has a specific CATCODE
- Facility or asset complete and separate

#### **Geographical / Functional Area**

This categorization is optional and recommended if the base already has local geographical / functional descriptors established. Currently, a RPUID is assigned to one entire system, which makes associating the type of funding and identifying the office of management for these assets difficult. To make it more apparent, the segments / other components should be grouped by the main function of that area such as flight-line, cantonment, housing or multiple. At larger bases, there may be a need to expand the areas since there may be multiple tenant units or remotely located portions of an installation. The business rules for the areas are as follows:

- Each area should be connected to the system with the ability to be isolated from the others areas by valves, switches or other mechanism
- Each area should be named after main function – at least 75% of the utilities support a function (flight-line, cantonment, or certain utility support areas)
  - Flight-line – at least 75% of the utilities support a flight-line function
  - Cantonment – at least 75% of the utilities support a cantonment function
  - Housing – at least 75% of the utilities support a housing area
  - Circuit A – electrical circuit a supports a certain area
- When no function represents at least 75% of the utility system, geographical area descriptions
  - Northside, Bayside, Southside, etc.

#### **Grouping**

Grouping consists of interconnected segments (linear and non-linear), which would isolate a utility service line with the minimum by valves, switches, or other mechanisms needed from the rest of the utility service line. Figure 13 is a low-level schematic depicting segment grouping; it is not meant to show specific exact pipe placement.

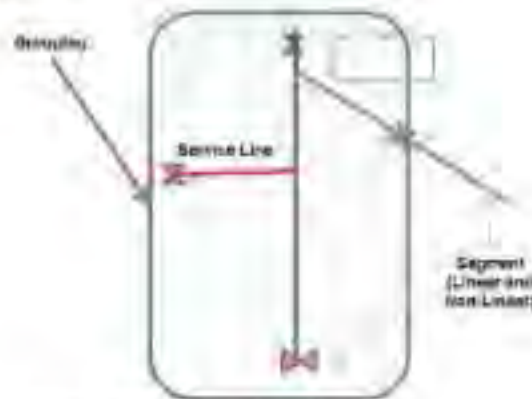


Figure 13 Segment Grouping

### Segments

Segments should contain elements of pipe / distribution segments and other components without RPUIDs such as valves, pumps, backflows, transformers, etc.

Below are commonly used components of non-linear assets associated with linear utilities assets. If a particular asset does not fit under any of the listings below, another non-linear component may be used.

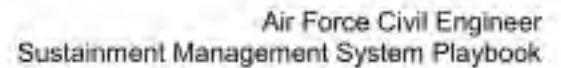
- **Water:** Valves, backflow prevention, Energy Management Control System (EMCS) component, flush point, hydrant, meter manhole
- **Electrical:** Transformers, generator points / backup generators, substations / switching stations, perimeter / security / street lighting, pole (includes cross arms, arrestors, etc.), sectionalized junctions, sectionalized switches
- **Wastewater:** Valves, cleanout, manhole, EMCS component
- **Stormwater:** Culverts, manhole, headwall, wing wall, inlet, outlet
- **Natural Gas:** Valves, cathodic protection, EMCS

component For linear assets, the segmentation should follow

these protocols:

- A segment must be made of common attributes (installation date, material, diameter, etc.)
- Line segments will be commonly assigned from pipe junction (intersection) to pipe junction, and pipe junctions to distribution valves
- A line that does not provide positive water pressure or feed (i.e., service line to facility, fire hydrant) will not break a segment

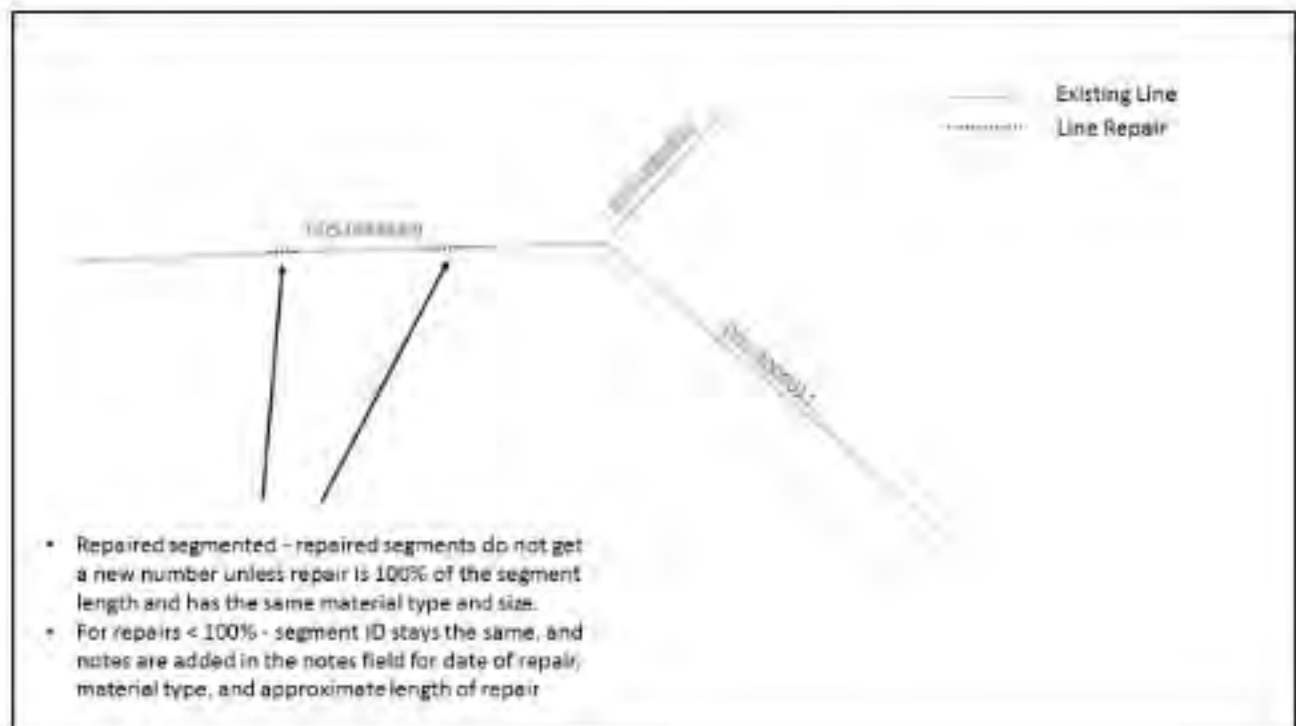




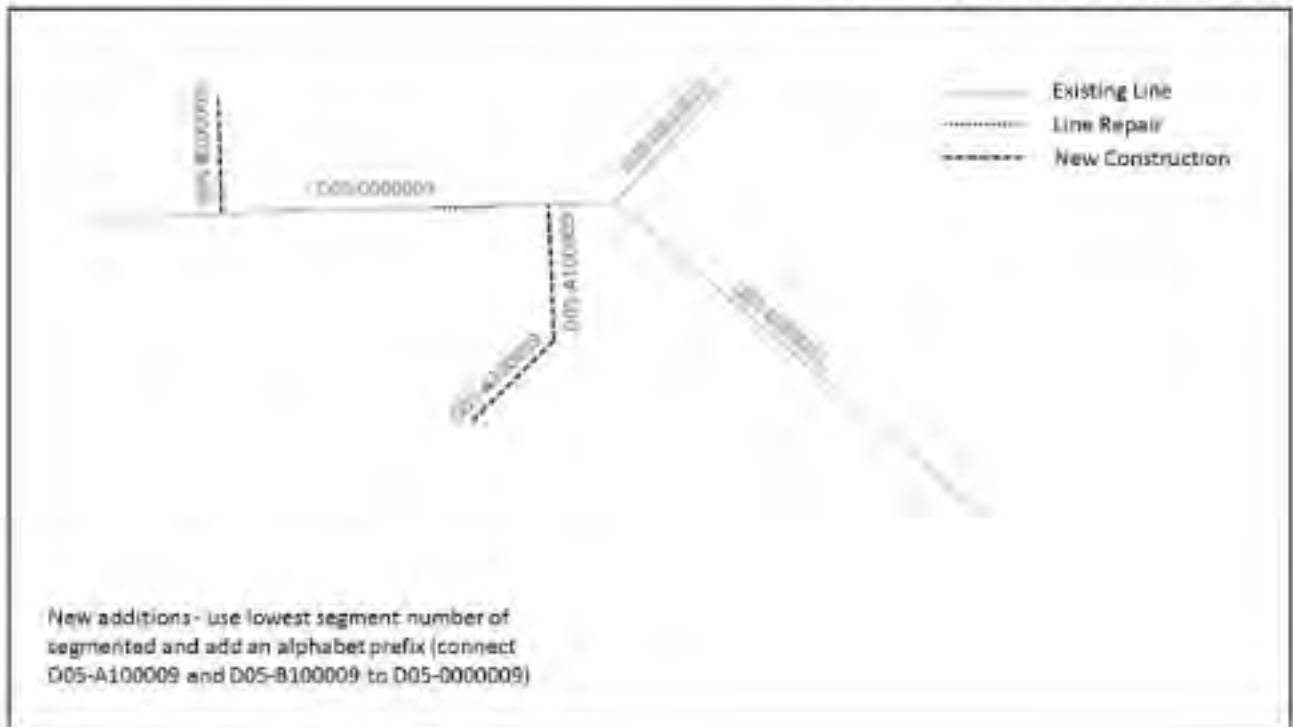
**Figure 14 Linear Segments & IDs**

### Linear Segmentation Rules for Repair, Demolition, and New Construction.

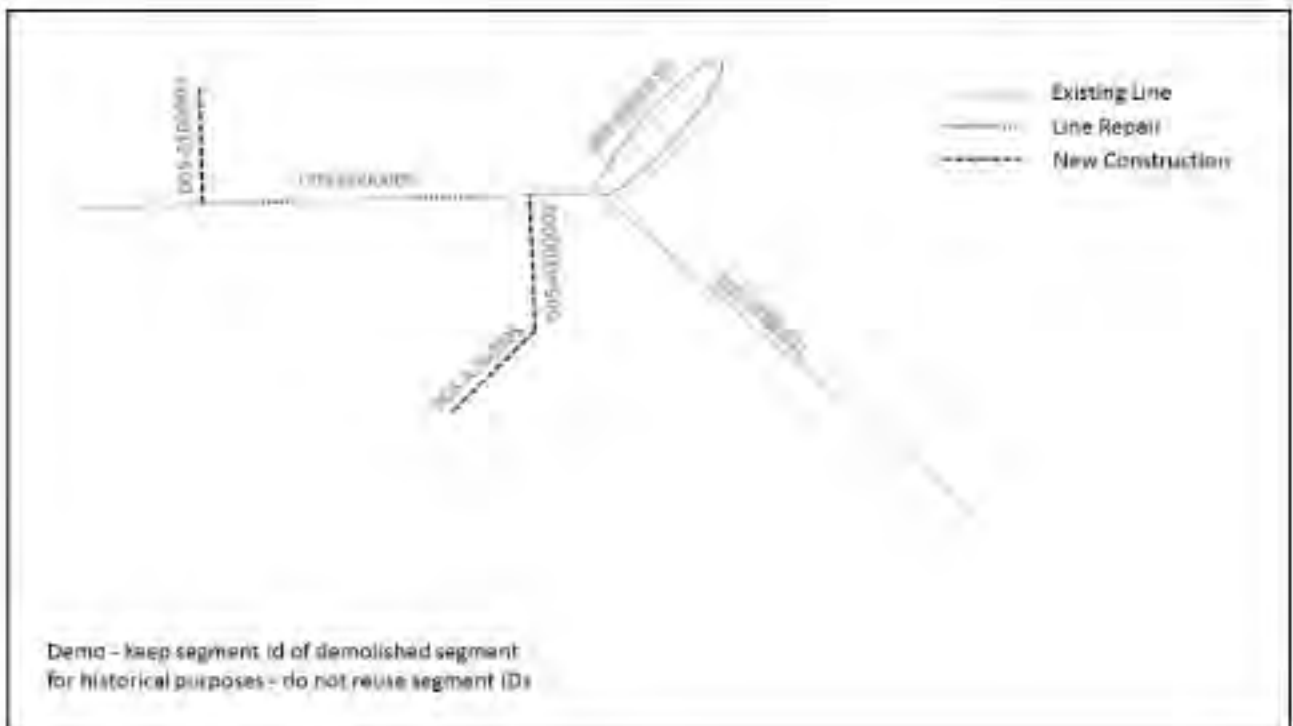
When segments are repaired, demolished, or new segments are constructed, the following four rules apply as required:



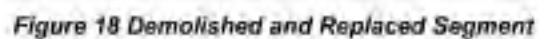
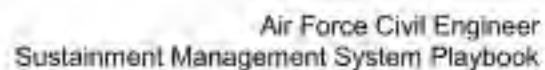
**Figure 15 Repaired and Segmented**



**Figure 16 New Addition Segments**



**Figure 17 Demolished Segment**



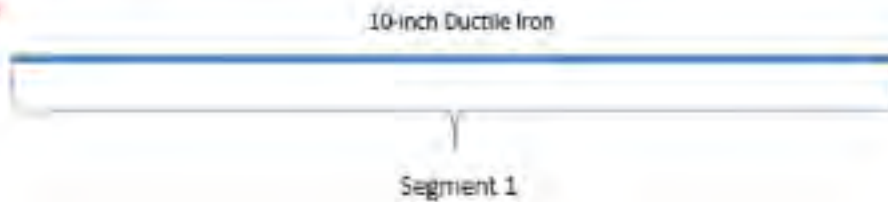


## Linear Segmentation Rules

### Utility Water Mains

**Rule #1:** Water main segments will contain all like attributes and be split where there is a change in attribution such as material, diameter, installation date, change in ownership, operations status, etc.

Example 1:



Example 2:



Figure 19 LS – Water mains: Rule #1

**Rule #2:** All valves will be snapped to the line segment at a vertex; however, they will not break the line segment.

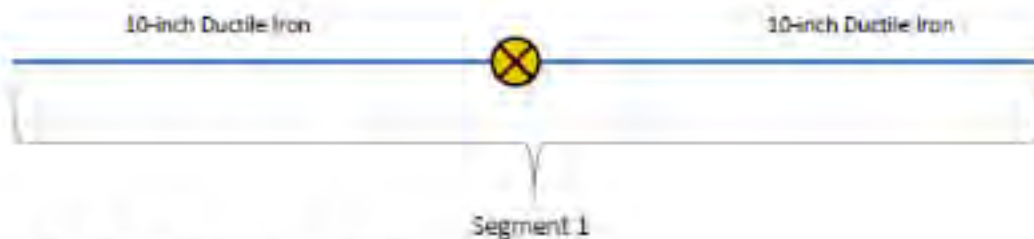


Figure 20 LS – Water mains: Rule #2



**Rule #3:** Water mains will be **broken at all connections** with another pipe (pipe junctions), including hydrant leads and services.

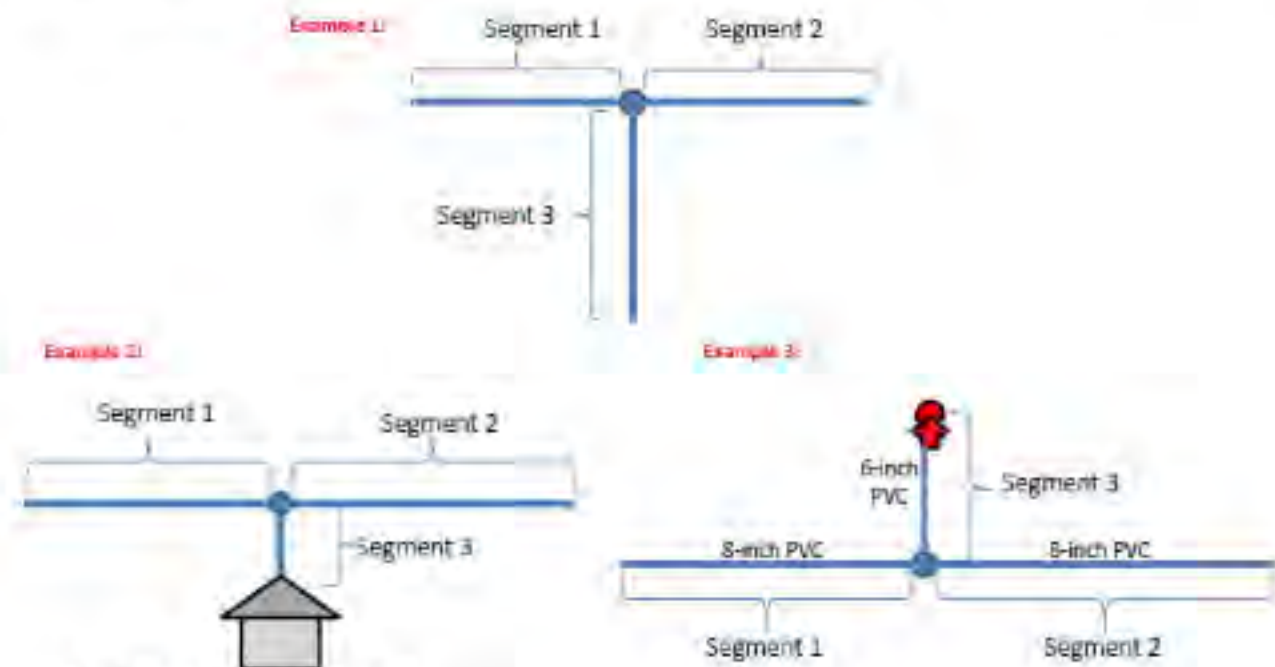


Figure 21 Water mains: Rule #3

## Electrical Systems

Linear Segmentation for the **Electrical Distribution System**: Overhead and Underground (eUGPrimary\_L and eOHPrimary\_L) primary power lines are represented by linear segments. Non-linear segments, such as Transformers, Sectionalizer Switches, Sectionalizer Junctions, Power Station, Substations, Manholes, and Poles, are represented by nodes (eTransformer\_P, eSwitch\_P, eSubstation\_P, eAccessPoint\_P, and ePole\_P). Create the segments according to the specific segmentation rules presented below. Field evaluation is sometimes required to ensure the electrical system is mapped consistently and accurately.

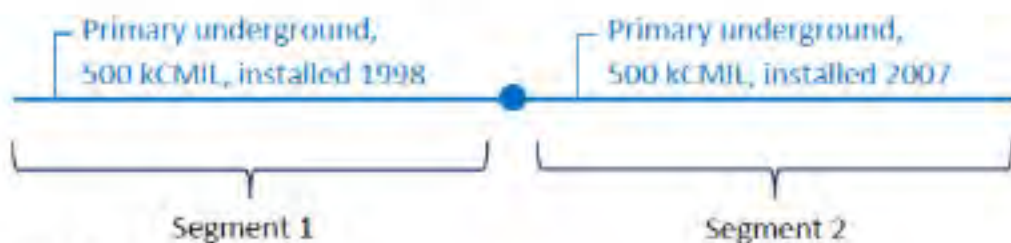
**Rule #1:** Power lines (Overhead or Underground) shall be segmented when attributes change: Attributes include overhead versus underground, circuit, type of conductor material, conductor size, installation date, ownership (Base or Local Utility), operation status (active or abandoned), and category type (Primary Main, Secondary Main, Distribution Main, and Service Line, See Appendix B, Table B1 for definitions). Also, do not limit the segment length to 1,000 feet as noted in the AF CE Playbooks.



**Example 1:**



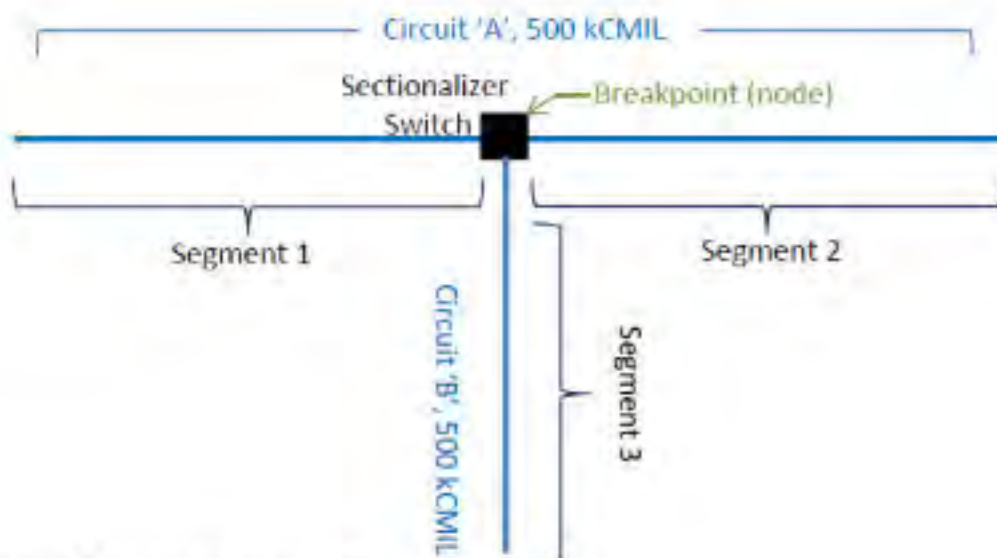
**Example 2:** Same circuit with different dates of installation; segment breaks.



**Figure 22 Electrical System: Rule #1**

**Rule #2:** Power line (OH or UG) shall be segmented where connected with another circuit, or to equipment such as Transformer, Switch, Junction Cabinet, Power Station, Substation, whether the attributes change or not.

**Example 1:** Circuit 'A' is segmented when connected to the switch.



**Figure 23 Circuit A Segmentation Example**





**Rule # 3:** Electrical manhole and power pole shall be snapped onto the power line segment as a node; however, they shall not break the line segment if all attributes are the same on each side of the node.

**Example 1:** Manhole or power Pole does not break a linear segment if attribute does not change.



**Example 2:** Attribute changes, segment breaks.

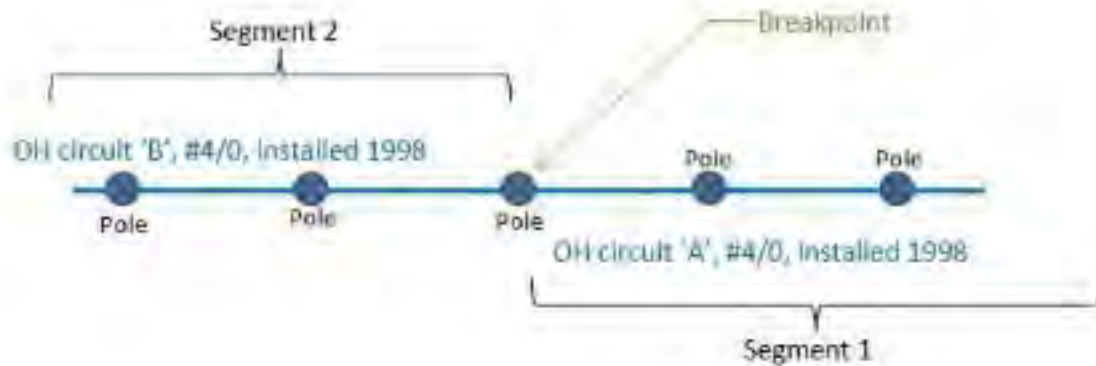


Figure 24 Electrical System: Rule 3

**Rule #4:** When multiple power lines/circuits are in near vicinity to one another (i.e. pass through the same manhole or strung on same pole at different heights), only one line will represent the multiple circuits in the GeoBase. Hovering the cursor over the line will display the individual circuits that the line represents with its associate attributes.

**Example:**

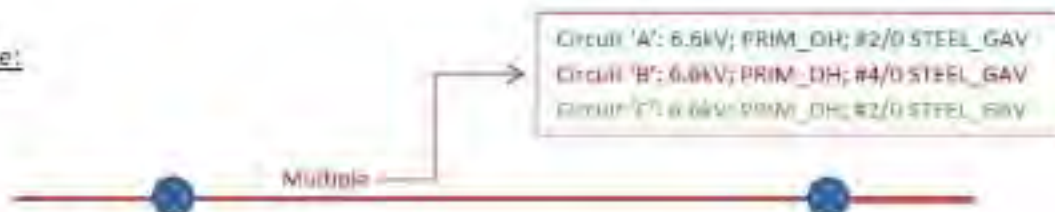


Figure 25 Electrical System: Rule #4



## Sanitary Sewer Mains

**Rule #1:** Split sanitary sewer mains at each manhole.



Figure 26 Sanitary Sewer Mains: Rule #1.

**Rule #2:** Split sanitary sewer mains where there is a change in categorization (E.g. main to trunk, trunk to primary/interceptor). In most cases a change in category will occur at a manhole (a); however, a category change can occur without a manhole (b).

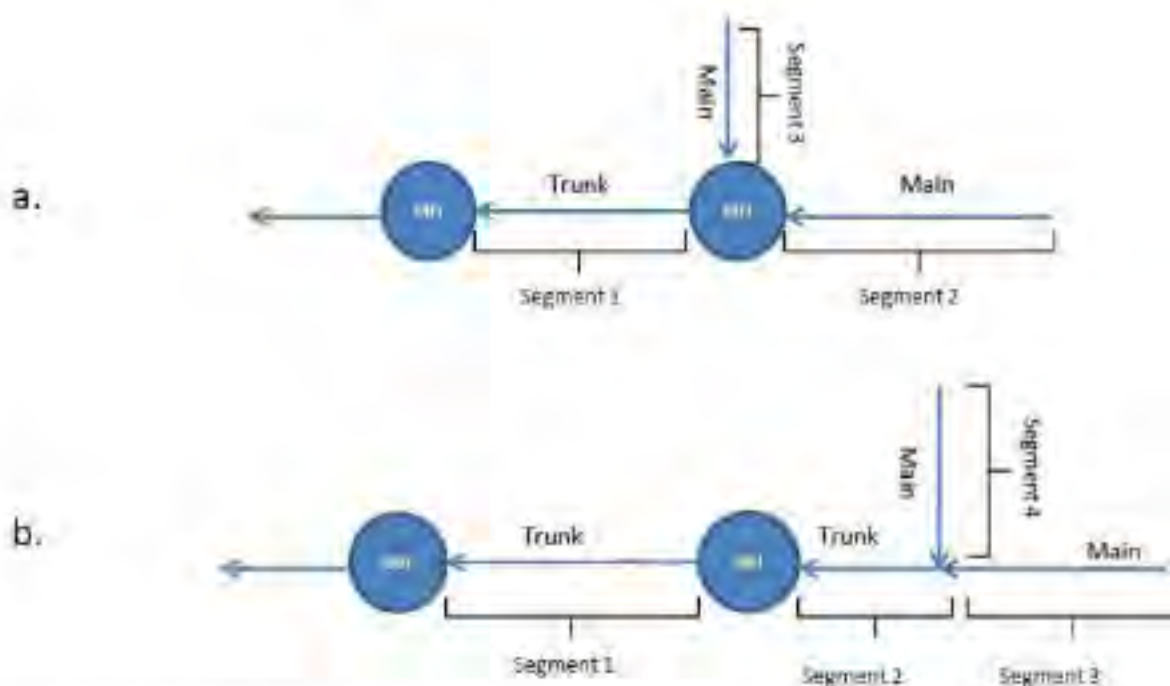


Figure 27 Sanitary Sewer Mains: Rule #2





**Rule #3:** Sanitary sewer mains that receive flow from lateral/service lines in-between manholes will remain as a single segment and not split at the junction.

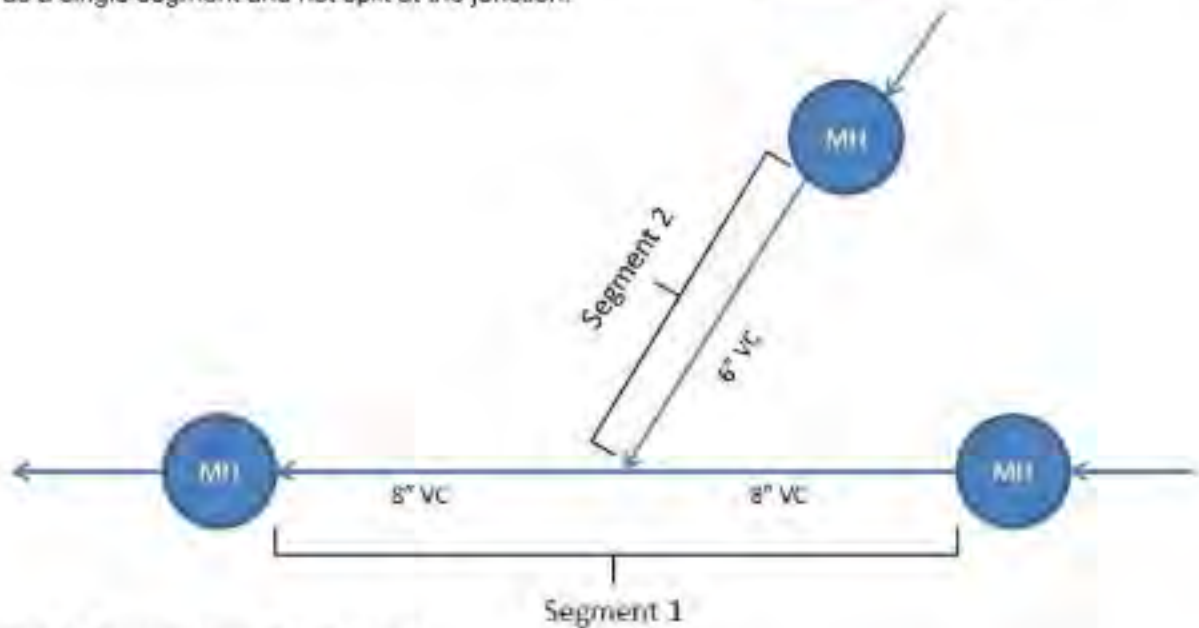


Figure 28 Sanitary Sewer Mains: Rule #3

**Rule #4:** There will be a split in pipe segments where there is a change in attributes that doesn't occur at a manhole (unlikely).

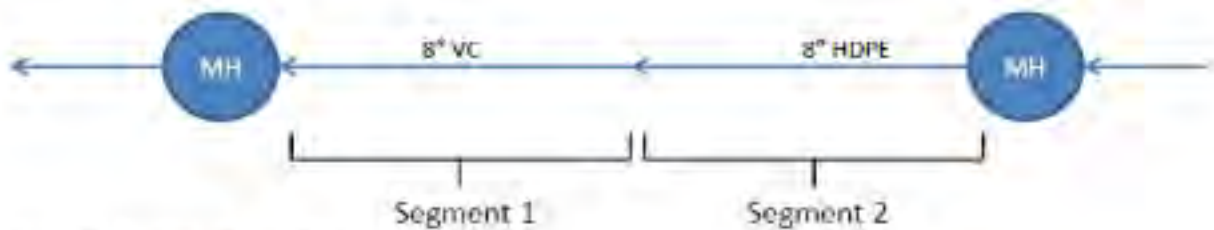


Figure 29 Sanitary Sewer Mains: Rule #4



**Rule #5:** Split mains into separate segments between cleanouts where there is a known change in attribute data (Example "a"). In situations where there are no known changes in attribute data, the pipes will be continuous segments (Example "b").

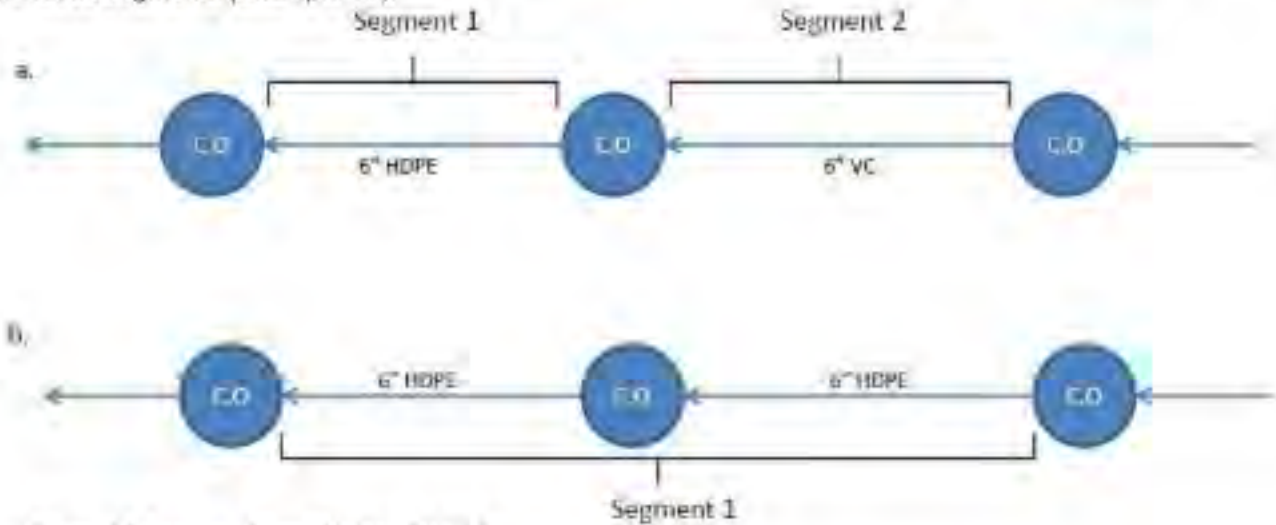


Figure 30 Sanitary Sewer Mains: Rule #5

**Rule #6:** Mains will be a continuous segment where there is a change in direction (but not attributes) which does not occur at a manhole.

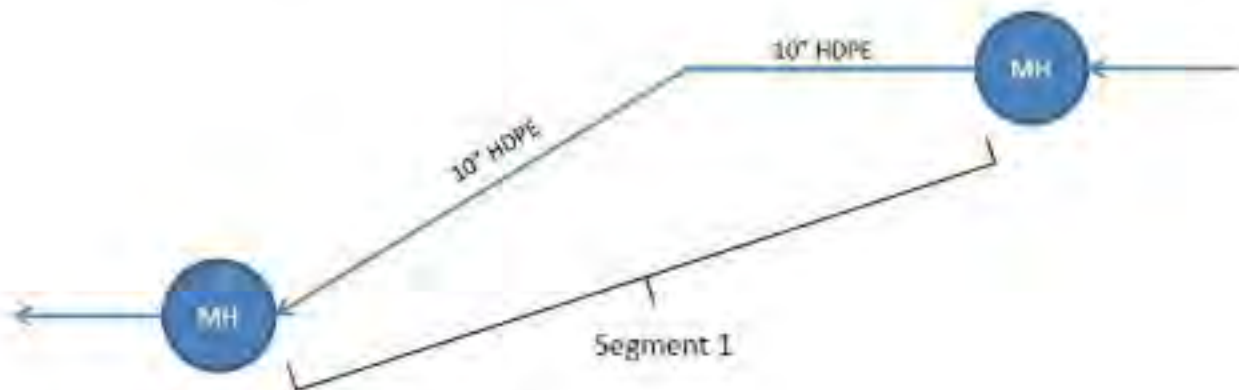


Figure 31 Sanitary Sewer Mains: Rule #6



## Storm Water Mains

**Rule #1:** Split storm water mains and open drainage lines (drainage channels) at each manhole.



Figure 32 Storm Water Mains: Rule #1

**Rule #2:** Split storm water mains and open drainage lines into separate segments between inlets that act as junction points.

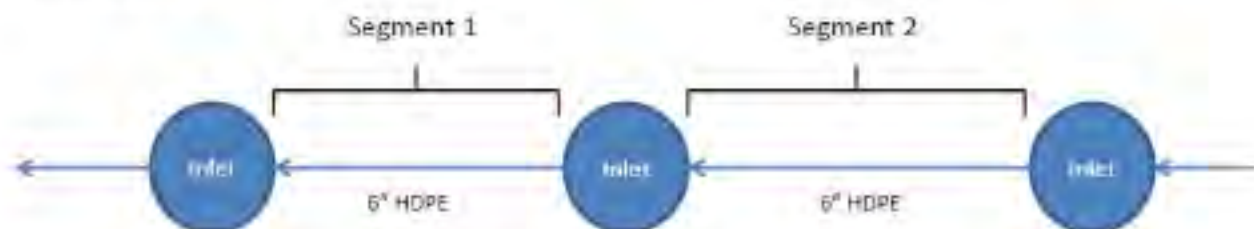


Figure 33 Storm Water Mains: Rule #2

**Rule #3:** Split storm water mains and open drainage lines where there is a change in categorization (E.g. main to trunk, trunk to primary/interceptor). In most cases, a change in category will occur at a manhole (a); however, a category change can occur without a manhole (b).

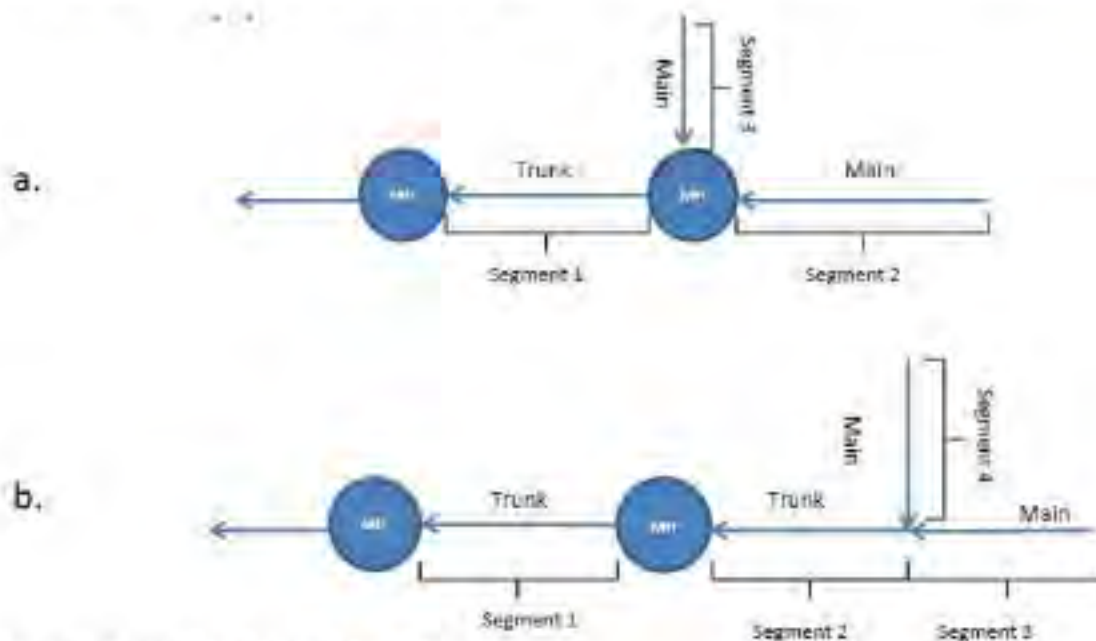
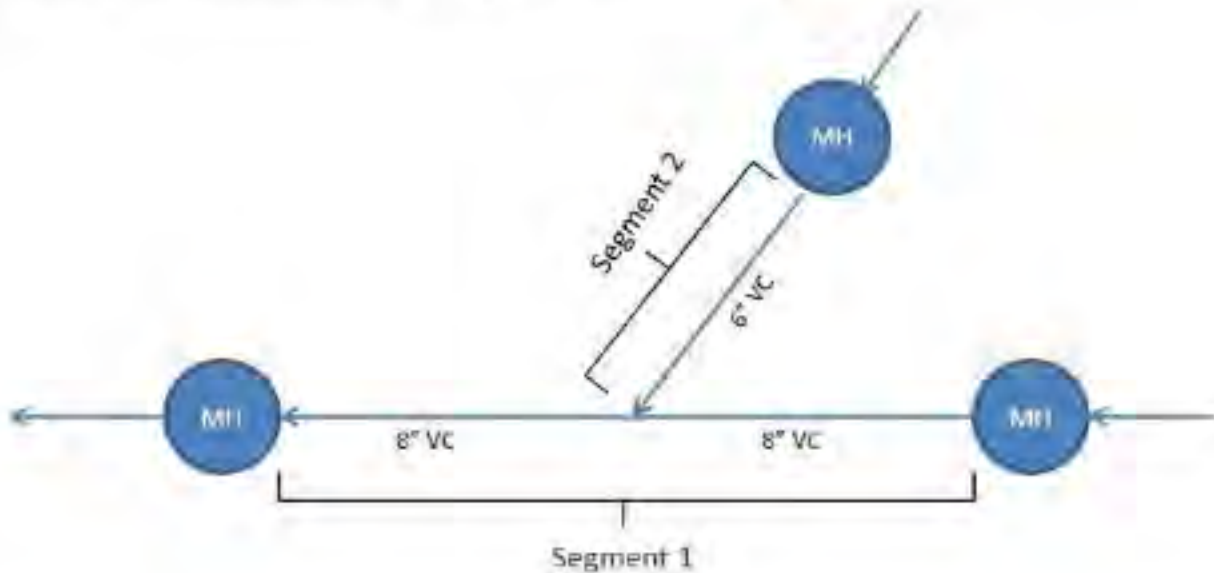


Figure 34 Storm Water Mains: Rule #3



**Rule #4:** Storm water mains and open drainage lines which receive flow from lateral/service lines in-between manholes will remain as a single segment and not split at the junction.



**Figure 35 Storm Water Mains: Rule #4**

**Rule #5:** There will be a split in pipe segments where there is a change in attributes that does not occur at a manhole (rare occurrences).



**Figure 36 Storm Water Mains: Rule #5**



**Rule #6:** Storm water mains and open drainage lines will be a continuous segment where there is a change in direction (but not attributes) which does not occur at a manhole.

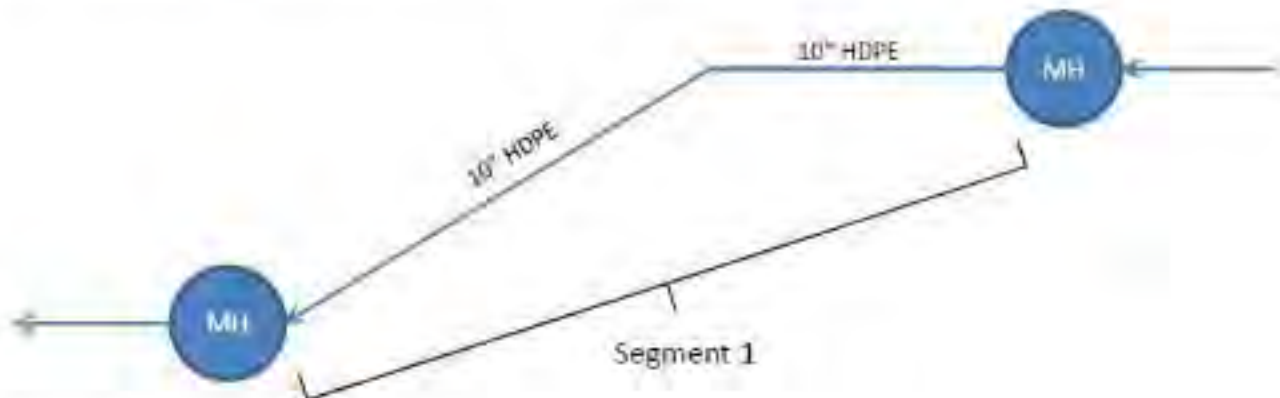


Figure 37 Storm Water Mains; Rule #6





**Natural Gas** Under construction  
**Steam Utilities** Under construction

Central Chilled Water Utilities  
Under construction

#### Identifying Attributes

Segments should be categorized by the following attributes:

- **Installation Year:** The installation year indicates when the segment was first installed or the year that the system was constructed
- **Material Type:** Below are commonly used material types for both linear and non-linear segments
  - **Water, Wastewater, Natural Gas:** Polyvinyl chloride (PVC), cast iron, ductile, steel, concrete, asbestos cement, polyurethane, high-density polyethylene (HDPE)
  - **Stormwater:** PVC, cast iron, ductile, steel, concrete, asbestos cement, polyurethane, natural swale / ditch

#### Electrical:

- Linear – copper, aluminum, triplex, steel
- Non-linear – wood, metal, concrete, pole mount, pad mount, substation
- **Size:** Depending on the utility type, the size may vary in unit of measure (inches, kilo volt amps [KVA], etc.)
- **Total Length:** A line segment should not exceed 1,000 except with adequate justification
- **Use:** Below are common identifications for usage

#### Water:

- Linear – fire suppression system, potable, irrigation, main, lateral, source
- Non-linear valves – butterfly, pressure reducing, gate, globe, check, air
- Non-linear backflow prevention – reduce pressure zone device, spill resistant vacuum breaker assembly, double check valve assembly, pressure vacuum breaker assembly

#### Wastewater:

- Linear – sewer main, sewer trunk, sewer interceptor, sewer lateral
- Non-linear valves – butterfly, pressure reducing, gate globe, check valve, air valve, high / low valve
- **Stormwater:** Storm main, structural, non-structural
- **Electrical:** Transmission line, distribution line, feeder, conduit, counterpoise

#### Natural Gas:

- Linear – main, lateral
- Non-linear valves – butterfly, pressure reducing, gate, globe, check, air
- **Location Coordinates:** Coordinates should be in the same format as GeoBase records and can be used by Civil Engineer (CE) Operations to locate each segment during fieldwork
- **Operational Status:** Operation status indicates whether an asset is active, inactive or abandoned

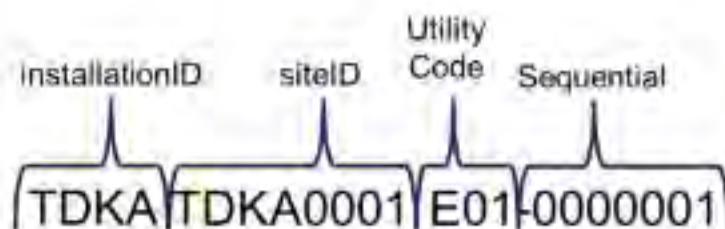


## Utilities Segment Prefix Conventions

The following conventions are to be used when labeling utility segments:

### Linear Segmentation Unique ID

E	utilitiesElectrical	O	utilitiesFuels
G	utilitiesGas	M	utilitiesMisc
S	utilitiesSewer	D	utilitiesStormwater
T	utilitiesThermal	W	utilitiesWater





## LS Unique ID - Electrical (E)

Electrical		Electrical	
Feature Class Name	Segment ID	Feature Class Name	Segment ID
eAccessPoint_P	E01	eOHTransmission_L	E12
eConduitSystem_L	E02	eStructureSupport_P	E13
eCounterpoiseSystem_L	E03	eSubstation_P	E14
eCurrentRegulator_P	E04	eSurfaceStructure_P	E15
eDynamicProtectiveDevises_P	E05	eSwitch_P	E16
eExteriorLight_P	E06	eSwitchingStation_P	E17
eGenerator_P	E07	eTransformer_P	E18
eGuyWire_L	E08	eUGPrimary_L	E19
eMeter_P	E09	eUGSecondary_L	E20
eOHPrimary_L	E10	eUGTransmission_L	E21
eOHSecondary_L	E11	eVoltageRegulator_P	E22

## LS Unique ID - Fuel (O)

utilitiesFuels	
Feature Class Name	Segment ID
oAirEliminator_P	O01
oControlValve_P	O02
oFilterStrainer_P	O03
oFitting_P	O04
oHydrant_P	O05
oInstallationPipeline_L	O06
oInterterminalPipeline_L	O07
oLineDefueling_L	O08
oMeter_P	O09
oOilWaterSep_P	O10
oPigLaunch_P	O11
oPump	O12
oPumpStation_A	O13
oPumpStation_P	O14
oTankFarm_A	O15





## LS Unique ID - Gas (G)

utilitiesGas	
Feature Class Name	Segment ID
gAlcoholInjectionEquipment_P	G01
gControlValve_P	G02
gDrip_P	G03
gFitting_P	G04
gGasLamp_P	G05
gLineDistribution_L	G06
gLineHeater_P	G07
gLineService_L	G08
gMeter_P	G09
gOdorizer_P	G10
gPigLaunch_P	G11
gPressureMonitoringDevice_P	G12
gPumpStation_A	G13
gPumpStation_P	G14
gRegulator_P	G15
gScrubber_P	G16
gStrainer_P	G17

## LS Unique ID - Electrical (E)

utilitiesMisc		utilitiesMisc	
Feature Class Name	Segment ID	Feature Class Name	Segment ID
Borehole_P	M01	SolarArray_A	M14
CathodicProtection_L	M02	SolarPanel_P	M15
CathodicProtection_P	M03	StorageTank_A	M16
ChemicalEnergyStation_A	M04	StorageTankFarm_A	M17
ChemicalEnergyStation_P	M05	ThermalPowerStation_A	M18
CommUtilityNode_P	M06	ThermalPowerStation_P	M19
CommUtilitySegment_L	M07	UtilityFailure_P	M20
EmagRadiationHazard_A	M08	Well_P	M21
ErosionControl_A	M09	WellField_A	M22
HydroelectricPowerStation_A	M10	WellField_P	M23
HydroelectricPowerStation_P	M11	WindFarm_A	M24
PipeCasing_L	M12	WindFarm_P	M25
Sample_P	M13		



## LS Unique ID - Sewer (S)

utilitiesSewer	
Feature Class Name	Segment ID
sCleanOut_P	S01
sControlValve_P	S02
sFitting_P	S03
sGreaseTrap_P	S04
sLineGravityMain_L	S05
sLineGravityService_L	S06
sLinePressurizedMain_L	S07
sLinePressurizedService_L	S08
sManhole_P	S09
sMeter_P	S10
sOilWaterSep_P	S11
sOutfall_P	S12
sPump_P	S13
sPumpStation_P	S14
sPumpStation_A	S15
sSepticTank_P	S16
sSepticTank_A	S17
sTreatmentPlant_P	S18
sTreatmentPlant_A	S19



## LS Unique ID - Stormwater (D)

utilitiesStormwater	
Feature Class Name	Segment ID
dControlValve_P	D01
dCulvert_L	D02
dDischarge_P	D03
dInlet_P	D04
dLineGravity_L	D05
dManhole_P	D06
dOpenDrainage_L	D07
dPump_P	D08
dStorageReservoir_P	D09
dStorageReservoir_A	D10



## LS Unique ID - Thermal (T)

utilitiesThermal	
Feature Class Name	Segment ID
tAnchor_P	T01
tCondensateCollector_P	T02
tControlValve_P	T03
tExpansionJoint_P	T04
tFitting_P	T05
tHeatCoolMain_L	T06
tHeatCoolService_L	T07
tJunction_P	T08
tMeter_P	T09
tPump_P	T10
tPumpStation_P	T11
tPumpStation_A	T12
tRegulator_P	T13

## LS Unique ID - Water (W)

utilitiesWater	
Feature Class Name	Segment ID
wControlValve_P	W01
wFireHydrant_P	W02
wFitting_P	W03
wHydrant_P	W04
wLineMain_L	W05
wLineService_L	W06
wMeter_P	W07
wPump_P	W08
wPumpStation_P	W09
wPumpStation_A	W10
wSource_P	W11
wWaterTreatment_A	W12
wWaterTreatment_P	W13





## ***SMS – Utilities Guidance: Enterprise FUELER SMS***

### ***FUELER Development Status***

#### ***Enterprise FUELER Development Status***

- FUELER SMS is being developed by the USACE Engineering Research Development Center (ERDC), Construction Engineering Research Laboratory (CERL), Champaign, IL.
- Software development will leverage GIS (SDSFIE) Version 3.1 standards and STAR (Storage Tank Accounting and Reporting) data.
- Defense Logistics Agency (DLA) is funding FUELER software development and the Air Force has funded for the inclusion of non-capitalized fuel storage and distribution systems under USAF ownership and maintenance.
- Developing assessment and project-level work generation rules leveraging existing Air Force ACC Fuels tool (Fuels Assessment Tool [FAST] as technical foundation for the FUELER SMS development.
- FUELER SMS will provide Facilities Condition Assessments (FCA) and standardized SMS approach DoD Wide.
- Additional funding support anticipated from Service Delivery Points for service unique work management system interfaces (NexGen IT for Air Force).
- Field Testing of FUELER Software DoD wide began in FY18.
- AFIT will begin development of training courses in FY 21.
- Fuels will be a separate "domain" under the new Enterprise SMS under development.
- FUELER SMS planned Initial Operating Capability (IOC) projected for end of CY20 with Full Operating Capability (FOC) in FY 2025.
- Air Force Approval for implementation and adoption for use will occur once NexGen IT interface has been completed.



## **SMS – Enterprise Utilities Guidance: U.SMS**

### UTILITIES SMS Development Status

#### **Enterprise UTILITIES SMS Development Status**

- Enterprise UTILITIES SMS (U.SMS) is being developed by the USACE Engineering Research Development Center (ERDC), Construction Engineering Research Laboratory (CERL), Champaign, IL.
- Software development will leverage GIS (SDSFIE) Version 3.1 standards.
- Air Force 3400 funding supports the development of U.SMS: Electric, Water, Gas, Wastewater, Stormwater, and Thermal (Steam & Chill Water) Utility Systems as individual sub-domains.
- CERL started development in FY 14 and fully funded in FY 16 for end of CY 2020 initial deployment Gas, Wastewater, Stormwater, and Thermal (Steam & Chill water) sub-domains.
- ESRI GIS Software used by AF Geobase will interface with U.SMS.
- U.SMS will interface with AF CE work management system, NexGen IT.
- AFCEC GIO is implementing SDSFIE 3.1 Adaptation across Air Force (AF) Enterprise.
- Bases' GIS data will serve as authoritative data input to U.SMS – Installations must be migrated to AF GIS Spatial Data Standards for Facilities, Infrastructure and Environment (SDSFIE) Version 3.1.
- Beta test and Proof of Concept testing of software architecture completed at Hurlburt Field, FL (installation development partner) Q1/Q4 FY17 – Hurlburt Field, FL utility systems are AF owned & linear segmented.
- Pilot Test of Stormwater sub-domain conducted at Hurlburt Field, FL, 29-31 Aug 17 – Demonstrated the use of a new common IT architecture based on SMS FUELER for future ENTERPRISE SMS (ESMS) development to be fielded in 2020+ for the DoD.
- Continued software testing at other AF bases with LS GIS data was completed in FY18.
- Software Operational Testing and Evaluation (OT&E) to continue through FY2020.
- Fuels Systems to be integrated with Utilities as a sub domain under ESMS.
- Anticipate an Initial Operating Capability (IOC) end of CY2020.
- Full Operating Capability (FOC) will occur once NexGen IT interface with ESMS is completed and SMS has been approved for Air Force deployment anticipated in late 2025.

## ***Extracting Value from SMS Data***

[Introduction](#)

[Extracting Value Using VAST](#)

[Extracting Value Using BUILDER Best Practices](#)

[Extracting Value Using AF Institute of Technology Data Analysis Guidance](#)

[Case Studies and Best Practices](#)

### ***Introduction***

Extracting value from our SMS data through data analysis is a critical part of the asset/activity management process. The populated SMS modules provide large amounts of asset data directly at an installation's fingertips. Most of the analysis an installation performs serves a need specific to them. The first section on Visible Asset Sustainment Tool (VAST) provides a convenient way for installations to perform analysis required by all.

Additionally, a Case Study from RAF Lakenheath and a link to additional Best Practices are included in Section 8.4 to demonstrate some of the individual analyses other installations have performed. The additional illustrated analyses are not required but may inspire others in the field with ways to improve their asset/activity management processes with better data analysis.

### ***Extracting Value Using VAST***

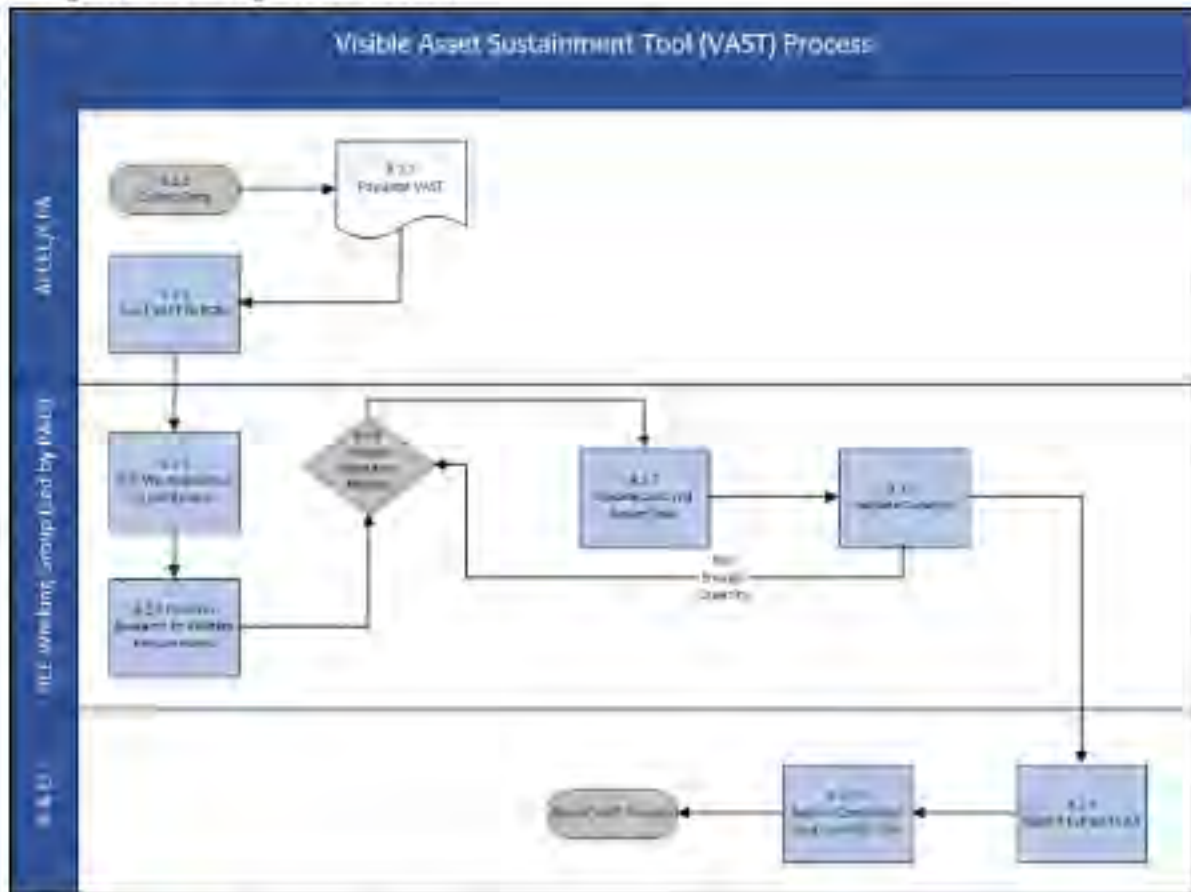
VAST was developed by AFCEC to aid in the activity/asset management process. The tool is prepopulated by AFCEC with installation data from BUILDER and PAVER SMS. Installations validate and verify the data and use it to develop a 3-year sustainment plan for every asset on their installation. VAST's benefits include preparing for ExPlan and AFCAMP submissions.

VAST benefits include improving SMS data quality, highlighting data completeness issues, breaking down CE squadron stovepipes, shifting from a reactive to proactive approach to requirements identification, and ensuring continuity through workforce attrition and loss of corporate knowledge as aging civilian workforce members retire.



## 1. The VAST Process

Figure 38 VAST High-Level Process



### 2. AFCEC Collects Data

Annually, AFCEC/CPRI runs unconstrained scenarios in BUILDER™ and PAVER to obtain raw data for VAST. An unconstrained scenario means the SMS projections are run with unlimited funds available. This captures all requirements. This is combined, as necessary, with supplemental data from other enterprise databases. VAST is the *Visible Asset Sustainment Tool*. It only displays assets for which the AF has asset *visibility*. If it is not in SMS, it will not be in VAST.

*Note: If the information in any of the databases is inaccurate, the data presented in VAST reflects this.*

### 3. AFCEC Populates VAST

AFCEC/CPRI uses the data collected to prepopulate VAST for each installation.

### 4. AFCEC Notifies Bases VAST is Available

AFCEC/CPRI posts each installation's copy of VAST to the Comprehensive Planning Platform (CPP) and notifies bases that the new tool is available. Each base decides who will develop the asset sustainment plans in VAST, but most installations will have a working group led by the Requirements and Optimization (R&O) Element with participation from AMP Managers, Community Planners, Programmers, Operations Shop Leads, and others.

### 5. BCE Working Group Initial Review



The working group reviews the information in VAST, performs research needed to validate requirements, proposes execution methods for each requirement, and assigns costs and years. It is recommended that the Operations Flight now validate that the In-House work assigned to the shops for each of the 3 years is a reasonable workload. Similarly, the Engineering Flight should validate that project workloads make sense. If any of the workloads are determined to be unbalanced or unrealistic, the proposed execution methods and assigned years should be revisited until an achievable workload is obtained for all parties.

#### **6. Submit Completed VAST to AFCEC**

Once all VAST entries are completed, the working group may want to upload the completed VAST file to the CPP VAST Repository so that that year's plan can be carried over into the ensuing year's VAST file as the Historic Plan.

#### **7. Origination of Data in VAST**

The information used to populate VAST is extracted from several enterprise databases. The majority of the information comes from inventory and condition-based unconstrained scenarios run in BUILDER or PAVER. Additional information regarding existing programmed projects is pulled from ACES-PM or NexGen IT as appropriate for that installation.

#### **8. VAST Training Aids**

Training videos have been developed to present an over view of the tool, updates, and detailed demonstrations of the Facilities and Pavement modules. VAST videos can be found at the following locations. Note: Videos at all 3 locations are identical, just providing different means to access videos.

- **milSuite** (*must be on a CAC device*)
  - VAST 3.0 for New Users: <https://www.milsuite.mil/video/27994>
  - VAST 3.0 Updates: <https://www.milsuite.mil/video/27993>
  - VAST 3.0 Facilities Demo: <https://www.milsuite.mil/video/27998>
  - VAST 3.0 Pavements Demo: <https://www.milsuite.mil/video/27996>
- **YouTube** (*for non-CAC devices*)
  - VAST 3.0 for New Users: <https://youtu.be/LJpn9zRPun4>
  - VAST 3.0 Updates: [https://youtu.be/tUJYRJ\\_Q\\_rM](https://youtu.be/tUJYRJ_Q_rM)
  - VAST 3.0 Facilities Demo: <https://youtu.be/mms6xQY8HE>
  - VAST 3.0 Pavements Demo: <https://youtu.be/W2zlgQJT4o>
- **Download** (*if streaming quality is poor; must be on a CAC device*)
  - All 4 Lessons: <https://cs2.eis.af.mil/sites/11488/pap/Pages/vast.aspx>

### **Extracting Value Using BUILDER Best Practices**

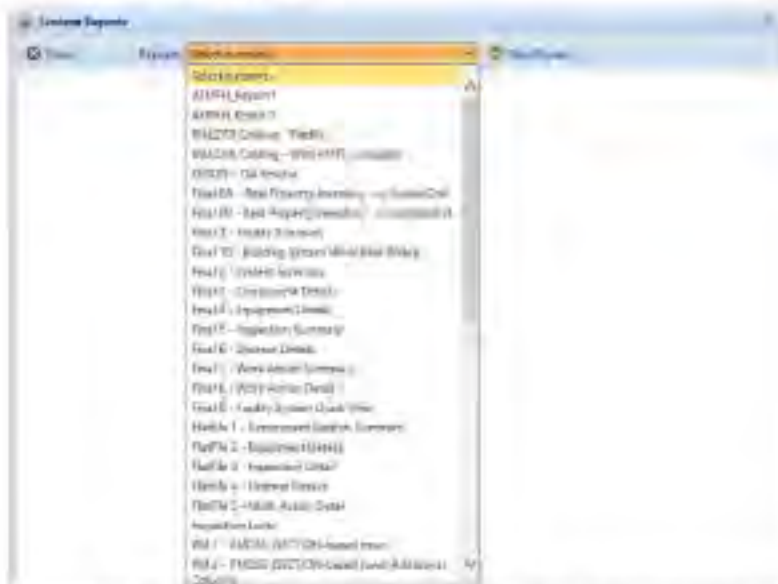
#### **1. Useful BUILDER Reports for Data Analysis**

BUILDER reports are a useful tool AMP and Sub-AMP managers can use to increase visibility of the facilities and effectively plan additional actions.

Verify the inventory tab is displayed.



1. Select the level at which you want to run the report.
- The report will include all levels beneath what you select.
2. Click the reports drop down.
  3. Select Custom.



4. Select from the available reports in the drop down list.
5. Click Run Report.

When the next window opens, you can choose to export the report to pdf, Excel or other file forms. As stated earlier, Excel is the best format for working with data. CSV format is useful when running large reports because it has no associated formatting.

#### 1. Final 9 – Facility System Quick View Report

The [Final 9 – Facility System Quick View Report](#) is a great place to start planning projects.

- Review real property data and system condition installation wide.
- Multi-disciplinary, multi-facility projects.
- Shows the system condition index for all systems.
- The system condition index is a general indicator of system health.
- More detailed information gathering using the DIGON QA Review and QC 6 is still required.
- The report is useful for multi-disciplinary and multi-facility projects. Optional information:
- However, because of how the CI is rolled up from one level to another it is insufficient detail to plan a project.
- Sections with a high CRV have more influence on the CI, so this will hide issues that are tied to sections with a low CRV and exaggerate issues tied to sections with a high CRV.

## **2. DIGON – QA Review**

The DIGON 4 – QA Review is a list of all sections, their names, subtypes, category, components, and systems. This is the most useful report for developing out year plans.

The review includes:

- Real property information such as site name, facility number, building construction year, and size.
- SMS produced data such as section design life, age, remaining design life, and remaining service life.
- Inspection information such as, inspection date, rating, and inspector name.
- CSCI which is the indicator of condition, section comments, number of inspections, number of details, and number of images associated with this section.

This report is useful because you can use the filters and:

- Plan work for a single building.
- Filter down to one building.
- Plan multi-disciplinary repairs based on the CSCI.
- Review the entire installation for single discipline work.
- Filter down to a single section subtype or section name.
- Sort CSCI from lowest to highest.

## **3. QC6 – Inspections Report**

The QC6 lists most of the items the DIGON QA review does including all historical assessments.

This report is most useful to validate assessments.

1. There should be a comment for every rating of Amber/Red. Photos are now

optional. The report automatically highlights missing inspection comments.

2. Inspection comments should describe the distress in standard terms like on the back of the assessment cards (e.g., corroded).
3. Search the "Insp. Comments" column for key words like "old" and find inspections that are age based. Inspections should not be based on age but actual physical distresses.
4. Note other common inspection errors.
5. Compare the reports to previous assessments. This should show a gradual degradation of the equipment. It is suspicious to find assessments that show green, then red, in a short amount of time.

## 2. BUILDER Tips to Aid in the VAST Process

While VAST replaces this process, in the interim between VAST cycles, this section can help with determining whether to repair or replace an asset. Additionally, the work planning section of BUILDER can provide further information that can be helpful to the installations and clarify the VAST information available. For example, when the generate work item button is clicked, BUILDER generates work items for a selected fiscal year. This could be helpful in preparation for the completion of VAST in the next fiscal year.



You can navigate to a specific building and view the work items for that building, review the asset description, cost, and suggested action from this screen.



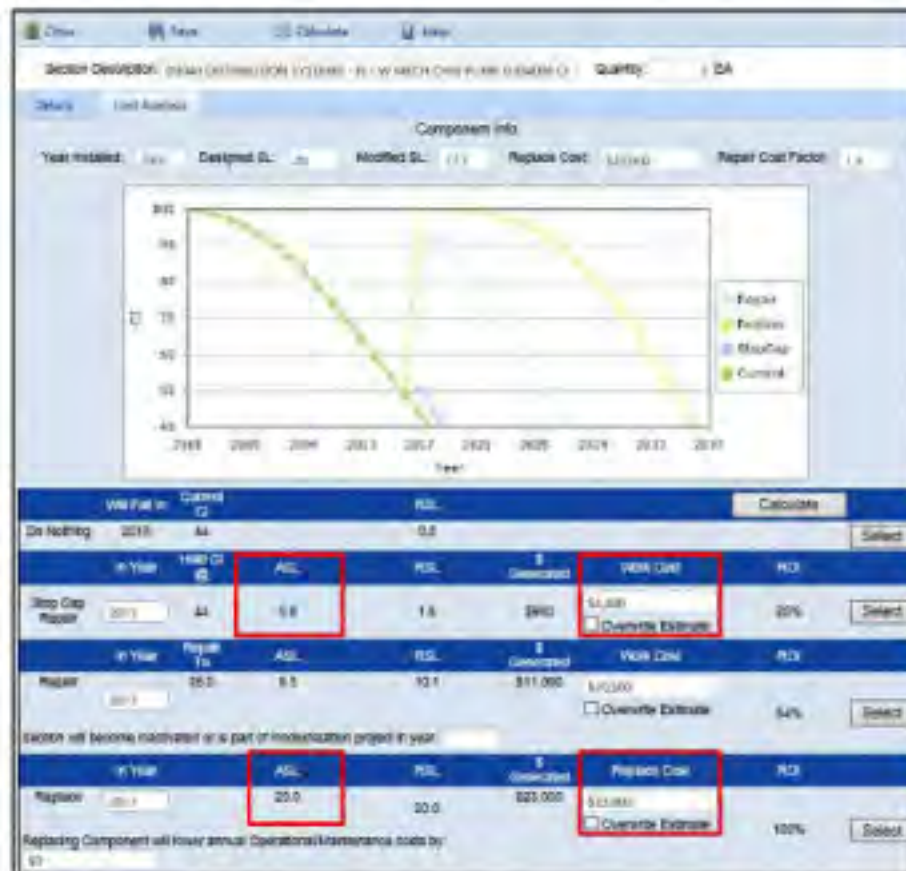
When you click on the link in the details column BUILDER opens the details screen.

This shows more details such as return and ROI which are useful in justifying and prioritizing the work items for work orders and projects.

The estimated cost comes from the AF cost book and is uniform at every base.

This area does not have a level of accuracy required for a programming cost estimate. Ensure the estimate accounts for the cost of doing business at your installation.

Select the cost analysis screen.



BUILDER compares the three types of work items economically.

BUILDER has three suggested actions: "Repair", "Replace", and "Stop Gap Repair".

- **Repair** – A major repair significant enough to improve the CI to 95.
- **Replace** – Section has replaced and deteriorates as if it were new, the CI is 100.
- **Stop Gap Repair** – This is the equivalent of an emergency or Band-Aid repair. BUILDER holds the CI constant for 1 year and the unit continues to degrade at the same rate thereafter.

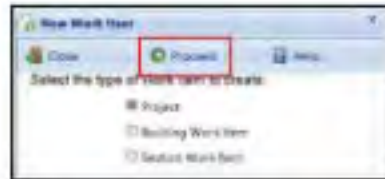
Note the difference in cost, additional service life, and ROI.

You can create "projects" in BUILDER by grouping work items.

1. Click the projects tab.



2. Select project, select proceed.



### 3. Select Work Items.

**Project**

Project Name: Repair B1389

**General Information** | **Work Items**

Description: [Empty text box]

Work Request ID: [Empty text box] Status: **Awaiting Reply**

Funding FY: [Redacted] ☐ Must Complete as planned

Work FY: 2019 Funding Source: [Empty dropdown]

Score: 1441 Estimated Cost: \$0.00 ☐ Override automatic unit estimate

Work Code: Substandard Actual Cost: \$0.00

**ROI Information**

Return: \$0 ROI: 1441

This takes you to a list of work items to select for your project.

ID	Name	Description	Cost	Status
1188	OPEN BELL CONDO	REPAIR BELL CONDO	\$0.00	100%
1189	OPEN BELL CONDO	REPAIR BELL CONDO	\$0.00	100%
1190	OPEN BELL CONDO	REPAIR BELL CONDO	\$0.00	100%
1191	OPEN BELL CONDO	REPAIR BELL CONDO	\$0.00	100%
1192	OPEN BELL CONDO	REPAIR BELL CONDO	\$0.00	100%
1193	OPEN BELL CONDO	REPAIR BELL CONDO	\$0.00	100%
1194	OPEN BELL CONDO	REPAIR BELL CONDO	\$0.00	100%
1195	OPEN BELL CONDO	REPAIR BELL CONDO	\$0.00	100%
1196	OPEN BELL CONDO	REPAIR BELL CONDO	\$0.00	100%
1197	OPEN BELL CONDO	REPAIR BELL CONDO	\$0.00	100%
1198	OPEN BELL CONDO	REPAIR BELL CONDO	\$0.00	100%
1199	OPEN BELL CONDO	REPAIR BELL CONDO	\$0.00	100%
1200	OPEN BELL CONDO	REPAIR BELL CONDO	\$0.00	100%

### 4. Selectively group work items so the project makes sense. For example, if the HVAC ducting requires replacement, this is a great opportunity to install a



sprinkler system.

Item ID	Description	Status	Item Cost	Item Score	Item Weight	Item Total	Item Rank	Item Type	Item Category	Item Subcategory	Item Unit	Item Quantity	Item Price	Item Total Cost	Item Total Score	Item Total Weight	Item Total Rank
10001	SPRINKLER SYSTEM	Active	10000	10000	1.0	10000	1	Project	Water	Sprinkler System	Sq Ft	1000	10000	10000	10000	10000	10000
10002	SPRINKLER SYSTEM	Active	10000	10000	1.0	10000	2	Project	Water	Sprinkler System	Sq Ft	1000	10000	10000	10000	10000	10000
10003	SPRINKLER SYSTEM	Active	10000	10000	1.0	10000	3	Project	Water	Sprinkler System	Sq Ft	1000	10000	10000	10000	10000	10000
10004	SPRINKLER SYSTEM	Active	10000	10000	1.0	10000	4	Project	Water	Sprinkler System	Sq Ft	1000	10000	10000	10000	10000	10000
10005	SPRINKLER SYSTEM	Active	10000	10000	1.0	10000	5	Project	Water	Sprinkler System	Sq Ft	1000	10000	10000	10000	10000	10000
10006	SPRINKLER SYSTEM	Active	10000	10000	1.0	10000	6	Project	Water	Sprinkler System	Sq Ft	1000	10000	10000	10000	10000	10000
10007	SPRINKLER SYSTEM	Active	10000	10000	1.0	10000	7	Project	Water	Sprinkler System	Sq Ft	1000	10000	10000	10000	10000	10000
10008	SPRINKLER SYSTEM	Active	10000	10000	1.0	10000	8	Project	Water	Sprinkler System	Sq Ft	1000	10000	10000	10000	10000	10000
10009	SPRINKLER SYSTEM	Active	10000	10000	1.0	10000	9	Project	Water	Sprinkler System	Sq Ft	1000	10000	10000	10000	10000	10000
10010	SPRINKLER SYSTEM	Active	10000	10000	1.0	10000	10	Project	Water	Sprinkler System	Sq Ft	1000	10000	10000	10000	10000	10000

Once the project is saved, the life cycle cost analysis information can be viewed just like a work item.

Remember to be critical of the cost information. All AF uses the same cost information; you need to account for the actual cost. You can modify and provide your own cost information. This information can be used to justify funding for the project via the "Savings-Only" project funding avenue.

Project Name: Repair \$1000

General Information: Work Item

Description: [Text Box]

Work Request ID: [Text Box]

Funding FY: 2017

Work FY: 2017

Score: 0

Work Code: [Text Box]

Status: [Text Box]

Estimated Cost: \$10,000.00

Actual Cost: \$10,000.00

ROI: [Text Box]

ROI Return: \$10,000.00

### 3. BUILDER Opportunities/Projects Using the AFCAMP Business Rules

When determining the viability of a project or opportunity in BUILDER, additional calculations are sometimes required. To obtain reliable, repeatable, and valid calculations, the Project Scoring Worksheet is an accepted Tool. For additional guidance on the Project Scoring Worksheet, refer to the Business Rules in the [AFCAMP Playbook](#).



which is updated annually.

## Project Scoring Worksheet

**Residential Project Scoring Worksheet**

Instructions: This worksheet is used to score a project against the AFCAMP Business Rules. The worksheet is divided into three main sections: Project Information, Project Details, and Project Summary. The Project Details section is used to enter the project information, and the Project Summary section is used to calculate the project score.

**Project Information:**

Project Name: \_\_\_\_\_  
 Project Address: \_\_\_\_\_  
 Project City: \_\_\_\_\_  
 Project State: \_\_\_\_\_  
 Project Zip: \_\_\_\_\_  
 Project Type: \_\_\_\_\_  
 Project Status: \_\_\_\_\_

**Project Details:**

Item	Quantity	Unit	Cost	Score	Notes
1. Foundation	1	Sq. Ft.	1000	1000	
2. Walls	1	Sq. Ft.	1000	1000	
3. Roof	1	Sq. Ft.	1000	1000	
4. Windows	1	Sq. Ft.	1000	1000	
5. Doors	1	Sq. Ft.	1000	1000	
6. Floors	1	Sq. Ft.	1000	1000	
7. Ceilings	1	Sq. Ft.	1000	1000	
8. HVAC	1	Sq. Ft.	1000	1000	
9. Electrical	1	Sq. Ft.	1000	1000	
10. Plumbing	1	Sq. Ft.	1000	1000	
11. Mechanical	1	Sq. Ft.	1000	1000	
12. Other	1	Sq. Ft.	1000	1000	

**Project Summary:**

Total Project Cost: \_\_\_\_\_  
 Total Project Score: \_\_\_\_\_  
 Project Status: \_\_\_\_\_

This shows where to put the information in a project savings calculator. It is available for download in the [AFCAMP business rules](#).

## Project Savings Calculator

**Project Savings Calculator**

Project Name: \_\_\_\_\_  
 Project Address: \_\_\_\_\_  
 Project City: \_\_\_\_\_  
 Project State: \_\_\_\_\_  
 Project Zip: \_\_\_\_\_  
 Project Type: \_\_\_\_\_  
 Project Status: \_\_\_\_\_

**Project Details:**

Item	Quantity	Unit	Cost	Score	Notes
1. Foundation	1	Sq. Ft.	1000	1000	
2. Walls	1	Sq. Ft.	1000	1000	
3. Roof	1	Sq. Ft.	1000	1000	
4. Windows	1	Sq. Ft.	1000	1000	
5. Doors	1	Sq. Ft.	1000	1000	
6. Floors	1	Sq. Ft.	1000	1000	
7. Ceilings	1	Sq. Ft.	1000	1000	
8. HVAC	1	Sq. Ft.	1000	1000	
9. Electrical	1	Sq. Ft.	1000	1000	
10. Plumbing	1	Sq. Ft.	1000	1000	
11. Mechanical	1	Sq. Ft.	1000	1000	
12. Other	1	Sq. Ft.	1000	1000	

**Project Summary:**

Total Project Cost: \_\_\_\_\_  
 Total Project Score: \_\_\_\_\_  
 Project Status: \_\_\_\_\_

Project Overview: **12345**  
 Project Name: **Sample Project**  
 Location: **DC**  
 Construction Start Date: **1/1/2020**  
 Construction End Date: **1/1/2025**

**2. Baseline Operating Costs**

Method: **Baseline** (Selected)  
 Method Description: **Baseline**  
 Method Notes: **Baseline**

**3. Baseline Operating Costs**

Method: **Baseline** (Selected)  
 Method Description: **Baseline**  
 Method Notes: **Baseline**

**4. Baseline Operating Costs**

Method: **Baseline** (Selected)  
 Method Description: **Baseline**  
 Method Notes: **Baseline**

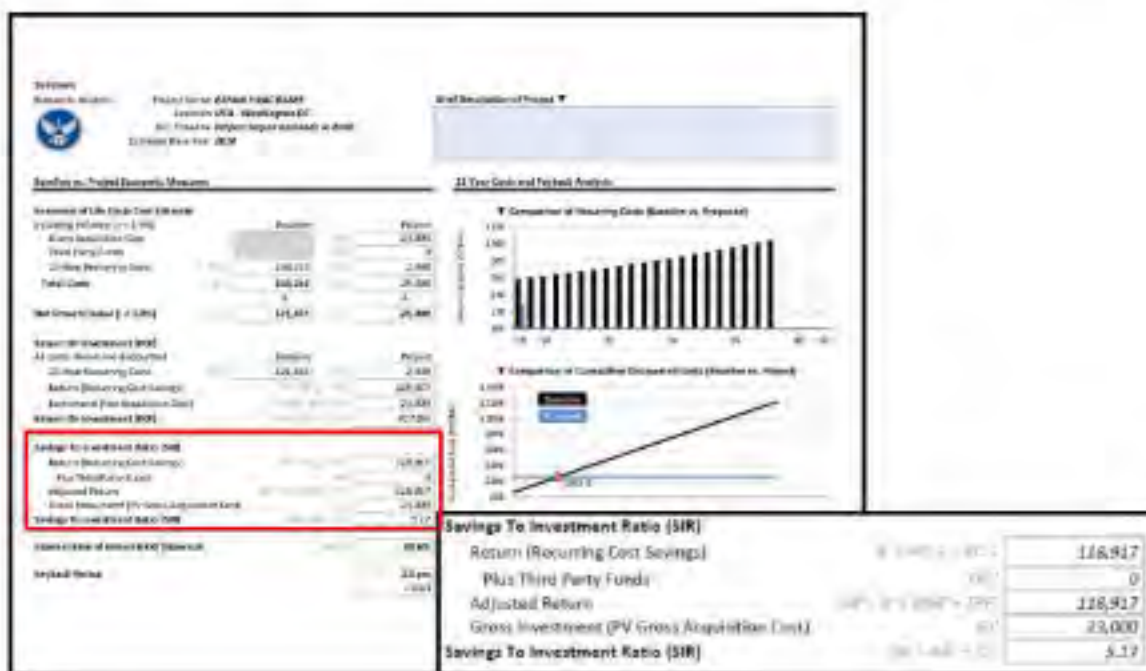
Method: **Baseline**

1. Acquisition Costs	Manual Entry	Baseline
1.1 Planning & Design (ASB)	23,000	
1.2 Construction / Installation	23,000	
1.3 Commissioning	0	
1.4 Restoration	0	

**Baseline Operating Costs**  
 Please provide and enter 2 years of data for Historical Costs

2. Recurring Costs	Baseline: Historical Costs		Baseline: Restoring Cost
	2021	2022	
2.1 Operations	5,500	5,500	5,500
2.2 Energy	0	0	0
2.3 Component Renewal	0	0	0
2.4 Preventive Maintenance	0	0	0
2.5 Corrective Maintenance	0	0	0
2.5.1 Structures (451)	0	0	0
2.5.2 Water/Pipes (469)	0	0	0
2.5.3 Electric (471)	0	0	0
2.5.4 DDC (472)	0	0	0
2.5.5 Power/Fans (473)	0	0	0
2.5.6 HVAC (491)	0	0	0
2.5.7 Pavements (492)	0	0	0
2.6 Lease Payments	0	0	0

This shows that the result of replacing an HVAC unit that was breaking frequently has an SIR of 5.17. An SIR over 1.2 is considered competitive. That is more than enough to justify funding the replacement.



## Extracting Value Using **BUILDER** Scenarios and Work Planning (Future)

This section will be added in a future update to the SMS Playbook.

## Extracting Value Using **AF Institute of Technology Data Analysis Guidance**

Data should provide an accurate representation of the physical world and be relatively simple/cheap to collect and maintain. It is very important to ensure the cost of collection/analysis is proportional to the value added to the decision that it supports.

The installations are interested in 2 types of data, inventory which *does not* change with time and attributes which *do* change with time. Data Analysis should realize one of two outcomes, support a decision, recommendation or direction, and/or confirm or remove a bias.

### 1. The Data Analysis Process



#### 1. Define the Problem.

This is the single most important step in the data analysis process. The question or definition of the problem must be clear, concise, and measurable. Is the analysis to support a decision, provide a recommendation or confirm a bias?

#### 2. Define the Criteria.

The criteria determine what data is required to perform the analysis. What kind of analysis is being done? Is it qualitative or quantitative analysis? What criteria will provide value to the decision, problem, or bias? The types of data required in this scenario could be condition, cost, size, MDI, or a combination thereof.

#### 3. Identify Data Requirements.

Prior to beginning the collection of data, it is imperative to define what data is required. To be effective, answer the question of, "what data do I need" prior to beginning the data collection. The problem defines the criteria. A criterion defines the data requirements.

#### 4. Plan the Analysis.

The chosen methodology and technique must be understood by the person performing the analysis. For accurate, useful, and repeatable analysis, prior to beginning the analysis, plan the approach and method to achieve the results desired. When the data sends the analyst down a rabbit hole, sometimes it requires the removal of a parameter, quality, or specific attribute to remove the unnecessary data. Unnecessary data could hide the real issue or provide data that is not relevant to the question/definition the analyst is trying to answer. For example, condition analysis uncovers a slew of age-based assessments skewing condition values. Is this relevant to the problem being investigated or should this criteria be removed from the dataset?

#### 5. Prepare the Data for Analysis.

Microsoft Excel is a tool useful to analysis. Spreadsheets can display a huge amount of data without issue. This can be overwhelming. Data trimming is sometimes required to remove information that is unnecessary. Hiding or removing a column has the potential to make the spreadsheet more manageable and understandable. Column or row-based hiding or removal makes data easier to filter, sort, and analyze.



- a. How to Trim Data (Column-Based Hiding or Removal).
  - i. Select the entire column you do not want (to see).
  - ii. Right Click your mouse.
  - iii. Select delete or hide. Be careful with deleting any information.
- b. How to Filter Data (Row-Based Hiding or Removal).
  - i. Highlight all cells in the header row.
  - ii. Go to the Data tab.
  - iii. Select Filter.
  - iv. On the column containing the information requiring a filter, click the dropdown arrow.
  - v. Select the items to isolate/view.
  - vi. Select enter. This should reduce the amount viewed to the specific criterion desired.

From: Thompson, M. A. (2017). A study of the effect of the use of the...

Table with columns: ID, Name, Type, Location, Status, etc.

Callout 1: I only care about type A, B, and E facilities, so I need to uncheck the

Callout 2: I only want to look at facilities (all of non SF units) of measured. So, I will only select the SF unit

## 6. Execute the Analysis.

To perform the analysis effectively, it is necessary to remove or highlight outliers and anomalies. Sort and search (also known as abnormality detection) allows the finding of the best and/or worst condition through a sort function. To find the outliers, highlight one of the headers and click sort.

A Pivot Table is a useful data summary tool for simplifying large quantities of data. To accomplish the creation of a pivot table, the user sets up and changes the summary's structure by "dragging & dropping" fields graphically. The attributes (columns) in data can be made into filters, columns, rows, or values in a summary table of many rows.

To manually create a PivotTable:

1. Click a cell in the source data or table range.
  2. Go to Insert > Tables > Recommended PivotTable.
  3. Excel analyzes your data and presents you with several options.
  4. Select the PivotTable that looks best to you and press OK.
7. Prepare and Present the Results.

The results of the data analysis are reported in a format as required by the users to support decisions and further action. The feedback from the users might result in additional analysis. The data analysts can choose data visualization techniques, such as tables and charts, which help in communicating the message clearly and efficiently to the users. The data visuals should be simple and legible. They should not create more questions than they answer. The analysis tools should highlight the important information with color and form. Labels and context are essential.

## 2. Data Analysis Question and Answer Example

1. Define the Problem:  
*What are my "worst" mechanical assets on the installation?*
2. Define the Criteria:  
*Condition and Age*
3. Identify Data Requirements. (What data will I use to evaluate criteria?)  
*Component Section Condition Index (CSCI) (or aggregated Condition Index (CI)), Remaining Service Life (RSL), Facility Number.*
4. Plan the Analysis. (What are you going to do?)  
*Worst D30 (HVAC) Assets.*
  - a. *Download DIGON QA report from BUILDER.*
  - b. *Trim & Filter to only D30 (HVAC).*
  - c. *Filter to only direct ratings (no age-based).*
  - d. *Generate worst first list. The worst first list is sorted based on the asset that has the "worst" rating in the given criteria as "first" on the list for repair or replacement.*
5. Prepare Data for Analysis.
  - a. *Trim: Keep Facility Number, Facility Name, System, Component, Section, Sub-Type, Inspection Type, Expected CI, Current Estimated CI, Replacement Cost, Design Life, Age, RSL.*
  - b. *Filter: Using the filters, remove any outliers and anomalies.*
6. Execute the Analysis.
  - a. *Sort: Current Estimated CI lowest to highest.*
    - i. *Rabbit hole #1: Lots of "general equipment" needs to be inventoried properly (guidance in SMS Playbook Toolbox).*
    - ii. *Rabbit hole #2: Found several instances where condition deterioration was inflated due to inoperable equipment (go fix the equipment!!).*

- b. Using the guidance provided above in [Step 6](#), run Pivot Tables to aggregate CI data (unweighted).
7. Present the Results:
  - a. Found lots of improperly inventoried equipment.
  - b. Average CI is not adjusted for CRV.
  - c. D30 data would benefit from some scrubbing to improve reliability.
  - d. Some abnormalities between what BUILDER expects and the condition value input to the system.
  - e. QC3 would have done this much faster.

Asset ID	Facility ID	Facility Name	Age of Current ECU
1	00001	100TH WING BLDG	10
2	00002	100TH WING BLDG	10
3	00003	100TH WING BLDG	10
4	00004	100TH WING BLDG	10
5	00005	100TH WING BLDG	10
6	00006	100TH WING BLDG	10
7	00007	100TH WING BLDG	10
8	00008	100TH WING BLDG	10
9	00009	100TH WING BLDG	10
10	00010	100TH WING BLDG	10

## Case Studies and Best Practices

### Using BUILDER's Work Planning Module Between VAST Cycles

The following process was developed by RAF Lakenheath, GB, to operationalize BUILDER data. VAST provides an annual work plan based on a snapshot in time, but, installations continue to conduct Facility Condition Assessments (FCA) on facilities not previously inventoried and conducting the periodic 5-year updates. This process will potentially change the inventories and condition on approximately 20% of an installation's facilities between annual VAST iterations.

The process below can be used for individual facilities as a facility's FCA is produced or updated to determine if previously determined work items are still necessary or can be deferred, if a component has deteriorated faster than predicted and needs to be addressed or a facility that is receiving its first FCA has defects requiring more immediate attention than waiting for the next year's VAST.

This planning process uses BUILDER reports to determine potential Work Items, validate the Work Items being generated are according to the AF Standards and Policies for a facility's Mission Dependency Index (MDI), validate the current condition of Work Item components, determine an execution method, determine/validate costs, and coordinate for appropriate execution action.

1. Navigate to the facility desired for analysis in BUILDER:
  - a. Run a Standard Condition Index Detail Report.
  - b. Export the report to an Excel spreadsheet.
  - c. Note the MDI of the facility.
2. Go to the Work Configuration tab in BUILDER:
  - a. Select Policies/Condition Policies/USAF.
  - b. Look up the MDI.
  - c. Add a new column to the exported Standard Condition Index Detail Report.
  - d. Annotate on the Standard Condition Index Report the Standard for each system.

3. Return to the Work Configuration tab in BUILDER:
  - a. Select Standards/AF/Condition Standards.
  - b. Annotate in two new columns on the Condition Index Detail Report:
    - i. The individual Standards for each system (i.e., Minimum Condition (CI) for Repair).
    - ii. Maximum Remaining Service Life (RSL) for Replacement in the added new columns on the Condition Index Detail Report Excel spreadsheet.
4. Review the Standard Condition Index Report to identify suitable work candidates.
  - a. Compare the minimum CI for Repair with the column R for each Section CI – Current Estimated). This allows identification of any Component-Section inspections that might be out of cycle (column W – inspection over 5 years ago) or any CSCI that are age based and not condition based (column R with no assessment CI for the Last Insp.)
5. Depending on the Component Section Condition Index (CSCI) score and number of Work Item candidates, decide the best execution method. Some may be singular Work Item candidates for immediate In-House Organic or In-House Contract Work. If there are numerous Work Item candidates of sufficient magnitude, a Project can be programmed for the Integrated Project List (IPL) for the appropriate year. If immediate action is required (i.e. work required within the next 2 years), a Service Request can be developed and processed through the normal Work Requirements Review Board (WRRB) for funding/execution. If a Project is required to be programmed for execution by CEN, proceed to the Work Plan.
6. Once in the Work Plan tab:
  - a. Navigate to the required facility.
  - b. Generate Items and Prioritize the Work Items in the Work Plan for the current and next Fiscal Years. The Work Items should be checked against the Condition Index Detail Report to ensure the Work Items are correct and following the correct trigger points established by the Standards and Policies.
7. Add a Project to the Work Plan
  - a. Select the Work Items from the Generated Items or load them manually through the Add New Work Item process to develop a Project(s).
  - b. Open the Detail for each Work Item in the Work Plan.
  - c. Conduct a 'Cost Analysis' to identify the best ROI and ensure that the cost is realistic.
  - d. Amend the Work Cost, if required.
8. Once all the Work Items are added to a Project(s):
  - a. Select the Reports icon.
  - b. Run a Work Plan Detail by Year report.
  - c. Export the report to Excel.
  - d. Filter the report to only show the Work Items for each Project.
9. The Work Plan Detail by Year report:
  - a. Print and attach to a Work Request (NexGen IT) or AF Form 332 (ACES).
  - b. Process through the WRRB.



- c. Forward to CEN for programming. Note: The AF Form 332 number should be annotated on the Project General Information tab in the Work Plan section in BUILDER. An electronic copy of the Work Plan can be saved to an appropriate folder in the appropriate share drive for the CEN programmer's to access.

This process requires repeating on all desired facilities between the annual VAST generations.

The process is not hard - just methodical. After running the process on several facilities, it becomes much easier and helps the Data Managers have a better understanding on the processes (Policies, Standards, trigger points, etc.) within BUILDER, apply what was learned in the Data Manager AFIT Course on Work Planning and, to some extent, how the scenario populating VAST works.

Regardless of how a Work Item is planned for execution, the Work Item needs to be validated as to the current condition of the component.

#### **RESULTS:**

RAF Lakenheath used this process after each facility periodic assessment by the Facility Condition Assessment Team (FCAT) on all their mission essential facilities (TIER 1). Work Item candidates were identified for immediate in-house execution or postured for IPL project development. They identified, validated, and priced approximately \$10M of sustainment work and then went on to analyze their TIER 2, 3 and 4 facilities data. This process is being utilized to identify potential current mission Unspecified Minor Military Construction (UMMC) and MILCON projects whenever it is not economical to continue to sustain existing facilities.

Just one example of how they utilized this process: RAF Lakenheath had originally developed a project to repair the HVAC system to a munitions processing facility. However, upon analysis of the BUILDER data, it was apparent a full facility repair project was required.

Because of the operational sensitivity of the facility, it was felt that running successive projects wasn't the best option. The facility's repair needs and a recommended way forward was advocated to 48 CES leadership. RAF Lakenheath used available O&M funds to carry out 'Stop gap' repairs to ensure the systems remained operational. 48 CES/CEN engaged with AFIMSC to secure additional funding resulting in a \$4.165M full facility repair project.

Of note, RAF Lakenheath did not wait for the VAST cycle before using the data for VAST Work Planning. They analyze each facility as they complete the inventory and assessments, and then use BUILDER directly to augment the VAST Work Plan and justify requirements.

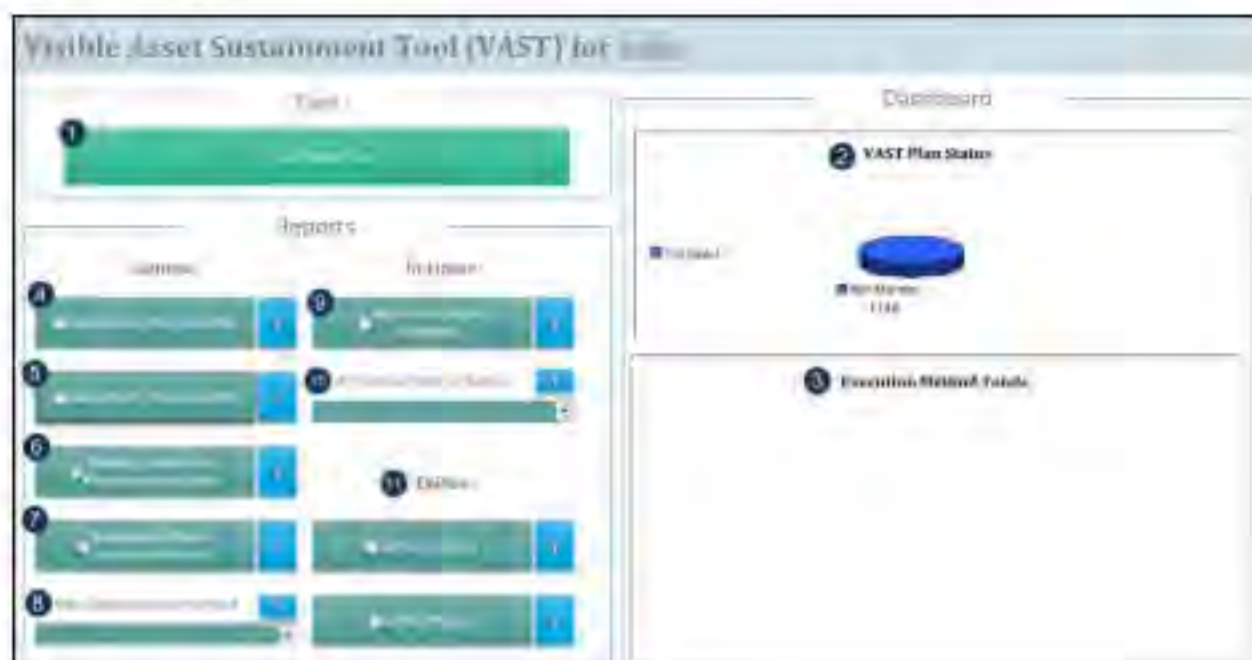
Note: Additional information on Case Studies and Best Practices can be found on the [SMS BUILDER Workspace](#).



## VAST Job Aid

This document provides guidance and an overview of Visible Asset Sustainment Tool (VAST).

### VAST Home Page



**Figure 39 VAST Landing Page**

This figure illustrates the VAST landing page.

#### Tool Section:

1. Enables a User to view the Master List and build a 3-year sustainment plan for each asset.

#### Dashboard Section:

1. VAST Plan Status: Shows the VAST Plan Status percentages for Not Started, In Progress, and Finalized. The statuses can be updated in the Master List to aid in tracking the progress of VAST completion across all assets.
2. Execution Method Totals: Shows a roll-up of the dollars planned for each execution method.

#### Reports Section:

1. View Sustainment Plan by Facility.
2. View Sustainment Plan by System.
3. View Buildings Flagged for Reassessment by Shop.
4. View Sustainment Plan by Execution Method.
5. View by Selecting an Execution Method from the Dropdown.
6. View All In-House Work by Building.
7. View All In-House Work by System.
8. View ExPlan Reports. Refer to [Section 7](#).

## Master List and Individual Building View

Column Definitions:

1. View programmed projects for the facility being viewed. This project information has been pulled from ACES-PM or NexGen IT.
2. View work item details from the BUILDER Final 8 report. These work items are the source for the costs in the SMS Projects by System section of this view.
3. View Inspection Summary from the BUILDER Final 5 report.
4. Return to the VAST Homepage.
5. Save the current inputs.
6. Building number.
7. Building name.
8. Area in square feet.
9. Building Condition Index.
10. Mission Dependency Index.
11. Construction Year.
12. Plant Replacement Value.
13. Real Property Unique Identifier.
14. Category Code.
15. Update All Execution Methods. This drop down will change the Execution Methods for all systems to the same value.
16. SMS Projections by System. The numbers in this section come from the BUILDER Final 8 report. The work items have been summed by system and year to provide the totals shown. This is how much BUILDER predicts will need to be spent on this facility in an unconstrained (unlimited money) scenario over the next 7 years.
17. Sustainment Plan. This section is where the most time will be spent.

18. Enter the planned sustainment spending for each system for the years shown.
19. Select the Execution Method from the drop down menu.
  - No Work Needed - If no work is intended to be performed on that system in the next 3 years.
  - In-House Organic - If the work will be performed by the organic shop personnel.
  - In-House Contract - If an Operations Flight contract vehicle is to be used.
  - In-House Reimbursed - If the funds will be reimbursed by an organization outside of CE (e.g., NAF).
  - Project on the Books - If the work will be completed by a project already programmed.
  - Send to CEN for Project - If the work needs to be programmed into a project by the Engineering Flight.
  - Sustained by Others - If the System or the entire facility is not sustained by CE.
  - Multi - If one system has multiple Execution Methods (over 3 years or multiple in 1 year); additional guidance will be required from AFCEC.
20. If a system requires multiple Execution Methods over the 3 years or within a single year, hover the mouse under the Multi Column next to the System in question. A button will appear. When the button is selected it allows the input of multiple Execution Methods.
21. Check this box if a system's BUILDER information does not match reality. A report can be run from the VAST Homepage to highlight all of the systems the Facility Condition Assessment Team should target for reassessment.
22. Building Data Section.
23. Reassess Entire Facility. Select this box if the entire facility requires reassessment.
24. VAST Plan Status. The status/progress of the VAST assessment. Three choices are available from the dropdown; Not Started, In Progress, and Finalized. The current status/progress is graphically represented on the Vast Homepage.
25. Notes. Enter pertinent information that was not captured elsewhere, but is relevant to the plan.
26. The lower portion of the Master List is a scrollable list of all buildings the installation has in BUILDER. Scroll to the desired building and select it to have the upper half of the screen show the building's detailed information.



1. The + sign is an artifact in Microsoft Access and cannot be removed, ignore it, the information provided is duplicative.

## Programmed Projects

1	2	3	4	5	6	7	8	9	10
Real Property Unique Identifier	Fiscal Year	Program Type Code	Funding Source Code	Installation/Opportunity/PM	Project Title	Facility Number	Programmed Amount	Project Status	Project Number (Legacy)
17743	2014	GMF	WV	MSB10112	Quarterly Maintenance	ACOMDAGOR	875		
2743	2014	GMF	WV	MSB10112	Quarterly Maintenance	COMBATLTH	875		

To view the Programmed Projects:

Select the View Programmed Projects button at the top of the Master List. A separate window will appear with the projects associated with this facility in ACES-PM or NexGen IT as appropriate for the installation. Select the column headings to sort and/or filter the list to target specific facilities more easily.

Column Definitions:

1. Real Property Unique Identifier.
2. Fiscal Year the project is programmed for execution.
3. Program Type Code.
4. Funding Source Code.
5. If the installation is still in ACES-PM, this is the ACES-PM project number. If the installation has transitioned to NexGen IT, this is the NexGen IT opportunity number.
6. Project Title.
7. Facility Number.
8. Programmed Amount.
9. Project Status Code.
10. If the installation is still on ACES-PM, this field is blank. If the installation has transitioned to NexGen IT, this is the legacy ACES-PM project number.

1	2	3	4	5	6	7	8	9	10
Real Property Unique Identifier	Fiscal Year	Program Type Code	Funding Source Code	Installation/Opportunity/PM	Project Title	Facility Number	Programmed Amount	Project Status	Project Number (Legacy)
10112	2014	GMF	WV	MSB10112	Quarterly Maintenance	ACOMDAGOR	875		
10112	2014	GMF	WV	MSB10112	Quarterly Maintenance	COMBATLTH	875		
10112	2014	GMF	WV	MSB10112	Quarterly Maintenance	COMBATLTH	875		
10112	2014	GMF	WV	MSB10112	Quarterly Maintenance	COMBATLTH	875		
10112	2014	GMF	WV	MSB10112	Quarterly Maintenance	COMBATLTH	875		

## View Work Item Details

To view the Work Item Details:

Select the View Work Item Details button at the top of the Master List. A separate window will appear with all the work item details from the BUILDER Final 8 report for this building.

Column Definitions:

1. Real Property Unique Identifier.
2. Special Area. This can help the user sort by any Complexes that have been set up in BUILDER.
3. Building Number.
4. Building Name.
5. Category Code.
6. Mission Dependency Index.
7. System Importance Factor.

8. System.
9. Component.
10. Material Equipment Type.
11. Component Type.
12. Section Name.
13. Component-Section Condition Index.
14. Quantity.
15. Unit of Measure.
16. Work Item Description.
17. Estimated Cost.
18. Fiscal Year.
19. Actual Cost.
20. Work Request.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
471345	471345	471345	471345	471345	471345	471345	471345	471345	471345	471345	471345	471345	471345	471345	471345	471345	471345	471345	471345
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### View Inspection Summary

To view the Inspection Summary:

Select the View Inspection Summary button at the top of the Master List. A separate window will appear with the inspection information from the BUILDER Final 5.

Column Definitions:

1. Real Property Unique Identifier.
2. Special Area. This can help the user sort by any Complexes that have been set up in BUILDER.
3. Building Number.
4. Building Name.
5. Component.

6. Material/Equipment.
7. Component Type.
8. Section Name.
9. Quantity.
10. Unit of Measure.
11. Section Year. When the Section was installed.
12. Section Year Source.
13. Inspection Date.
14. Inspection Type.
15. Inspection Rating.
16. Inspector Name.
17. Comments.
18. Number of Inspection Images.

## ***ExPlan Reports***

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The screenshot displays the ExPlan Reports interface. At the top, there is a 'Tools' section containing a green button labeled 'Report Manager'. Below this is the 'Reports' section, which is divided into two columns: 'Overview' and 'Detailed'. The 'Overview' column contains several buttons for different report types, each with a small icon and a blue arrow button. The 'Detailed' column contains a similar set of buttons. A red rectangular box highlights the 'ExPlan' section within the 'Detailed' column, which contains two buttons: 'ExPlan Overview' and 'ExPlan Detailed'.

The left screenshot displays the 'In-House' report. It features a table with columns for Building Name, Building Number, System, and Cost. The data is sorted by execution method. The right screenshot displays the 'Projects' report, which includes a table with columns for Building Name, Building Number, System, and Cost, sorted by execution method. Both reports have a filter bar at the top and buttons for PDF and Excel export.

### The ExPlan Reports:

The ExPlan In-House report sums the costs for the current year by building where execution methods are listed as any type of In-House option. It includes the building name, number, system, and it is sorted by execution method.

The ExPlan Projects report sums the costs for the current year by building where execution methods are listed as Send to CEN for Project or Project on the Books. It includes the building name, number, and system.

Note: These reports will be provided to AFIMSC as supplementary information for your ExPlan.

1. Select the PDF button to export the report to PDF.
2. Select the Excel button to export the report to Excel.

## VAST Training Links

Detailed training videos for VAST can be found at the following locations. Note: Videos at all 3 locations are identical.

1. milSuite (must be on a CAC device)
  - a. Lesson 1: <https://www.milsuite.mil/video/18217>
  - b. Lesson 2: <https://www.milsuite.mil/video/18218>
  - c. Lesson 3: <https://www.milsuite.mil/video/18222>
2. YouTube (best for non-CAC devices; may not be accessible from an AF computer)
  - a. Lesson 1: <https://youtu.be/ivmOx78h1eU>
  - b. Lesson 2: [https://youtu.be/GGH1\\_ehMyR0](https://youtu.be/GGH1_ehMyR0)
  - c. Lesson 3: <https://youtu.be/i8V21WxtKy4>
3. Download (if streaming quality is poor; must be on a CAC device)
  - a. All 3 Lessons can be accessed through this [link](#).

### Additional Resources

If the SMS Playbook or the VAST Job Aid does not answer your question(s) on how to populate the tool, contact the AFCEC POC, Ben Graf, at [ben.graf@us.af.mil](mailto:ben.graf@us.af.mil).



## SMS Playbook Acronyms

### A

AAFES	Army Air Force Exchange Service
AAS	Aircraft Arresting Systems
ACC	Air Combat Command
ACES	Automated Civil Engineering System
ACES-PM	Automated Civil Engineering System – Project Management
ACES-RP	Automated Civil Engineering System – Real Property
AETC	Air Education and Training Command
AF	Air Force
AFB	Air Force Base
AFCAMP	Air Force Comprehensive Asset Management Plan
AFCEC	Air Force Civil Engineer Center
AFCEC/CO	Air Force Civil Engineer Center/Operations Directorate
AFCEC/COA	Air Force Civil Engineer Center/Operations Directorate – Asset Visibility Division
AFCEC/COAP	Air Force Civil Engineer Center/Operations Directorate – Asset Visibility Division, Airfield Pavement Evaluation Branch
AFCEC/DTS	Air Force Civil Engineer Center/Data Transformation Services
AFMAN	Air Force Manual
AFI	Air Force Instruction
AFRPA	Air Force Real Property Assets
AFWAY	Air Force Way
AHU	Air Handling Unit
AMP	Activity Management Plan
APE	Airfield Pavement Evaluation
AP	Apron
ASRR	Airfield Suitability and Restrictions Report
ASTM	American Society for Testing and Materials
ATL	Acquisition, Technology, and Logistics



ATO	Authority to Operate
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## **B**

BCAMP	Base Comprehensive Asset Management Plan
BCCI	Building Component Condition Index
BCE	Base Civil Engineer
BCI	Building Condition Index
BIA	Built Infrastructure Assessment
BIAT	Built Infrastructure Assessment Team
BR	Business Rules
BRED	BUILDER Remote Entry Database

## **C**

CAMP	Comprehensive Asset Management Program
CATCODE	Category Code
CE	Civil Engineer
CEN	Engineering Flight
CERL	Construction Engineering Research Laboratory
CES	Civil Engineer Squadron
CI	Condition Index
CONUS	Continental United States

## **D**

DAA	Designated Approval Authority
DCS	Defense Collaboration Services
DD	Department of Defense form number
DeCA	Defense Commissary Agency
DET	Detachment
DHA	Defense Health Agency
DLA	Defense Logistics Agency
DoD	Department of Defense
DoDEA	Department of Defense Education Activity
DSW	Direct Scheduled Work

## **E**

EA	Engineering Assistants
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EMCS	Energy Management Control System
EQ	Environmental Quality
ERDC	Engineer Research and Development Center
ETL	Engineering Technical Letter

## **F**

FAC	Facility Analysis Category
FACID	Facility Identification
FAST	Fuels Assessment Tool
FCA	Facility Condition Assessment
FCI	Facility Condition Index
FES	Fire Emergency Services
FHWA	Federal Highway Administration
FIAR	Financial Improvement and Audit Readiness
FOA	Field Operating Agency
FoB	Found on Base
F&OTM	Fasteners and Other Track Materials
FUB	Facilities Utilization Board
FYDP	Future Years Defense Program

## **G**

GIS	Geographic Information System
GSU	Geographically Separated Units

## **H**

HAF/A4	Headquarters Air Force/Logistics, Installations and Mission Support
HAF-GIO	Headquarters Air Force Geo Integration Office
HDPE	High-Density Polyethylene
HQ AFSPC/A6S	Headquarters Air Force Space Command/Communications and Information Software
HVAC	Heating, Ventilation, and Air Conditioning
HWD	Heavy Weight Deflectometer

## **I**

ID	Identification
IDIQ	Indefinite Delivery Indefinite Quantity
IE	Installations and Environment

IGIS	Installation Geospatial Information System
IPL	Integrated Priority List
IWIMS	Integrated Work Information Management System
IT	Information Technology

## **J**

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## **K**

KPI	Key Performance Indicators
KVA	Kilo Volt Amps

## **L**

LF	Linear Feet
LOS	Levels of Service
LS	Linear Segmentation

## **M**

MAJCOM	Major Command
MDI	Mission Dependency Index
M&R	Maintenance and Repair

## **N**

NAVAIDS	Navigational Aids
NCOIC	Non-Commissioned Officer in Charge
NEX	Navy Exchange

## **O**

OCONUS	Outside the Continental United States
OH	Overhead
OPG	Operation Program Group
OSD	Office of the Secretary of Defense
OSD/IE	Office of the Secretary of Defense/Installations and Environment

## **P**

PAD	Program Action Directive
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PCASE	Pavement-Transportation Computer Aided Structural Engineering
PCC	Portland Cement Concrete
PCI	Pavement Condition Index
PCN	Pavement Classification Number
PM	Preventive Maintenance
PMP	Preventive Maintenance Plan
PMTL	Preventive Maintenance Task List
POC	Point of Contact
POM	Program Objective Memorandum
P-Plan	Programming Plan
PVC	Polyvinyl chloride

## Q

QC	Quality Control
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## R

R/A/G	Red/Amber/Green
RCI	Rail Condition Index
RED	Remote Entry Database
RETAI	Real Estate Transactions, Accountability, and Inventory
R&O	Requirements and Optimization
ROI	Return On Investment
ROOFER	Roofing management system
RP	Real Property
RPA	Real Property Accountability
RPAD	Real Property Asset Database
RPI	Real Property Inventory
RPIE	Real Property Installed Equipment
RPIM	Real Property Information Model
RPIR	Real Property Inventory Requirements
RPO	Real Property Office
RPSUID	Real Property Site Unique Identifier
RPUID	Real Property Unique Identifier
RSL	Remaining Service Life

## S

SDSFIE	Spatial Data Standard for Facilities, Infrastructure, and Environment
SF	Square Feet
SMS	Sustainment Management System
SMSWIG	Sustainment Management System Implementation Working Group
SOP	Standard Operating Procedure
SOW	Statement of Work
SRM	Sustainment, Restoration, and Modernization
sub-AMP	sub – Activity Management Plan
SY	Square Yards

## T

TBD	To Be Determined
TDS	Total Dissolved Solids
TERPS	Terminal Instruments Procedures
TNAP	Transportation Networks and Airfield Pavements

## U

UFC	Unified Facilities Criteria
UG	Underground
USC	United States Code
USACE	United States Army Corps of Engineers
USAF	United States Air Force
USAFR	United States Air Force Reserve

## V

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## W

WRRB	Work Requirements Review Board
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## X

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## Y

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**z**



## BUILDER Systems and Components

This topic presents the identifying numbers and names of the Systems and Components used in BUILDER.

To divide a Building into Systems and Components, BUILDER follows the Naval Facilities Engineering Command (NAVFAC) UNIFORMAT II classification for building elements (Level 2 and 3).\*

\*see <https://www.wbdg.org/ffc/navy-navfac/design-build-request-proposal/uniformat-structure>.

Level 2	Level 3
A10 Foundations	A1010 Standard Foundations A1020 Special Foundations A1030 Slab on Grade
A20 Basement Construction	A2010 Basement Excavation A2020 Basement Walls
B10 Superstructure	B1010 Floor Construction B1020 Roof Construction
B20 Exterior Closure	B2010 Exterior Walls B2020 Exterior Windows B2030 Exterior Doors
B30 Roofing	B3010 Roof Coverings (Note: Roof openings are a subcategory of Roof Coverings)
C10 Interior Construction	C1010 Partitions C1020 Interior Doors C1030 Specialties
C20 Stairs	C2010 Stair Construction
C30 Interior Finishes	C3010 Wall Finishes C3020 Floor Finishes C3030 Ceiling Finishes C3040 Interior Coatings and Special Finishes
D10 Conveying	D1010 Elevators and Lifts D1020 Weight Handling Equipment D1030 Escalators and Moving Walks D1090 Other Conveying Systems

D20 Plumbing	D2010 Plumbing Fixtures D2020 Domestic Water Distribution D2030 Sanitary Waste D2040 Rain Water Drainage D2090 Other Plumbing Systems
D30 HVAC	D3010 Energy Supply D3020 Heat Generating Systems D3030 Cooling Generating Systems D3040 Distribution Systems D3050 Terminal & Package Units D3060 Controls & Instrumentation D3070 Systems Testing & Balancing D3080 HVAC Valves D3090 Other HVAC Systems & Equipment
D40 Fire Protection	D4010 Fire Alarm and Detection Systems D4020 Fire Suppression Water Supply and Equipment D4030 Standpipe Systems D4040 Sprinklers D4050 Fire Protection Specialties D4090 Other Fire Protection Systems
D50 Electrical	D5010 Electrical Service & Distribution D5020 Lighting & Branch Wiring D5030 Communication & Security D5090 Other Electrical Services
E10 Equipment	E1010 Commercial Equipment E1020 Institutional Equipment E1030 Vehicular Equipment E1090 Other Equipment
E20 Furnishings	E2010 Fixed Furnishings E2020 Movable Furnishings
F10 Special Construction	F1010 Special Structures F1020 Integrated Construction F1030 Special Construction Systems F1040 Special Facilities F1050 Special Controls and Instrumentation
F20 Selective Building Demolition	F2010 Building Elements Demolition F2020 Hazardous Components Abatement



G10 Site Preparations	G1010 Site Clearing G1020 Site Demolition & Relocations G1030 Site Earthwork G1040 Hazardous Waste Remediation
G20 Site Improvements	G2010 Roadways G2020 Parking Lots G2030 Pedestrian Paving G2040 Site Development G2050 Landscaping G2060 Airfield Paving
G30 Site Civil/Mechanical Utilities	G3010 Water Supply G3020 Sanitary Sewer G3030 Storm Sewer G3040 Heating Distribution G3050 Cooling Distribution G3060 Fuel Distribution G3090 Other Site Mechanical Utilities
G40 Site Electrical Utilities	G4010 Electrical Distribution G4020 Site Lighting G4030 Site Communication and Security G4090 Other Site Electrical Utilities

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DIVISION 01 - GENERAL REQUIREMENTS

SECTION 01 78 36.00 24

WARRANTY OF CONSTRUCTION AND DESIGN

4/07

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- 1.1 WARRANTY OF CONSTRUCTION
- 1.2 ADDITIONAL WARRANTY REQUIREMENTS
  - 1.2.1 Performance Bond
  - 1.2.2 Pre-Warranty Conference
  - 1.2.3 Equipment Warranty Identification
  - 1.2.4 Warranty Service Calls
  - 1.2.5 Equipment Warranty Booklet
- 1.3 SUBMITTALS
- 1.4 EQUIPMENT WARRANTY IDENTIFICATIONS TAGS
  - 1.4.1 GENERAL REQUIREMENTS
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- 1.5 WARRANTY OF DESIGN

PART 2 NOT USED

PART 3 NOT USED

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## SECTION 01 78 36.00 24

## WARRANTY OF CONSTRUCTION AND DESIGN

4/07

## PART 1 GENERAL

## 1.1 WARRANTY OF CONSTRUCTION

(a) Foremost and in addition to any other warranties in this contract, the Contractor warrants, except as provided in paragraph (i) of this clause, that work performed under this contract conforms to the contract requirements and is free of any defect in equipment, material, design furnished, or workmanship performed by the Contractor or any subcontractor or supplier at any tier.

(b) This warranty shall continue for a period of 1 year from the date of final acceptance of the work. If the Government takes possession of any part of the work before final acceptance, this warranty shall continue for a period of 1 year from the date the Government takes possession.

(c) The Contractor shall remedy at the Contractor's expense any failure to conform, or any defect. In addition, the Contractor shall remedy at the Contractor's expense any damage to Government-owned or controlled real or personal property, when that damage is the result of--

(1) The Contractor's failure to conform to contract requirements;  
or

(2) Any defect of equipment, material, workmanship, or design furnished by the Contractor.

(d) The Contractor shall restore any work damaged in fulfilling the terms and conditions of this clause.

(e) The Contractor's warranty with respect to work restored, repaired or replaced will run for 1 year from the date of restoration, repair or replacement. This provision applies equally to all items restored, repaired, or replaced under paragraph (c) and (d) above.

(f) The Government will notify the Contractor, in writing, within a reasonable time after the discovery of any failure, defect, or damage. Repair work necessary to correct a warranty condition which arises to threaten the health or safety of personnel, the physical safety of property or equipment, or which impairs operations, habitability of living spaces, etc., will be performed by the Contractor on an immediate basis as directed verbally by the Government. Written verification will follow verbal instruction.

(g) If the Contractor fails to remedy any failure, defect, or damage within a reasonable time after receipt of verbal or written notice, the Government shall have the right to replace, repair, or otherwise remedy the failure, defect, or damage at the Contractor's expense.

(h) With respect to all warranties, express or implied, from subcontractors, manufacturers, or suppliers for work performed and materials furnished under this contract, the Contractor shall--

(1) Obtain all warranties that would be given in normal commercial practice;

(2) Require all warranties to be executed, in writing, for the benefit of the Government, if directed by the Contracting Officer; and

(3) Enforce all warranties for the benefit of the Government, if directed by the Contracting Officer.

(i) In the event the Contractor's warranty under paragraph (b) of this clause has expired, the Government may bring suit at its expense to enforce a subcontractor's, manufacturer's, or supplier's warranty.

(j) Unless a defect is caused by the negligence of the Contractor or subcontractor or supplier at any tier, the Contractor shall not be liable for the repair of any defects of material or design furnished by the Government nor for the repair of any damage that results from any defect in Government-furnished material or design.

(k) This warranty shall not limit the Government's rights under the Inspection and Acceptance clause of this contract with respect to latent defects, gross mistakes, or fraud.

(l) The Prime Contractor shall designate a representative to attend and chair warranty meetings that will be held each month at the project site for the duration of the warranty period, with government and subcontractor personnel as necessary. The meeting shall review past warranty corrections and response times, open warranty items, up-coming scheduled corrections, site investigations, and other issues.

## 1.2 ADDITIONAL WARRANTY REQUIREMENTS

### 1.2.1 Performance Bond

(a) It is understood that the Contractor's Performance Bond will remain effective for one (1) year from the date of acceptance.

(b) If either the Contractor or his representative doesn't diligently pursue warranty work to completion, the contractor and surety will be liable for all costs. The Government, at its option, will either have the work performed by others or require the surety to have it done. Both direct and administrative costs will be reimbursable to the Government.

### 1.2.2 Pre-Warranty Conference

(a) Prior to contract completion and at a time designated by the Contracting Officer or his authorized representative, the Contractor shall meet with the Contracting Officer or his authorized representative to develop a mutual understanding with respect to the requirements of the Paragraph: WARRANTY OF CONSTRUCTION. Communication procedures for Contractor notification of warranty defects, priorities with respect to the type of defect and other

details deemed necessary by the Contracting Officer or his authorized representative for the execution of the construction warranty shall be established/reviewed at this meeting.

(b) In connection with these requirements and at the time of the Contractor's quality control completion inspection, the Contractor will furnish the name, telephone number and address of the service representative which is authorized to initiate and pursue warranty work action on behalf of the Contractor and surety. This single point of contact will be located within the local service area of the warranted construction, will be continuously available, and will be responsive to Government inquiry on warranty work action and status. This requirement does not relieve the Contractor of any Contractual responsibilities in connection with the paragraph: WARRANTY OF CONSTRUCTION.

(c) Local service area is defined as the area in which the contractor or his representative can meet the response times as described in paragraph 1.2.4 and in any event shall not exceed 200 miles radius of the construction site.

#### 1.2.3 Equipment Warranty Identification

The Contractor shall provide warranty identification tags on all mechanical and electrical equipment installed under this contract. Tags and installation shall be in accordance with the requirements of Paragraph: EQUIPMENT WARRANTY IDENTIFICATION TAGS.

#### 1.2.4 Warranty Service Calls

The Contractor or his local service representative will respond to the site, to a call within the time periods as follows: Four (4) hours for Heating, Air Conditioning, Refrigeration, Air Supply and Distribution, Critical Electrical service Systems and Food Service Equipment and Twenty-Four (24) hours For All Other Systems.

#### 1.2.5 Equipment Warranty Booklet

At or before 30 days prior to final inspection and acceptance of the work, the Contractor shall submit the data mentioned as follows:

The Contractor shall provided a Booklet, which consists of a listing of all equipment items (see paragraphs a. and b. below) which are specified to be guaranteed along with the warranty papers for each piece of equipment. Three (3) legible bound copies of the booklet shall be submitted for approval and shall be indexed alphabetically by equipment type. For each specific guaranteed item, the name, address, and telephone number shall be shown on the list for the subcontractor who installed equipment, equipment supplier or distributor, and equipment manufacturer. Completion date of the guarantee period shall correspond to the applicable specification requirements for each guaranteed item. The names of service representatives that will make warranty calls along with the day, night, weekend and holiday contacts for response to a call within the time period specified shall also be identified.

a. For Equipment in Place: The equipment list shall show unit retail value and nameplate data including model number, size, manufacturer, etc. This would include capital equipment and other nonexpendable supplies of a movable nature that are not affixed as an integral part of the facility

and may be removed without destroying or reducing the usefulness of the facility. Some examples are spare parts, special tools, manufacturing equipment, maintenance equipment, instruments, installed under this contract.

b. For Installed Building Equipment: The equipment list shall show unit retail value and nameplate data including model number, size, manufacturer, etc. This would include items of equipment and furnishings (including material for installation thereof), which are required to make the facility usable and are affixed as a permanent part of the structure. Some examples are plumbing fixtures, laboratory counters and cabinets, kitchen equipment, mechanical equipment, electrical equipment, and fire protection systems installed under this contract.

### 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-11 Closeout Submittals

Equipment Warranty Booklet

### 1.4 EQUIPMENT WARRANTY IDENTIFICATIONS TAGS

#### 1.4.1 GENERAL REQUIREMENTS

The Contractor shall provide warranty identification tags on all Contractor and government furnished equipment which is Contractor installed.

##### 1.4.1.1 Tags and Information

The tags and information shall be similar in format and size to the exhibits provided by this specification, and shall be suitable for interior and exterior locations, resistant to solvents, abrasion, and to fading caused by sunlight, precipitation, etc. These tags shall have a permanent pressure-sensitive adhesive back, and shall be installed in a position that is easily (or most easily) noticeable. If the equipment surface is not suitable for adhesive back, Contractor shall submit his alternative to the Contracting Officer's Authorized Representative for review and approval. Contractor furnished equipment that has differing warranties on its components will have each component tagged.

##### 1.4.1.2 Tags for Warranted Equipment

The tag for his equipment shall be similar to the following:

```

+-----+
|               EQUIPMENT WARRANTY               |
|               CONTRACTOR FURNISHED EQUIPMENT    |
|               MFG-----MODEL NO.-----      |
+-----+

```



SERIAL NO.-----
CONTRACT NO.-----
CONTRACTOR NAME-----
CONTRACTOR ADDRESS-----
CONTRACTOR TELEPHONE-----
CONTRACTOR WARRANTY EXPIRES-----
IN CASE OF WARRANTY ACTION FIRST CONTACT
BCE     AT 719-333-2790

EQUIPMENT WARRANTY	
GOVERNMENT FURNISHED EQUIPMENT	
MFG _____	MODEL NO. _____
SERIAL NO. _____	
CONTRACT NO. _____	
DATE EQUIP PLACED IN SERVICE _____	

#### 1.4.1.3 Exclusion to Providing Tags

If the manufacturer's name (MFG), model number and serial number are on the manufacturer's equipment data plate and this data plate is easily found and fully legible, this information need not be duplicated on the equipment warranty tag. The Contractor's warranty expiration date and the final manufacturer's warranty expiration date will be determined as specified by the Paragraph "WARRANTY OF CONSTRUCTION".

#### 1.4.2 EXECUTION

The Contractor will complete the required information on each tag and install these tags on the equipment by the time of and as a condition of final acceptance of the equipment. The Contractor shall be responsible for scheduling acceptance inspection with the Contracting Officer (verbal and written notification required). If this inspection is delayed by the Contractor, the Contractor shall, at his own expense, update the in-service and warranty expiration dates on these tags.

#### 1.4.3 Equipment Warranty Tag Replacement

Under the terms of this contract, the Contractor's warranty with respect to work repaired or replaced shall run for one year from the date of repair or replacement. Such activity shall include a data warranty

identification tag on the repaired or replaced equipment. The tag shall be furnished and installed by the Contractor, and shall be similar to the original tag, except that it should include the scope of repair and that the contractor's warranty expiration date will be one year from the date of acceptance of the repair or replacement. In the case of repair, the repair only will be covered by the extended warranty. In the case of replacement of a component, the component only will be covered by the extended warranty. In these cases, the original tags will not be removed, but an additional tag will be installed for the repair or component replacement.

#### 1.5 WARRANTY OF DESIGN

(a) Foremost and in addition to any other warranties in this contract, the Contractor warrants that the design shall be performed in accordance with the Contract requirements. Design and design related construction not conforming to the Contract requirements shall be corrected at no additional cost to the Government. The standard of care for design is defined in paragraph (b) of Section 01 30 00.24 OTHER ADMINISTRATIVE AND SPECIAL REQUIREMENTS "RESPONSIBILITY OF THE CONTRACTOR FOR DESIGN".

(b) The period of this warranty shall commence upon final completion and the Government's acceptance of the work, or in the case of the Government's beneficial occupancy of all or part of the work for its convenience, prior to final completion and acceptance, at the time of such occupancy.

(c) This design warranty shall be effective from the above event through the Statute of Limitations and Statute of Repose, as applicable to the state that the project is located in.

(d) The rights and remedies of the Government provided for under this clause are in addition to any other rights and remedies provided in this contract or by law.

PART 2 NOT USED

PART 3 NOT USED

-- End of Section --

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## SECTION 01 78 39.00 24

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Modifications and Title Block Examples

-- End of Section Table of Contents --

## SECTION 01 78 39.00 24

AS-BUILT DRAWINGS  
02/22

## PART 1 GENERAL

Attachments: Modifications and Title Block Examples

## 1.1 DEFINITIONS

The definitions listed below form a part of this specification.

## 1.1.1 Red-Line Drawings

Accepted design drawings marked-up during construction to show actual work performed to include necessary sketches, modification drawings, shop drawings and notes.

## 1.1.2 As-Built Drawings

Professionally-finished bond paper drawings and electronic CAD Files developed from the accepted design drawings that include all of the information from the redline drawings and suitable for half-size reproduction. Building Information Modeling (BIM) files are considered a part of As-Built Drawings. See Section 01 33 39.00 10 ADVANCED MODELING (BIM/CIM/GIS/CAD) REQUIREMENTS for additional requirements and deliverables.

## 1.1.3 Black-Line Drawings

Electronic CAD files that can be used to produce high quality drawings.

## 1.1.4 Full-Size Drawings

22 inches x 34 inches nominal size drawings with all details visually readable so that half-size plot will fit on 11 inches x 17 inches cut sheets.

## 1.1.5 Modification Circle

A circle with a horizontal line through the center to identify modification changes on the drawings. The top half will contain the letter "R" with the bottom half containing the Modification number, unless directed otherwise. The lettering standard will be 1/8-inch Arial.ttf.

## 1.1.6 Electronic CAD Files

See Section 01 33 39.00 10 ADVANCED MODELING (BIM/CIM/GIS/CAD) REQUIREMENTS.

## 1.1.7 Issued for Construction Drawings

Design drawings created by the design-build contractor for the construction phase of the contract that have been reviewed and accepted by the Government.

#### 1.1.8 Building Information Modeling (BIM) Files

See Section 01 33 39.00 10 ADVANCED MODELING (BIM/CIM/GIS/CAD) REQUIREMENTS for definition.

#### 1.1.9 Geodetic Datum

See Section 01 33 39.00 10 ADVANCED MODELING (BIM/CIM/GIS/CAD) REQUIREMENTS for definition.

#### 1.1.10 State Plane Coordinate System (SPCS)

See Section 01 33 39.00 10 ADVANCED MODELING (BIM/CIM/GIS/CAD) REQUIREMENTS for definition.

### 1.2 REFERENCES

#### U.S. ARMY CORPS OF ENGINEERS (USACE)

ERDC/ITL TR-19-7 (2019) A/E/C CAD Standard - Release 6.1

EM 1110-1-2909 (2012) Geospatial Data and Systems

USACE A/E/C A/E/C CAD Standards, Most Current Release  
<https://cadbimcenter.erdcdren.mil/>

### 1.3 SUSTAINABILITY REQUIREMENTS

Materials in this technical specification may contribute towards contract compliance with sustainability requirements. See Section 01 33 29 SUSTAINABILITY REQUIREMENTS AND REPORTING for project requirements.

### 1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

#### SD-03 Product Data

50 Percent Preliminary As-Built Drawings; G-DO

100 Percent Preliminary As-Built Drawings; G-DO

#### SD-11 Closeout Submittals

Final As-Built Drawings; G-DO

Sustainability Documentation; G-RO

### 1.5 GENERAL REQUIREMENTS

#### 1.5.1 As-built Drawings

Create electronic CAD files, BIM files and Red-Line Drawings showing As-Built conditions. Provide as-built Building BIM model in compliance

with USACE Minimum Modeling Matrix (M3) for Level of Detail (LOD) and element Grade for "Record Models" as referenced in Section 01 33 39.00 10 ADVANCED MODELING (BIM/CIM/GIS/CAD) REQUIREMENTS. Use the ERDC/ITL TR-19-7 USACE A/E/C CAD Standard for the As-Built drawings. Obtain the A/E/C Standards in effect at time of Contract Award. The A/E/C Standards are available at:

<https://cadbimcenter.erdcdren.mil/>

(New users will be required to register. See "New User Registration" at the website indicated above.)

Obtain the required CAD software and BIM software for Contractor use. **Do not convert electronic drawing files from one software language to another unless as specifically allowed or required in Section 01 33 39.00 10 ADVANCED MODELING (BIM/CIM/GIS/CAD) REQUIREMENTS.** Show the transmittal requirements for the As-built Drawings as activities on the Contractor-prepared project schedule.

Show all changes from the accepted design drawings on the as-builts. Accurately and neatly record all changes on the As-built drawings using the same symbols, terminology, and general quality as the original set of accepted design drawings. Show all changes on all drawings that are affected by the change. Changes include: actual work performed, deviations resulting from Government responses to Requests for Information or Serial letters, surveys, shop drawings, descriptive changes, sketch changes, and modifications to the contract. Show all systems designed or enhanced by the Contractor such as HVAC control system, fire alarm system fire sprinkler system, and irrigation sprinkler system, on the As-built drawings. Where accepted design drawings or specifications allow for options, only show the option selected and actually constructed on the As-Built Drawings.

#### 1.5.2 Red-Line Drawings

Update Red-Line Drawings throughout the construction phase of the contract showing all changes that will be shown on the final as-builts. Place all as-built conditions on the Red-Line Drawings **within two (2) days** after completing the work activity or it shall be entered on the deficiency tracking system (see Section 01 45 00.00 10 QUALITY CONTROL). The Government will consider the Contractor to not be making satisfactory progress and will withhold funds from progress payments if the Contractor does not completely and accurately update the as-built drawings.

Provide red-line drawings in an electronic format.

##### 1.5.2.1 Electronic Red-Lines

Make electronic red-line drawings available to the COR at all times through a Local Area Network (LAN) or Internet connection. The connection shall have a download transfer rate not less than 10 Megabit/second (~1.250 Megabytes/second) and an upload transfer rate of not less than 1 Megabit/second (~124 kilobytes/second) in order to facilitate the timely access of drawing files. Make backups of all the electronic drawings at the close of business on the final day of work each week on a durable digital media such as removable hard-drive, tape drive, or optical disk. Preserve each weekly file system backup over the course of the project and do not overwrite; label the file folders or individual media with the date of backup. Store the weekly backup media in a fireproof and waterproof

safe in a locked room of the Contractor's trailer. Electronically provide the COR with updated PDF drawings on a monthly basis. Show all changes to the electronic drawings with clouding and in accordance with ERDC/ITL TR-19-7.

#### 1.5.3 GeoDataBase

Provide digital media containing a SDSFIE/FGDC GeoReferenced personal GeoDataBase, in accordance with the requirements of this section and EM 1110-1-2909, unless otherwise directed by the Contracting Officer.

See Section 01 33 39.00 10 ADVANCED MODELING (BIM/CIM/GIS/CAD) REQUIREMENTS for applicable references and requirements.

#### 1.5.4 Sustainability Documentation

All Sustainability documentation that was submitted in the USGBC templates and any other documentation which supports the templates and indicates compliance with related Federal Mandates shall be submitted once Sustainability Documentation is finalized. See Section 01 33 29 SUSTAINABILITY REQUIREMENTS AND REPORTING for detailed requirements. Submit all Sustainability documentation within 120 days after the final inspection. Place the Sustainability documentation on two DVDs and send one copy sent to the COR and the other to the Omaha District Office (ATTN: Patricia Lambert, CENWO-CDS-C).

#### 1.6 PAYMENT

In accordance with the clause "Payment Under Fixed - Price Construction Contracts", cost load closeout activities amounts in accordance with Section 01 32 01.00 10 PROJECT SCHEDULE not less than \$35,000 or 1 percent of the present contract value, which ever is greater, up to \$200,000. This amount will be withheld from payment for the creation of As-Built Drawings until Final As-Built Drawings and GeoDatabase Files are delivered to and accepted by the COR.

#### 1.7 CONTRACTOR PERFORMANCE RATING

The Government will evaluate the Contractor's performance in CPARS (Contractor Performance Assessment Reporting System) at intervals of no more than 365 days during the period of performance and complete the final evaluation within 120 days of completion of the project. The timeliness and quality of As-Built drawings submittals, Final As-built Drawings, Red-line drawings, Sustainability Documentation, and GeoDataBase Files will be an important factor in determining the assigned rating for the Schedule evaluation area. If the Contractor fails to submit complete and accurate Final As-Built Drawings and GeoDataBase Files within sixty (60) calendar days of turning the completed project over to the Using Service, this failure will be noted in the comments under the Schedule evaluation area and may result in a lower rating for this area. Repeated failure to submit correct and accurate As-Built drawings submittals, Final As-built Drawings, Red-line drawings, Sustainability Documentation, and GeoDataBase Files may also result in lower ratings for the Quality and Management evaluation areas. The Contractor shall receive an Unsatisfactory rating for Sustainability documentation if Sustainability documentation is not submitted within 120 days after the final inspection.



## 1.8 TRANSMITTAL OF AS-BUILT DRAWINGS

### 1.8.1 Optional As-built Drawings Sample

Optionally submit a sample of preliminary as-built drawings to the Omaha District Office that will be reviewed for formatting purposes. Include five distinct sheets from the project drawings in this submittal. Send this optional submittal on approved digital media to the Omaha District Office (ATTN: Patricia Lambert, CENWO-CDS-C) and include the following:

- a. Electronic CAD/BIM/CIM Files
- b. Individual PDF Drawings
- c. One (1) Combined Set of full-size PDF Drawings with bookmarks for each sheet

### 1.8.2 50 Percent Preliminary As-Built Drawings

Submit the 50 Percent Preliminary As-Built Drawings within ten (10) days after 50% physical completion unless otherwise directed by the COR. The Government will review these drawings for technical content and formatting requirements. Include all changes up to the time of submission with "clouding" around the changes on the electronic CAD Files. Submit all drawings contained in the complete project set of drawings plus any additional drawings with the 50 Percent Preliminary As-Built Drawings. Include the following on the approved digital media for the 50 Percent Preliminary As-Built Drawings (ATTN: Patricia Lambert, CENWO-CDS-C):

- a. All documents and files required under "Advanced Modeling Submittal Packaging" paragraph of Section 01 33 39.00 10 ADVANCED MODELING (BIM/CIM/GIS/CAD) REQUIREMENTS.
- b. Current electronic red-line drawings for reviewing purposes.

If a resubmittal is required, resubmit within fifteen days after receiving comments back from the Government. Failure to submit the 50 Percent Preliminary As-Built Drawings by the specified time will result in the Government not considering the Contractor to be making satisfactory progress on the project and withholding funds from the progress payments.

### 1.8.3 100 Percent Preliminary As-Built Drawings

The 100 Percent Preliminary As-Built Drawings include all changes to the drawings as specified. The 100 Percent Preliminary As-Built Drawings will be reviewed for technical content and formatting requirements. Within thirty (30) days after the final inspection, submit 100 Percent Preliminary As-Built Drawings indicating all as-built changes with "clouding" on all of the project drawings. Submit all drawings contained in the complete project set of drawings plus any additional drawings with the 100 Percent Preliminary As-Built Drawings. The COR may grant the Contractor additional time if the Contractor is making reasonable progress on the as-builts, in the sole judgment of the COR. Do not submit the Final As-Built Drawings until the 100 Percent Preliminary As-Built Drawings are approved. Include the following on the approved digital media for the 100 Percent Preliminary As-Built Drawings (ATTN: Patricia Lambert, CENWO-CDS-C):

- a. All documents and files required under "Advanced Modeling Submittal Packaging" paragraph of Section 01 33 39.00 10 ADVANCED MODELING (BIM/CIM/GIS/CAD) REQUIREMENTS.
- b. Current electronic red-line drawings for reviewing purposes.

Also include one hardcopy set of half-size black-line drawings on bond paper.

#### 1.8.4 Final As-Built Drawings

Produce Final As-Built Drawings without "clouding". Include all changes shown on the 100 Percent Preliminary As-Built Drawings plus any additional required changes on the Final As-Built Drawings. Submit all drawings contained in the complete project set of drawings plus any additional drawings with the Final As-Built Drawings. Submit the Final Drawings no later than ten days after the 100 Percent Preliminary As-Built Drawing submittal is approved. The COR may grant additional time if the Contractor is making reasonable progress on the as-builts. Send the following to the COR:

Three approved digital media containing the following:

- a. All documents and files required under "Advanced Modeling Submittal Packaging" paragraph of Section 01 33 39.00 10 ADVANCED MODELING (BIM/CIM/GIS/CAD) REQUIREMENTS.
- b. Current electronic red-line drawings for reviewing purposes.

Include one hardcopy set of half-size black-line drawings on bond paper in documents sent to COR.

Send one copy of the digital media only to the Omaha District Office ( ATTN: Patricia Lambert, CENWO-CDS-C).

#### 1.9 AS-BUILT DRAWINGS FORMAT REQUIREMENTS

##### 1.9.1 General Formatting

Prepare As-built Drawings in accordance with ERDC/ITL TR-19-7 requirements and/or match the detail shown on the accepted design drawings. Include all of the requirements below on the drawings:

- a. Update the drawing index when drawings are added.
- b. When opened, ensure the view is zoomed to fit the border.
- c. Reference a border supplied by the CAD/BIM Technology Center ( <https://cadbimcenter.erdcdren.mil/>) placed in the layout/sheet model at a scale of 1 at the location (0,0) in all files.
- d. Delete all unnecessary information outside the border.
- e. Purge/compress all files.
- f. Include all reference files in appropriate folders within the provided workspace.
- g. Use the Arial.ttf font for all text.
- h. Provide an ASCII text file with the following information: the name and phone number of the person we need to contact if we have problems, and the version of the CAD software used to create and/or work on the drawings.
- i. (CAD only) Supply pen tables for plotting.
- j. (CAD only) Provide each sheet/design with its own file and file name with only one layout/sheet per design file.
- k. (CAD only) Accomplish half toning by using the color 8 and setting the pen table to plot color 8 to half tone.
- l. The file name is the project code followed by the sheet identification number. Include the file name in the border on every sheet and match the name of the file on the Digital Media. The

project code is AA70.

- m. Include the File number in the border on every sheet. The file number is: (the Contract number, to be provided at award).
- n. Change the cover sheet from "Contract Award Set" to "As-Built Record Set" with month & year completed.
- o. Show drawing changes by "clouding" the affected area in layer "G-ANNO-REVS" (CAD only) in the drawing file of all preliminary as-builts and redlines. For BIM, accomplish clouding commensurate with the available tools.
- p. Place all submitted Electronic CAD Files and PDF drawings under a folder labeled "As-Built" on the submitted Digital Media.
- q. Include the name of the project, location, project code, solicitation number, contract number, and words detailing which submittal it is on both the Digital Media case and Digital Media. Title the Final As-builts Drawings "As-Built Record Set".
- r. Do not use zipped or compressed folders on any of the As-built submittals.
- s. On the cover sheet add or revise text to read "This folio includes all reissued and descriptive amendments, RFIs, and modifications."
- t. Place the Electronic CAD native design files and PDF drawings in separate folders on the Digital Media.

#### 1.9.2 Title Block

Fill in and correct all information in the title block. Include all the requirements below in the title block.

- a. Add "RECORD DRAWING" text below the title block on the right side of the drawing on all sheets.
- b. Add the date in the revision box for modifications from Block 3 of Form SF-30.
- c. State "REVISED TO SHOW AS-BUILT CONDITIONS" and date the top line of the revision box. Use a "-" for the "Mark".
- d. Enter the month and year as-builts were completed in the date box.
- f. Insert the initials "PEL" in the approved box.
- e. Show the contract number and the solicitation number (if available) on all sheets.
- f. Properly identify additional word abbreviations, not found on the abbreviation sheet but necessary to describe the work, and incorporate with the other standard word abbreviations.
- g. Properly note modifications in the title block in accordance with paragraph "Modification Changes" below.

#### 1.9.3 Modification Changes

Include all modification changes on the as-built drawings. At a minimum, include all revised and reissued sheets, descriptive changes, sketches, etc. Change other sheets as appropriate with any modification change that also affects other sheets other than the one referenced with the modification. Typically, modification changes can be done by following the descriptive change included with the modification, but may require additional effort depending on the change and level of detail of the modification change. Post modifications in accordance with the following:

- a. Follow directions in the modification for posting all changes.
- b. Post all modifications to the contract in chronological order.
- c. Show the last modification number completed on the sheet with the modification circle in the top right corner of the "Project Title" and "Project Location" box.

- d. Place a modification number in the revision box over column entitled "Mark" for all modifications to plans, sections, or details. Use the statement "GENERAL REVISIONS" when applicable.
- e. Make the Modification Circle size 1/2-inch diameter unless the area where the circle is located is crowded. Use a smaller size circle for crowded areas.
- f. Place a Modification Circle at the location of each deletion.
- g. For all new details or sections that are added to a drawing, place a Modification Circle by the detail or section title.
- h. For changes to a drawing, place a Modification Circle by the title of the affected plan, section or detail titles (each location).
- i. For changes to schedules on drawings, place a Modification Circle either by the schedule heading or by the change in the schedule.

#### 1.9.4 Legends

Do not use symbols which conflict with those on the original accepted design legend sheet. Properly identify and add to the legend sheet or supplemental legend additional symbols necessary to depict any additional work items. Those projects that do not have legend sheets may use supplemental legends on each sheet where symbol is shown.

#### PART 2 PRODUCTS (NOT APPLICABLE)

#### PART 3 EXECUTION

##### 3.1 GENERAL

Make revisions to and maintain the red-line and as-built drawings to the same level of detail as shown on the original accepted design drawings. Provide any additional drawings as required to display all details. In addition, prepare the GeoDatabase Files as specified above and submit in conjunction with the As-Built drawings.

##### 3.2 SITE WORK

###### 3.2.1 Utilities

Show all utilities whether active or abandoned on the as-built drawings and include all those shown on the original accepted design drawings or found on-site. Show the type of utility, location, general direction, size, material make-up and depth. Show the location and description of any utility line or other installations of any kind known to exist within the construction area. Include dimensions to permanent features as part of the location. Locate during installation all new underground utility lines (including electrical power and communications, gas, water, sanitary sewer, storm drains, roof drains and culverts). Survey pipe invert of gas, water, sanitary sewer, storm drains, roof drains and culverts and top of duct bank of electrical power and communications lines and associated fixtures (valves, manholes, test points, meters, cathodic protection points, tanks, ground points, and all point features along the new utility lines). Survey storm drains and sanitary sewer lines where pipes enter manholes and inlets and at 100-foot maximum intervals along the line. Survey the inverts of all cleanouts and tees. Survey inverts at each end of culverts. Survey electrical power, communications, gas and water lines at all manholes, tees, valves, corners, changes in direction and at intervals along the line to accurately depict the location of the line in both horizontal and vertical directions (50-foot maximum interval). Make the horizontal and vertical accuracy such that 100% of the points are +

0.25' of their absolute position..

### 3.2.2 Structures

Show structures above and below ground. Show the size, material make-up, location, height, and/or depth. Show rim elevation and invert elevations as applicable at manholes. Show electrical equipment, guy wires, and voltage rating on power poles.

### 3.2.3 Grades

Correct grade or alignment of roads, structures, or utilities if any changes were made from the contract drawings. Correct elevations if changes were made in site grading. If any grades were finalized outside of the respective grades tolerances, show that new grade on the as-builts.

## 3.3 STRUCTURAL

### 3.3.1 Steel/Concrete

Incorporate shop drawings that deviate from the accepted design drawings in the As-Built Drawings.

## 3.4 MECHANICAL

### 3.4.1 Ductwork

Show ductwork to reflect actual installation and duct size. Show ductwork routing changes.

### 3.4.2 Plumbing

Show piping and fixtures to reflect the type of material, size and the route or location.

## 3.5 ELECTRICAL

### 3.5.1 PANELS

Revise all accepted design drawing panel schedules to show as-built conditions. Ensure home-run circuit designation on electrical drawings accurately correspond to the as-built panel schedules.

### 3.5.2 Controls

Revise all control diagrams in accepted design drawings to reflect as-built conditions and setpoints.

## 3.6 CONTRACTOR SHOP DRAWINGS

Incorporate contractor shop drawings, which supersede data on the accepted design plans and/or additional drawings, prepared by the Contractor, into the As-Built Drawings. Include the designer's name on the As-Built Drawings for any design plans prepared by the Contractor.

-- End of Section --


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RECORD DRAWING

DEFINITIONS OF REVISIONS:









- 1. LAST ENTRY IN DESCRIPTION BOX SHALL APPLY TO AS-BUILT CONDITIONS
- 2. REVISIONS BY MODIFICATION. (AFTER AWARD OF CONSTRUCTION CONTRACT).
- 3. METHOD OF ADDING NEW DRAWING BY MODIFICATION.
- 4. REVISIONS BY AMENDMENT WHEN WRITTEN "WORD DESCRIPTIVE" AMENDMENT IS ISSUED AND DRAWINGS ARE POSTED FROM WRITTEN DESCRIPTIONS AFTER THE ISSUE DATE.
- 5. REVISIONS BY AMENDMENT WHEN DRAWING IS TO BE RE-ISSUED.
- 6. METHOD OF ADDING NEW DRAWING BY AMENDMENT.  
NOTE: DELTA NUMBER MATCHES AM. NUMBER

INSTRUCTIONS FOR NOTING REVISIONS:

- 1. ADD THE REVISION DESCRIPTION (EITHER CHANGE ORDER, AMENDMENT OR MODIFICATION DESCRIPTION AS APPLICABLE).
- 2. ADD THE PROPER REVISION SYMBOL TO THE LEFT OF THE REVISION NOTATION.
- 3. ADD THE PROPER AMENDMENT OR MOD. SYMBOL NEAR EACH REVISED ITEM IN THE BODY OF THE DRAWING.
- 4. ADD ARCHITECT-ENGINEERS INITIALS IN APPROVED BLOCK WHEN A-E IS RESPONSIBLE FOR AMENDMENT OR MODIFICATION.
- 5. WHEN ADDING A NEW DRAWING TO SHOW SUPPLEMENTAL DATA, USE SAME DRAWING NUMBERS AS DRAWING WITH SIMILAR SUBJECT MATTER AND ADD AN ALPHABETICAL SUFFIX TO THE SHEET NO. THIS DRAWING SHOULD BE ADDED TO THE INDEX OF DRAWINGS IN ITS PROPER PLACE ACCORDING TO THE SHEET NUMBER.
- 6. FOR MODIFICATION ONLY:  
ADD A 1/2 INCH ENCIRCLED  INSIDE OF TITLE BLOCK SHOWING THE LAST MOD NUMBER COMPLETED. ALSO USE THIS NEAR EACH REVISED ITEM IN THE BODY OF THE DRAWING.





REVISION DESCRIPTIONS - FOR AMEDMENTS AND/OR MODIFICATIONS:

- CHANGE ORDER #000X (DESCRIPTION & REASON FOR CHANGE ARE THE SAME AS AMENDMENTS LISTED BELOW)
- AM. #000X REISSUED FOR CLARITY (DRAWING IS HARD TO READ - BLURRY)
- AM. #000X GENERAL REVISIONS (THIS WOULD BE FOR ANY RE-ISSUED DRAWINGS, TYPICAL CHANGES OR CORRECTIONS)
- AM. #000X REVISED AND REDRAWN (MAJOR OVERHAUL OF THE DRAWING, TOO MANY CHANGES TO INDICATE INDIVIDUALLY)
- AM. #000X NEW DRAWING ADDED (DRAWING THAT WAS NOT ORIGINALLY INCLUDED IN THE ADVERTISED SET)
- REVISED IN ACCORDANCE WITH AM. #000X (THIS IS FOR DESCRIPTIVE CHANGES THAT WENT OUT IN THE AMENDMENT - DRAWING IS NOT RE-ISSUED - AND THE CHANGES ARE THEN LATER POSTED TO THE DRAWINGS AS IT BECOMES A CONTRACT SET)
- (DASH) REVISED TO SHOW AS-BUILT CONDITIONS

SHEET IDENTIFICATION NUMBER	PROJECT TITLE PROJECT LOCATION Y Y	 5	U. S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS	DESIGNED BY:	DATE:	 R-4	REVISED TO SHOW AS-BUILT CONDITIONS	08-14-2012														
				DWN BY:	CKD BY:		SOLICITATION NO.:	 R-1	GENERAL REVISIONS	06-17-2012												
				SUBMITTED BY:			CONTRACT NO.:	 A	NEW DRAWING ADDED	03-27-2012												
				FILE NAME:			FILE NUMBER:	 A	REVISED IN ACCORDANCE WITH AM. NO. 0007	03-17-2012												
SIZE:		PLOT SCALE:	PLOT DATE:			 A	AM. #0003 GENERAL REVISIONS	02-27-2012														
						 A	AM. #0001 NEW DRAWING ADDED	02-17-2012														
						 A	CHG. ORDER #0001 GENERAL REVISIONS	02-08-2012														
						MARK	DESCRIPTION	DATE	APPR.	MARK	DESCRIPTION	DATE	APPR.									



<b>DESIGNED BY:</b>  INITIALS OF DESIGNER		<b>DATE:</b>  CURRENT DATE: MONTH AND YEAR EXAMPLE: JUNE 2012	
<b>DWN BY:</b>  INITIALS OF CAD TECH. OR DESIGNER	<b>CKD BY:</b>  INITIALS OF REVIEWER	<b>SOLICITATION NO.:</b>  THIS NUMBER IS ASSIGNED BY CONTRACTING AND ADDED TO TITLE BLOCK AT THE TIME OF PLOTING ADVERTISEMENT DRAWINGS	
<b>SUBMITTED BY:</b>  INITIALS OF REVIEWER/DESCIPLINE SECTION CHIEF		<b>CONTRACT NO.:</b>  THIS NUMBER IS ASSIGNED BY CONTRACTING AND ADDED TO TITLE BLOCK AT THE TIME OF PLOTING CONTRACT AWARD DRAWINGS	
<b>FILE NAME*:</b> FILE NAMES SHOULD BEGIN WITH THE PROJECT CODE ASSIGNED BY THE CAD MANAGER. SEE A/E/C CADD STANDARDS FOR SHEET FILE NAMING CONVENTION		<b>FILE NUMBER**:</b> THIS NUMBER IS ASSIGNED BY PROJECT COORDINATOR AND ADDED TO TITLE BLOCK AT THE BEGINNING OF THE PROJECT	
<b>SIZE:</b>  AUTO GENERATED INFO. DO NOT EDIT	<b>PLOT SCALE:</b>  AUTO GENERATED INFORMATION DO NOT EDIT	<b>PLOT DATE:</b>  AUTO GENERATED INFORMATION DO NOT EDIT	

—	REVISED TO SHOW AS-BUILT CONDITIONS	08-14-2012	
R-5	REVISED AND REDRAWN	07-03-2012	
R-4	GENERAL REVISIONS	06-17-2012	
R-1	NEW DRAWING ADDED	03-27-2012	
	REVISED IN ACCORDANCE WITH AM. NO. 0007	03-17-2012	
	AM. #0003 GENERAL REVISIONS	02-27-2012	
	AM. #0001 NEW DRAWING ADDED	02-17-2012	
	CHG. ORDER #0001 GENERAL REVISIONS	02-12-2012	R.W.S.
<b>MARK</b>	<b>DESCRIPTION</b>	<b>DATE</b>	<b>APPR.</b>

**REVISION SYMBOL AND/OR NUMBER:  
SEE EXAMPLE ABOVE AND/OR  
AMENDMENT/MOD EXAMPLE DRAWING FOR CLARIFICATION**

**INDICATES REVISION TYPE AND DESCRIPTION:  
SEE EXAMPLE ABOVE AND/OR  
AMENDMENT/MOD EXAMPLE DRAWING FOR CLARIFICATION**

— **DATE OF REVISION**

INITIALS (IF REQUIRED) BY REVIEWER/DISCIPLINE SECTION CHIEF

DISCIPLINE DESIGNATOR  
w/ Level 2 Designator  
(see A/E/C CADD STANDARD  
for Level 2 Designator)

— SHEET TYPE DESIGNATOR

M-201

— SHEET SEQUENCE NUMBER

### A/E NAME AND LOCATION INFORMATION

**ADDITIONAL PROJECT INFORMATION  
IF NEEDED**

**DRAWING TITLE**

U. S. ARMY ENGINEER DISTRICT  
CORPS OF ENGINEERS

DESIGNED BY: X	
DWN BY: X	C X
SUBMITTED BY: X	
FILE NAME: X	
SIZE: X	PLOT X

DATE:	X
SOLICITATION	X
CONTRACT NO	X
FILE NUMBER:	X
	PLOT DATA

MARK	DESCRIPTION	DATE	APPR.	MARK	DESCRIPTION	DATE	APPR.
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**US ARMY CORPS  
OF ENGINEERS**





## SECTION TABLE OF CONTENTS

## DIVISION 01 - GENERAL REQUIREMENTS

## SECTION 01 81 00

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05/18

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## SECTION 01 81 00

SUMMARY OF THE WORK  
05/18

## PART 1 GENERAL

## 1.1 REFERENCES

The design publications listed below shall be used as sources of criteria for the design. Where a date is not specified, the most current edition of the code or standard in effect, including errata and addenda available at the RFP advertisement shall be used as criteria for the design. The criteria from these sources may be supplemented but not supplanted, by applicable criteria contained in nationally recognized codes and standards.

## U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 1-200-01	DoD Building Code
UFC 1-200-02	High Performance and Sustainable Building Requirements
UFC 3-101-01	Architecture
UFC 3-210-10	Low Impact Development
UFC 4-010-06	Cybersecurity of Facility-Related Control Systems

## U.S. Air Force Academy (USAFA)

USAFA DS	(Latest Approved Version) USAFA Design Standards
USAFA IFS	United States Air Force Academy Installation Facilities Standards

## 1.2 DESIGN AND CONSTRUCTION OBJECTIVES

The US Air Force Academy (USAFA) Preparatory School currently houses its cadet candidate population in three dormitories. These three dormitories were constructed in 1957, and each individual building contains a single squadron of students. The current dormitories are not well aligned with current Preparatory School needs. The dorms as constructed are not suited to infrastructure upgrading and continue to have recurring maintenance issues. The current facilities are limited in square footage, and some existing spaces, such as day rooms, have been reduced in size to accommodate new spaces and functions. Operationally, the Preparatory School is looking to consolidate student and staff activities, which does not align well with the current three dormitory arrangement. Lastly, the individual dorm rooms do not accommodate the desired arrangement of furniture. The dorm rooms do not match in size and arrangement the dorm rooms that the cadet candidates will use once accepted to the USAFA. As such, the USAFA Preparatory School is planning for a new dormitory project to address these issues.

The USAFA Preparatory School leadership is planning to create a consistent unified campus feel for the Preparatory School area. As such, they have commissioned a new overall Campus Master Plan that addresses the siting and aesthetics of the new Dormitory, as well as other new buildings for the Preparatory School campus. The new Dormitory shall take into account a new Academic Building and Headquarters Facility when orienting and locating the dormitory, and provide direct connections between the buildings.

The primary goals of this project are to provide a new Preparatory School Dormitory, sized to consolidate all students and associated staff into a single building, designed with dorm rooms sized and arranged similarly to USAFA standard dorm rooms, including the technical features necessary for the students' and staffs' needs, and aligned with the siting and aesthetic requirements of the Campus Master Plan.

### 1.3 PROJECT SCOPE

The Consolidate Prep. School Dormitories project is an 8,234 square meter (88,630 square feet) four story dormitory building. The building includes long clear spans. The project includes pavement rated for vehicle loads. The project includes site improvements, site utilities, and new pavement. New communications, mechanical, electrical, and fire protection systems will need to be installed. Provide a new fire sprinkler, fire alarm, and mass notification system for the building. The facility shall meet life safety, anti-terrorism/force protection (ATFP), and handicapped accessibility requirements.

Three existing facilities will be demolished as a part of this project: Dormitories 5210, 5212, and 5214. Minor site demolition of existing pavement and infrastructure will occur to accommodate the new Dormitory.

#### 1.3.1 Facility Functions

The new Dormitory includes three main functions: student housing, student study activities, and staff administrative functions. Student housing spaces include 126 double occupancy dorm rooms, day rooms, student belongings storage space, and laundry rooms. Student study activities spaces include study rooms, with one study room per floor. Staff administrative spaces include private offices. The facility will also include standard utility spaces, such as mechanical, electrical, telecommunications rooms, janitor's rooms, a building manager's office, and restroom/shower rooms. An incidental function is a covered exterior drill pad area, located at the ground level under the body of the building, used for all three squadrons to form up and practice drill activities.

#### 1.3.2 Site and Infrastructure Functions

The footprint of the new Dorm is located at the east end of Cedar Drive, south of the road in what is currently a parking lot for the Milazzo Club as shown on the drawings. The road and parking area will require realignment to meet anti-terrorism force protection (ATFP), emergency access as well as other design vehicle criteria. Bus and emergency access to the adjacent Milazzo Center is to be maintained during and after construction. The design shall provide accommodation for 10 permanent parking spaces to the Milazzo Center. Shared emergency and pedestrian access will be required around the new Dorm and adjacent athletic fields with multiple dedicated fire connections. Design for minimal replacement

of parking lot pavement and associated drives. Existing storm sewer infrastructure and other utilities within the building footprint will require relocation. An existing storm water detention facility located east of the Dorm shall be utilized and resized to support the requirements of the new facility. New utilities including but not limited to electrical, communications, natural gas, water, sanitary sewer, and storm water will be provided to the new facility.

#### 1.3.3 Project Site

The project is located at the US Air Force Academy, Colorado, on the Preparatory School campus. Vicinity and location maps can be found in the drawings provided with this RFP.

#### 1.3.4 Base Bid and Bid Option

##### 1.3.4.1 Base Bid

The base bid includes the design and construction of the complete and usable facility as described in all sections of these specifications, appendices and drawings.

##### 1.3.4.2 Bid Options

Bid Options are summarized here. See discipline specific requirements sections and drawings for additional information.

##### 1.3.4.2.1 Bid Option - Procure and Install Furniture, Fixtures and Equipment (FF&E) Package

See Section 01 84 00 Interior Design Requirements for more information.

##### 1.3.4.2.2 Bid Option - Procure and Install Electronic Security System (ESS)

Procure and install ESS equipment (keyless access control system, and associated head end control systems). See Section 01 86 26 ELECTRICAL REQUIREMENTS for additional requirements. The design of ESS equipment is included in the base bid. The procurement and installation of supporting infrastructure to include items such as conduit, junction boxes and similar to support contractor installed ESS equipment as well as Government Furnished Government installed CCTV cameras and equipment are part of the base bid.

##### 1.3.4.2.3 Bid Option - Bid Option - Bid Option - Procure and Install Audio/Visual Equipment

Procure and install Audio/Visual equipment (TVs and associated controls and equipment). See Section 01 86 26 ELECTRICAL REQUIREMENTS for additional requirements. The design of Audio/Visual Equipment is included in the base bid. The procurement and installation of supporting infrastructure to include items such as conduit, junction boxes and similar are part of the base bid.

#### 1.4 DESIGN AND CONSTRUCTION REQUIREMENTS

##### 1.4.1 Changes to RFP Criteria Requirements

This Request for Proposal provides requirements expected of the Design-Build Contractor during the design and construction of this project.

The RFP bridging documents present an overall design concept of the project; provide useful project information; establish some definition of the systems to be used; and incorporate requirements expected by the Using Service.

It shall be the responsibility of the Design-Build Contractor to assemble the best-value-priced construction systems for this project that meet or exceed the design criteria set forth herein.

Offerors should not consider changes to RFP criteria requirements during proposal preparation. After contract award, any changes to the RFP criteria requirements require approval by the Contracting Officer.

See Section 01 33 00.32 DESIGN AND CONSTRUCTION DELIVERABLES/PROCEDURES for additional requirements.

#### 1.4.2 Codes and Criteria

All pertinent building codes, life safety codes, and reference criteria shall be met or exceeded. This project utilizes the DoD Building Code, as defined by UFC 1-200-01 and its references. The Contractor shall follow the requirements of UFC 1-200-01, which includes by reference core UFCs that must be followed, as well as all other applicable UFCs.

If there is a conflict in requirements, order of precedence shall be as follows, in order of decreasing precedence:

- a. Life Safety, as defined by DoD Building Code UFC 1-200-01 and its references
- b. RFP Specifications
- c. RFP Drawings
- d. Non-life safety criteria, as defined by DoD Building Code UFC 1-200-01 and its references
- e. Other criteria as listed herein, such as the USAFA DS and USAFA IFS

Both the USAFA IFS and USAFA DS are included as applicable criteria for this RFP. In cases of conflicts between the requirements in the USAFA IFS and the USAFA DS, the requirements of the USAFA IFS apply. For both criteria, the requirements and allowances of this and other specification sections override the requirements of both criteria.

The United States Air Force Unaccompanied Housing Design Guide/Dorms-4-Airmen criteria, as well as any other Air Force dormitory criteria not explicitly referenced, is not applicable to this project.

#### 1.4.3 Phasing of Work, Security, and Construction Staging

Due to being an active educational environment, work activities will need to be coordinated to limit impact on student activities. The Preparatory School program begins in mid-August, with graduation in mid-May. During sports events, Parents' Weekend, graduation and similar student activities, construction activities may be limited to certain times, or even moved to other days. In addition, construction activities that produce significant noise will be limited to not occur after 1900 (7:00 PM) as this is when student quiet hours begin. Demolition of the existing dormitories shall not begin until the new dormitory has been constructed and occupied, to allow for seamless operations of the Preparatory School.

The Contractor shall maintain a construction area fence throughout the duration of the contract. See Section 01 89 00 SITE WORK REQUIREMENTS for additional information.

See drawings for construction staging areas.

#### 1.4.4 Airfield Construction Waiver

A crane waiver shall be obtained prior to beginning construction. The waiver can be coordinated with the 10th Civil Engineer Squadron Community Planner at 719-333-8367. The waiver process will require a minimum of 45 days to process and approve and may require additional coordination with the FAA. The waiver process shall be included in each of the schedules identified within 01 32 01.00 10 PROJECT SCHEDULE for review and approval.

#### 1.4.5 Sustainability

##### 1.4.5.1 Criteria

This project shall at a minimum incorporate high performance and sustainable site and building features as listed in UFC 1-200-02 HIGH PERFORMANCE AND SUSTAINABLE BUILDING REQUIREMENTS, UFC 3-210-10 LOW IMPACT DEVELOPMENT, and UFC 3-101-01 ARCHITECTURE as applicable to the project scope.

##### 1.4.5.2 Total Building Commissioning

Apply total building commissioning principles and fully commission the facility, in compliance with 01 91 00.15 10 TOTAL BUILDING COMMISSIONING and UFC 1-200-02.

##### 1.4.5.3 Cybersecurity

All control systems (including systems separate from an energy management control system) shall be planned, designed, acquired, executed, and maintained in accordance with UFC 4-010-06, and as required by each individual DoD Service's implementation policy. Systems requiring cybersecurity include, but are not limited to, the following:

Electronic Security Systems (ESS) which includes: Intrusion Detection Systems (IDS), Access Control Systems (ACS), and Video Monitoring Systems/Closed Circuit TV (CCTV)

Fire Protection Life-safety Systems which include: Fire Alarm Reporting System (FA), Fire Suppression System, Mass Notification System (MN)

Building (Level) Automation System (BAS) which includes Heating, Ventilation, Air Conditioning Systems (HVAC)

Energy Monitoring and Control System (EMCS), and Utility Monitoring and Control System (UMCS)

Fuel Systems

Building Lighting System (UFC 3-530-01), and Receptacle Control System

Airfield Lighting Systems

Elevators

Cranes

Variable Frequency Drives

Automated Rollup Doors

Automated Window Shades

Bullet Collection Systems

Automated Targeting Systems for Shooting Ranges

Impressed-Current Cathodic Protection Systems

Electrical Distribution System (Exterior, and Interior) with micrologic processors

Utility Metering System (Advanced Meters, AMI, etc.)

LED Marquee Systems when connected to process controllers

Public Address System (PA)

Audio/Visual Systems (A/V)

Supervisory Control and Data Acquisition (SCADA) Systems

Gate Controllers

Irrigation Controllers

Other FRCS as defined by Project Requirements, and not specifically identified. Any system, or component of a system which has wireless, radio frequency (rf), blue tooth, network communication capabilities, or a port for connecting a laptop/computer

#### 1.4.5.4 Third Party Certification/Validation

This facility meets applicability requirements for use of UFC 1-200-02, HPSB for third party validation of Guiding Principles and air barrier requirements as indicated in UFC 3-101-01, Architecture. The contractor shall design and construct a project that is 100% compliant with UFC 1-200-02 and Guiding Principles, demonstrated by receiving a "Certificate of Compliance" thru USGBC/GBCI.

Included with this RFP is a pre-edited Air Force Sustainability Requirements Scoresheet for this project. The contractor shall complete, maintain and update the Scoresheet, and have the Scoresheet available at any time for auditing and Air Force reporting. At project completion, the Scoresheet should be completely fill out with only "Yes" and "N/A" indicated in the Compliance column. All N/A responses must have justification included. See 01 33 29 SUSTAINABILITY REPORTING for additional requirements.

The contractor shall be responsible for all review and certification/validation fees. The contractor shall provide a LEED AP or



equivalent accredited professional. The Guiding Principles registration process can be started by contacting the GBCI via email at [GuidingPrinciplesAssessment@gbci.org](mailto:GuidingPrinciplesAssessment@gbci.org).

The A-E/Contractor shall coordinate with the Omaha District Resiliency/Sustainability Coordinator Brian Nohr (402) 995-2172 and provide him with access to the project directory. The contractor shall make Brian Nohr a project administrator as a part of project closeout.

#### 1.4.6 Bridging Documents

Conceptual drawings of the site plans and dorm room layout floor plans are included for use in developing this design. For information only as-built drawings are included as an appendix. Room data sheets with minimum space and space-type requirements have also been attached as an appendix.

#### 1.4.7 Design and Construction Measurement Units

Design, products, and construction for the project shall be accomplished using English units of measurement. All measurement in the technical specifications sections shall be shown in English.

#### 1.4.8 Personnel Qualifications and Experience

Design and construction personnel qualifications and experience shall be per the requirements of Section 00 22 00 and Section 01 33 00.32 DESIGN AND CONSTRUCTION DELIVERABLES/PROCEDURES.

#### 1.4.9 Design and Construction Deliverables

See Section 01 33 00.32, DESIGN AND CONSTRUCTION DELIVERABLES/PROCEDURES.

#### 1.4.10 Advanced Modeling and Facility Data Requirements

The contractor shall design and construct this project by leveraging BIM, CIM and electronic facility data to the greatest extent practical under the scope of this project. See 01 33 39.00 10 ADVANCED MODELING (BIM/CIM/GIS/CAD) REQUIREMENTS for minimum project requirements. This project also requires the development and turnover of electronic facility data (via a Facility Data Workbook (FDW)) to the Government. See 01 78 24.00 10 FACILITY DATA REQUIREMENTS.

#### 1.4.11 Operations and Maintenance Requirements

See Section 01 78 23 OPERATION AND MAINTENANCE DATA for requirements.

### PART 2 PRODUCTS

NOT USED

### PART 3 EXECUTION

NOT USED

-- End of Section --

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## SECTION 01 82 00

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05/18

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    - 1.4.3.2 Space Adjacency and Circulation Requirements
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    - 1.4.3.6 Sound and Vibration Control
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PART 3 EXECUTION

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## SECTION 01 82 00

## ARCHITECTURAL REQUIREMENTS

05/18

## PART 1 GENERAL

## 1.1 REFERENCES

The design publications listed below shall be used as sources of criteria for the architectural design. Where a date is not specified, the most current edition of the code or standard in effect, including errata and addenda available at the RFP advertisement shall be used as criteria for the design. The criteria from these sources may be supplemented but not supplanted, by applicable criteria contained in nationally recognized codes and standards.

## U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910	Occupational Safety and Health Standards
36 CFR 1191	Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines

## U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 1-200-01	DoD Building Code
UFC 1-200-02	High Performance and Sustainable Building Requirements
UFC 3-101-01	Architecture
UFC 3-110-03	Roofing
UFC 3-120-01	Design: Sign Standard
UFC 3-490-06	Elevators
UFC 3-600-01	Fire Protection Engineering for Facilities
UFC 4-010-01	DoD Minimum Antiterrorism Standards for Buildings
DoD ABA Memorandum	(2008) Dod Memorandum - Access for People with Disabilities

## U.S. Air Force Academy (USAFA)

USAFA DS	(Latest Approved Version) USAFA Design Standards
USAFA IFS	United States Air Force Academy Installation Facilities Standards

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING  
ENGINEERS (ASHRAE)

ASHRAE 90.1 - IP (2013) Energy Standard for Buildings  
Except Low-Rise Residential Buildings

## ASTM INTERNATIONAL (ASTM)

ASTM E84 (2020) Standard Test Method for Surface  
Burning Characteristics of Building  
Materials

ASTM E1264 (2022) Standard Classification for  
Acoustical Ceiling Products

## INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC (2021) International Building Code

## NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 101 (2021) Life Safety Code

NFPA 252 (2022) Standard Methods of Fire Tests of  
Door Assemblies

NFPA 80 (2022) Standard for Fire Doors and Other  
Opening Protectives

## UNDERWRITERS LABORATORIES (UL)

UL 10C (2016; Reprint May 2021) UL Standard for  
Safety Positive Pressure Fire Tests of  
Door Assemblies

## BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

ANSI/BHMA A156.13 (2017) Mortise Locks & Latches Series 1000

## U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA 625-R-92-016 (1993; Am 1994) Radon Prevention in Design  
and Construction of Schools and Other  
Large Buildings

## 1.2 GENERAL DESIGN REQUIREMENTS

## 1.2.1 Applicable Codes and Criteria

All pertinent building codes, life safety codes, and reference criteria shall be met or exceeded. This project utilizes the DoD Building Code, as defined by UFC 1-200-01 and its references.

Both the USAFA IFS and USAFA DS are included as applicable criteria for this RFP. In cases of conflicts between the requirements in the USAFA IFS and the USAFA DS, the requirements of the USAFA IFS apply. For both criteria, the requirements and allowances of this specification section as listed below override the requirements of both criteria.

### 1.2.2 Technical Specifications

Government-provided technical guide specifications shall be completely edited and fully coordinated with the drawings to accurately and clearly identify the selected products and installation requirements for this project

Certain specifications and performance requirements, deemed critical to the project, have been included herein. Where requirements are not covered in the guide specifications, specification sections shall be prepared to cover those subjects and shall be in the same format as the guide specifications.

### 1.2.3 Handicapped Accessibility

Per DoD ABA Memorandum, "It is the goal of the Department of Defense (DoD) to make its facilities accessible to persons with disabilities. To achieve that goal, the Department intends to go beyond the minimum requirements of law. Even if a facility is exempt from coverage under the Architectural Barriers Act of 1968 (ABA), compliance with the standards identified in this memorandum is recommended to the maximum extent that is reasonable and practicable without degrading the facility's military utility."

The facility and site, excluding mechanical, electrical, and telecommunication equipment rooms, shall be designed and constructed to be fully accessible in accordance with the Architectural Barriers Act ( 36 CFR 1191).

### 1.2.4 Occupational Safety and Health

Building design shall comply with 29 CFR 1910 Occupational Safety and Health Standards (OSHA) criteria for all items which must be included in the design to ensure safety compliance.

### 1.2.5 Antiterrorism/Force Protection

This building shall include design provisions meeting the requirements of UFC 4-010-01 - DoD Minimum Antiterrorism Standards for Buildings. This includes, but is not limited to, minimum setbacks from parking areas and access drives, glazing and blast resistance requirements; visual screening; HVAC intake louver locations; and other protective features as outlined in the UFC.

### 1.2.6 Fire Protection and Life Safety

Facility design shall comply with UFC 3-600-01 Fire Protection Engineering for Facilities. The facility shall be protected by an automatic fire sprinkler system throughout the building.

## 1.3 TYPE AND METHOD OF CONSTRUCTION

This facility shall be designed and constructed as permanent construction. The definition of permanent construction is, "Facilities designed and constructed to serve a life expectancy of more than 50 years, should be energy efficient, and must have finishes, materials, and systems selected for low maintenance and low life-cycle cost." Reference UFC 1-200-02 for additional design criteria.

The overall building occupancy classification for the facility is defined

in Section 01 86 13 FIRE PROTECTION REQUIREMENTS. Construction "Type IIB" shall be used for the facility at a minimum. Provide fire protection, separation, and life safety features as necessary for the occupancy and type of construction listed.

#### 1.4 FUNCTIONAL BUILDING REQUIREMENTS

##### 1.4.1 Space and Square Footage Allocation

The building spaces shall be arranged with adjacencies as described in this RFP. The adjacencies have been arrived at after consultation with the end user and have been determined as the best way to meet the functional needs of the client, in addition to meeting necessary code requirements. However, other design solutions which slightly modify the furnished solutions may be acceptable, and will be reviewed on their design merits against the furnished criteria.

The maximum gross square footage of the facility is 88,630 SF. Overall maximum gross square footage shall not be exceeded. The maximum gross square footage consists of a mixture of one-half scope and full scope spaces, calculated in accordance with UFC 3-101-01. As a clarification, all unenclosed first floor space underneath the second floor footprint shall be calculated as one-half gross square footage.

Individual spaces shall be sized based on the number of people occupying the spaces, the activities conducted in those spaces, and the fixtures, furniture, and equipment located in those spaces. Spaces shall be sized so that each space's function can be conducted efficiently and comfortably. Spaces shall not be significantly oversized beyond that which is necessary to achieve their designated function. Several spaces, such as private offices, have a maximum square footage requirement, listed in the Room Data Sheets. Square footage of these spaces should adhere as close to the maximum square footage as possible.

Dimensions of built interior spaces shall adhere to the requirements of the USAFA DS and USAFA IFS regarding the governing grid module.

Proposed design solutions shall build as close to the maximum 88,630 square feet as possible. Any unallocated square footage on top of minimum space square footages required for functional spaces shall be allocated per the following priority list. Unallocated square footage can be allocated to more than one item on the priority list.

- a. Increased Day Room Square Footage
- b. Increased Study Room Square Footage
- c. Increased second, third, and fourth floor Storage Room Square Footage - larger or additional rooms
- d. Increased Restroom Showers Square Footage (with an increase in shower fixtures)
- e. Increased Laundry Room Square Footage

##### 1.4.2 Demolition Requirements

Demolish three existing Preparatory School Dormitories. The three buildings to be demolished are Buildings 5210, 5212, and 5214. These three dormitories were constructed in 1957. These buildings shall not be demolished until the new Preparatory School Dormitory is constructed and ready for occupancy. The contractor shall coordinate with the government prior to demolition activities commencing to allow time for the government



to salvage items from the existing facilities such as existing artwork, training equipment, and similar items for reuse in the new facility while minimizing impact to any cadet school activities. The US Air Force Academy's 10th Communications Squadron will salvage the existing closed circuit television (CCTV) cameras and equipment from the dormitories prior to demolition. The contractor will provide notice to the 10th Communications Squadron through the KO thirty (30) days prior to demolition so that the 10th Communications Squadron may remove the CCTV system before demolition activities begin. The existing dormitories are nearly identical to each other in floor plan arrangement. Each dormitory is three stories tall, with each floor being approximately 3,878 SF, for a total of approximately 11,634 SF per building. The buildings have concrete floor slabs, concrete columns and concrete beams structure. The exterior of the building consists primarily of glass and spandrel panel curtain wall construction, with some face brick supported by concrete masonry units at the narrow ends of the building.

The contractor shall demolish these facilities in their entirety, including below grade building structure. See respective discipline requirement sections, bridging drawings, and 02 41 00 DEMOLITION for additional requirements.

For information only As-Built drawings consisting of .TIFF images, .pdf files, and .dwg cad files of the existing dormitories have been compiled into a .zip archive and are included with this RFP as an attachment.

#### 1.4.3 New Construction Requirements

The day room, study room, and offices shall incorporate floor to ceiling interior windows at the walls located adjacent to corridors and circulation. Windows shall be mostly contiguous, as opposed to many small sections of windows. The day room shall have interior windows for a minimum of 40% of the linear length of day room walls along a corridor. The study room shall have interior windows for a minimum of 40% of the linear length of study room walls along a corridor. Each private office shall have interior windows the full width of the office wall which hosts the entrance door. Interior windows shall be translucent between floor height and head height to provide privacy. Clear glass may be provided above the translucent portion of the window. Glass at interior windows shall be laminated tempered glass. Translucency shall be created using digitally printed ceramic ink/frit, using a base color of white. For the day room interior windows, incorporate graphics into the ceramic frit. The graphics shall contain USAFA themed content. The graphical content of the windows shall be coordinated with the users through the KO. The content shall be submitted to the Government for approval.

Provide the following minimum fixture counts. Provide a minimum of 12 showers, 8 lavatories, 8 water closets, and 4 urinals in each male restroom. Provide a minimum of 12 showers, 8 lavatories, and 12 water closets in each female restroom. Provide 6 paired water coolers, with one at each end of the facility on the second, third, and fourth floors. Water coolers shall be paired units with an accessible height unit. Water coolers shall have bottle fillers. Water coolers shall not have filters.

Provide roof access via an interior ladder and roof hatch, per UFC 3-110-03. Roof hatch and ladder should be located in a low use utilitarian space with limited access, excluding electrical and telecommunications rooms. The hatch opening shall be hinged so that the hatch opening faces east or south. Hatch shall be located away from roof edge so that fall protection

is not required per 29 CFR 1910 Occupational Safety and Health Standards (OSHA) criteria.

Telecommunication room doors shall swing out of the spaces.

Provide minimum 6'-0" wide doors for the first floor mechanical room(s).

Provide minimum 6'-0" wide doors for the first floor student belongings storage room(s).

Provide minimum 6'-0" wide doors for the trash/recycling storage room.

Roof drainage shall be via internal drains. Exterior scuppers, gutters, and downspouts are not allowed.

Roller shades are a part of the FF&E Bid Option. As a part of the base bid, where roller shades are called out to be provided, provide recessed soffit pockets for the roller shades. See Room Data Sheets and SECTION 01 84 00 INTERIOR DESIGN REQUIREMENTS for location of roller shades and their salient features.

#### 1.4.3.1 Massing Requirements

Facility massing shall be as follows. The facility shall be rectangular and orthogonal in overall footprint and massing. Square buildings, "U" shaped, "L" shaped, "T" shaped, and similar shapes are not allowed. The overall building plan arrangement shall adhere to USAFA's standard 7'-0" grid module, as required in the USAFA DS and USAFA IFS. The second, third and fourth floors shall be identical in layout. The second, third, and fourth floors shall not have any protuberances or notches. The upper stories shall cantilever over the first floor elements, which shall be offset from the second floor plate edge a minimum of 7'-0". The floor to floor height for the first floor shall be taller than the second, third and fourth floors to visually distinguish it from the other floors. The second, third, and fourth floors shall all have the same floor to floor height. Ceiling heights on all floors shall be minimum of 9'-0" above finished floor. Parapet height shall be kept to a minimum, and 29 CFR 1910 compliant guardrail height parapets are not desired or required. Walls at the roof shall all extend to the same height and not follow the slope of the roof surface. The first floor shall consist of two separate masses located at either end of the rectangular building footprint. One mass shall include the primary building entrance, located and oriented west to facilitate student and staff circulation to other primary buildings that will make up the USAFA Preparatory School campus. Each first floor massing shall include vertical circulation for the building. First floor arrangement shall create an open space between the two massings which shall be designated a drill pad area. The drill pad area shall be sized to allow all three squadrons to form up prior to drill activities. Individual squadrons are arranged in 4 rows of 21 students.

#### 1.4.3.2 Space Adjacency and Circulation Requirements

This facility shall have four stories. The first floor is relatively unique, with spaces on that floor that do not occur on other floors. Floors two, three and four shall be identical in footprint, as each floor will contain one squadron. The contractor shall propose floor plan solutions that meet the adjacency requirements listed below.

Building circulation on the second, third, and fourth floors shall consist

of two primary longitudinal corridors running the length of the building. Vertical circulation shall be located near the ends of the building, with one end having a stair and an elevator (primary building entrance end) and the other end only having a stair. Dorm rooms shall be located along the primary longitudinal corridors, as well as be located on exterior walls. Near the center of the building shall be a large corridor/open space connecting the two longitudinal corridors. A Charge of Quarters (CQ) desk will be located in the central area of the building on floors two, three and four.

First floor spaces include a building vestibule and lobby, two stairs, an elevator, an elevator machine room or control room, a student belongings storage room or rooms, a Facility Manager's office, lactating mother's space (alternate location on an upper floor) and a mechanical room. The first floor consists of two separate masses. Each mass should be relatively equal in size. One mass will consist of the primary building entrance and vestibule, lobby, stair, elevator and elevator machine room, lactating mother's space, and Facility Manager's office. The other massing shall include the second stair and a mechanical room. Separating the two masses shall be the drill pad. The mechanical room may be a single room, or it may be subdivided with a mechanical space in each massing. Similarly, the student belongings room may be located in either mass, and may be a single room, or may be subdivided and located in different masses, as long as the subdivisions allow for each individual squadron's storage gear to be collocated together, and not divided between two or three spaces. The intent of these allowed subdivisions of the mechanical and student belongings storage room is to allow for better balancing of the first floor massings, as well as allow for potential efficiencies in the location of the mechanical room(s).

The drill pad shall be located completely underneath the second floor footprint and shall accommodate all three squadrons and staff to form up prior to drill activities. Each individual squadron of cadet candidates shall form up in four rows and twenty-one columns, an area approximately 10'-0" by 66'-8" per squadron, not counting space for each squadron's assigned staff members.

The primary entrance vestibule shall be located and oriented to facilitate student and staff circulation to other primary buildings that will make up the USAFA Preparatory School campus. The entrance vestibule shall provide direct access to an entrance lobby. Directly accessible from the entrance lobby shall be the elevator, stair, lactating mother's space, and Facility Manager's office. The elevator machine room or control room shall be located on the first floor, with adjacencies and access as required by UFC 3-490-06. The student belongings storage room shall be primarily accessible from the exterior of the building.

The second stair may be directly accessible from the exterior of the building, or may be accessible through a vestibule. The mechanical room shall be adjacent to, but not accessible from the second stair.

First floor exterior doors shall face either east or west to limit visibility of the doors from the primary longitudinal elevations.

Second, third and fourth floor plans shall be identical, with identical adjacencies, with an exception for an alternate location for one lactating mother's space. Each floor shall have dorm rooms, stairs, an elevator, a day room, a study room, gendered restrooms with attached shower rooms, a CQ desk, a laundry room, a business center, a Commander Office, two Tech

Sergeant Offices, an overflow private office, a gathering/study space, a small storage room for student gear, a janitor's closet, a trash/recycling storage room, and electrical spaces and telecommunications spaces as necessary to support the building services.

The most common space type is the dorm rooms. There shall be 126 dorm rooms in the facility, each sized for two cadet candidates. A prototype dorm room floor plan is included in the appendices. Each floor, excluding the first floor, shall have forty-two (42) dorm rooms. All dorm rooms shall be located on exterior walls and be provided with operable windows.

Restrooms on the second floor shall be separated into male and female restrooms. Each gendered restroom on each floor shall be located at opposite ends of the building from the other gendered restroom, to facilitate the grouping of a single gender of cadet candidates at either end of the building.

It is desirable that the day room, study room, and private offices have access to daylight, and at least one of these three space types should be located on an exterior wall. Higher use spaces, such as the day room, study room, and office block should be located throughout the length of the building as opposed to being collocated together at one end of the building. The intent is to create a movement of users throughout the entirety of the building.

The offices shall be located near the center of the building, close to the CQ desk.

A wider pass through space between the two longitudinal corridors shall be centrally located in the building, and shall include the CQ Desk. The pass through spaces shall be open to the longitudinal corridors. The private offices shall be centrally located adjacent to the pass through space and CQ Desk. The private offices shall not have their doors open onto the longitudinal corridors.

A business center shall be located to be easily accessible to students. The business center will not be a fully enclosed room, but instead shall be a semi-enclosed alcove. The business center may occasionally be used by staff.

The janitor's closet and laundry room shall be located adjacent to each other and in the vicinity of a restroom. The laundry room shall be acoustically separated from acoustically sensitive spaces such as the day room, study room, and offices.

Locate telecommunication room and electrical rooms where necessary to support building services. Electrical room and telecommunication room may be consolidated with one electrical room and one telecommunication room per floor or multiple rooms distributed across the floor as necessary.

A single lactating mother's space shall be located in the building and shall be located on the first floor, or alternately on an upper floor. It shall be located in the facility to be easily accessible by building staff.

Locate trash/recycling storage room near utilitarian functions, such as the janitor's closet.

#### 1.4.3.3 Desired Image and Architectural Compatibility

The Consolidate Prep. School Dormitories project is looking to create a new, distinct aesthetic for the Preparatory School Campus. While the USAFA DS is attached to this RFP, it should be treated as For Information Only (FIO) in regards to its exterior aesthetic architectural requirements for the Community Center/Preparatory School area. The USAFA DS serves as a context for the new building and provides examples of the architectural styling found on the base. The USAFA IFS is also included as an attachment. The USAFA IFS requirements apply except where this specification section provides alternate requirements and allowances, such as allowable exterior materials. In cases of conflicts, the information included within this specification section override the requirements of the USAFA IFS. While the new facility shall be harmonious with the architectural context of the Preparatory School, a design solution that merely copies the aesthetics, materials, and detailing of the Preparatory School area or the wider US Air Force Academy is not required nor desired. The building shall be designed in the International Style of Modernism as practiced in the United States at the middle of the 20th century for commercial buildings. Coordinate with the KO for approval of material aesthetics.

#### 1.4.3.4 Exterior Envelope and Exterior Materials

Allowable first floor exterior finishes include brick, colored metal wall panels, architectural concrete, anodized aluminum, and framed glazing. The primary vestibule and lobby shall have access to significant natural light. If columns are provided, columns shall be encased to provide a footprint with of dimension of 1'-9" by 1'-9". If encased in concrete, chamfer edges of concrete 1 inch. Brick color shall be similar to color of existing Preparatory School brick work.

Allowable second, third, and fourth floor exterior finishes include anodized aluminum, framed glazing, and metal wall panels.

Glass shall be gray colored.

If sunshading devices (vertical and/or horizontal) are provided, they shall be anodized aluminum.

Provide metal soffit panels at the first floor overhang.

Provide a TPO membrane roof.

All concrete located directly under the building footprint shall be earth tone dyed concrete. Coordinate exact earth tone color with the the Base CE through the Contracting Officer.

Provide exterior metal wall trim at corners, soffits, and top of walls. Metal trim shall resemble existing trim found at Preparatory School area. Break metal trim is not allowed. Provide plate aluminum trim.

Exterior building elements (vertical mullions, gridlines, panel joints) shall follow the USAFA standard 7'-0" grid and incremental derivatives (3'-6", 1'-9", etc.) thereof.

#### 1.4.3.5 Room Finishes

See Section 01 84 00 INTERIOR DESIGN REQUIREMENTS for room finish

requirements. Technical requirements for room finishes may be found in both this section and SECTION 01 84 00 INTERIOR DESIGN REQUIREMENTS.

#### 1.4.3.6 Sound and Vibration Control

Walls and ceilings shall be designed and constructed to impede transmission of equipment vibrations and other noises between rooms and within a room. Wall construction in this facility shall be insulated or isolated to the minimum levels as required in the USAFA IFS, except as modified by the room data sheets. When spaces with differing values abut one another, the more stringent value shall govern. Other acoustical requirements applicable to this project, such as Noise Criteria (NC) requirements, can be found in the USAFA IFS.

Where not otherwise defined, walls separating individual spaces in this project shall be constructed to Sound Transmission Class (STC)-33 requirements. Interior "stub" walls or other walls that do not serve as a means of physically enclosing a space need not be insulated. Walls that are rated STC 42 or higher shall extend to structural deck above.

#### 1.4.3.7 Security and Access Control

Conventional security measures, such as door locking hardware, shall be incorporated into the facility's design. In addition to keyed locks, entrance to the facility shall be through electronic card readers at the primary entrance vestibule and the secondary entrance at the second stair. The contractor shall provide conduit and infrastructure for the electronic card readers. The procurement and installation of the electronic card readers, as well as supporting system components are a bid option.

As a part of the base bid, the contractor shall design a Closed Circuit Television (CCTV) system for the facility, and shall provide conduit, infrastructure, and installed cables for the system. The procurement and installation of the CCTV system components are a bid option. The contractor's work shall support interior CCTV coverage of the day rooms, study rooms, laundry rooms, stairs, primary and secondary entrance vestibules, student belongings storage room(s) doors, and corridors. The contractor's work shall also support exterior CCTV coverage, providing full visual coverage of the perimeter of the building at the first floor, as well as providing coverage of the site around the building. Feeds for CCTV coverage shall go to USAFA's designated head end equipment. In addition, each floor's CQ Desk shall have CCTV feeds showing their respective floor's corridors, stairs, laundry room, study room, and day room, as well as the primary and secondary entrance vestibules. Camera feeds showing the exterior of the building shall be able to be called up on viewing screens at the CQ Desk, but the default views displayed at the CQ desks shall be interior camera feeds. Contractor's infrastructure locations shall enable 100% CCTV coverage of the spaces requiring CCTV coverage, with no blind spots, excluding student belongings storage room(s), which only need interior coverage of the doors. See SECTION 01 86 29 COMMUNICATIONS REQUIREMENTS for additional requirements.

#### 1.4.3.8 Sustainability and Energy Performance

##### 1.4.3.8.1 Air Barrier

An air barrier shall be designed, installed, and tested following the requirements in UFC 1-200-02 and UFC 3-101-01. Air barrier specifications SECTION 07 27 10.00 10 BUILDING AIR BARRIER SYSTEM and SECTION 07 05 23

PRESSURE TESTING AN AIR BARRIER SYSTEM FOR AIR TIGHTNESS are to be edited by the contractor. On design drawings indicate air barrier limits and provide detail drawings and specifications for construction. Mechanical rooms are exempt from testing. All other areas shall be segregated and constructed for required air barrier construction with full blower door testing.

#### 1.4.3.8.2 Building Envelope Energy Performance

The contractor shall meet the minimum building envelope energy performance values of ASHRAE 90.1 - IP. The contractor shall insulate the building as needed to meet these values. The contractor shall also meet the minimum energy reduction requirements as listed in Federal mandates, as outlined in UFC 1-200-02.

#### 1.4.3.8.3 Total Building Commissioning

Apply total building commissioning principles and fully commission the facility, in compliance with 01 91 00.15 10 TOTAL BUILDING COMMISSIONING and UFC 1-200-02.

#### 1.3.10 Radon Mitigation

Construct the facility to meet the minimum requirements for radon resistant new construction as outlined in Chapter 2 of EPA 625-R-92-016. Provide the building with an active sub-slab depressurization system.

### PART 2 PRODUCTS

#### 2.1 MATERIAL SELECTION CRITERIA

Material selections shall be based upon reducing operation and maintenance costs. All materials shall be easy to clean and resist soiling.

#### 2.2 ROOFS

##### 2.2.1 Single Ply Membrane Roofing

Single Ply Membrane Roofing shall be internally fabric or scrim reinforced and fully adhered to its substrates. Acceptable products on this project is limited to Thermoplastic Polyolefin (TPO). Minimum thickness shall be as required to meet warranty requirements or as indicated in UFC, whichever is greater. Single ply membrane roof shall be light gray in color. Coordinate roof solar reflectivity requirements with Third Party Certification/Validation requirements for sustainability and the requirements of UFC 3-110-03.

Provide walkways in areas where regular foot traffic on the membrane may be expected for roof access or mechanical equipment inspection or maintenance. Walkways shall be factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway pads or rolls, approximately 3/16 inch thick, and acceptable to membrane roofing system manufacturer. Color to match roof membrane.

##### 2.2.2 Roof Warranties

The roof manufacturer shall provide a single source, comprehensive 25-year, non-pro-rated, no dollar limit total roof system warranty, including flashing, insulation, and accessories necessary for a watertight, wind,

and hail resistant roof system construction. The components of the roofing system shall be products of a single roofing system manufacturer (except in the case the component is an accessory and that type of component is not available through the roofing system manufacturer) as required to provide the specified system warranty. The warranty shall include coverage for sustained wind speed and/or peak wind gusts up to 115 mph, damage from hail up to 2 inch in diameter, accidental punctures resulting from normal rooftop inspection, maintenance and/or service, and must state that:

- a. If within the warranty period the roof system, as installed, becomes non-watertight, shows evidence of moisture intrusion within the assembly, splits, tears, cracks, delaminates, separates at the seams, shrinks to the point of bridging or tenting membrane at transitions, or shows evidence of excessive weathering due to wind, hail, defective materials or installation workmanship, the repair or replacement of the defective and damaged materials of the roof system assembly and correction of defective workmanship must be the responsibility of the roof membrane manufacturer. The roof membrane manufacturer is responsible for all costs associated with the repair or replacement work.
- b. When the manufacturer or his approved applicator fail to perform the repairs within 72 hours of notification, emergency temporary repairs performed by others does not void the warranty.

The roof system installer shall warrant for a period of not less than one (1) year that the roof system, as installed, is free from defects in installation workmanship, to include the roof membrane, flashing, insulation, accessories, attachments, and sheet metal installation integral to a complete watertight roof system assembly. The warranty must run directly to the Government. The roof system installer is responsible for correction of defective workmanship and replacement of damaged or affected materials. The installer is responsible for all costs associated with the repair or replacement work.

## 2.3 DOORS AND FRAMES

### 2.3.1 Exterior Doors

#### 2.3.1.1 Exterior Hollow Metal Doors

All exterior doors not located in storefront/curtainwall assemblies shall be insulated hollow metal. All door frames shall be welded. No knock-down frames shall be allowed. Minimum thickness for hollow metal doors shall be 1-3/4 inches. Door frames not located under protective overhangs shall have continuous overhead rain drips for the full length of the door opening. All doors shall include aluminum thresholds and aluminum housed weather seals. Exterior doors and frames shall receive a painted finish. Exterior doors shall exceed minimum insulation required in ASHRAE 90.1 - IP. Door frames shall be filled with spray foam insulation. Interior vestibule doors shall match the type, construction and configuration of their corresponding exterior doors and frames, when possible. Exterior doors and frames shall comply with UFC 4-010-01.

#### 2.3.1.2 Doors in Curtainwalls/Storefronts

Provide doors with hardware and finishes compatible with Curtainwall and Storefront requirements listed below. Doors in curtainwalls and storefronts shall be fully-glazed. Coordinate door style with other doors



in the facility.

#### 2.3.1.3 Thresholds

All exterior thresholds shall be thermally broken.

#### 2.3.2 Interior Doors

Interior doors shall be solid core wood veneer unless other requirements dictate otherwise. Doors shall be factory stained and finished and factory prepared for door hardware.

Door frames shall be welded hollow metal type. Knock-down frames are not allowed. Paint frames.

Door frames shall be located at a minimum four inches away from perpendicular walls.

Dorm Room doors shall be minimum 36 inches wide.

##### 2.3.2.1 Interior Acoustic Rated Doors

Doors in STC 42 rated walls and above shall have a minimum rating of STC 33 and shall be fully-gasketed. See the room data sheets for spaces that require higher-rated interior door assemblies.

#### 2.3.3 Fire Doors

Doors shall comply with NFPA 80. Doors to have a fire resistance rating shall conforming to the requirements of UL 10C or NFPA 252 for the class of door required. Affix a permanent metal label with raised or incised markings indicating testing agency's name and approved hourly fire rating to hinge edge of each door.

#### 2.3.4 Hardware

Provide door hardware in type and configuration appropriate for the spaces being served. Provide panic hardware on all doors serving the primary building circulation system including all building exits and all doors that separate building circulation spaces and corridors. Use lever handles per ABA for doors that do not have panic hardware. All hardware shall comply with ANSI/BHMA standards for heavy use. Provide non-removable security pins on door hinges in exterior building perimeter and as required by referenced criteria. Finish for hardware shall be consistent throughout the facility when practical. Provide stainless steel or satin nickel finish on exposed hardware.

For restrooms, provide a keyed dead bolt lock on the main entry door(s) into the space, so that the entire space can be closed off for maintenance or other access control purposes.

Door Stops (floor mounted, wall mounted, and closer stops) are required at all interior and exterior locations. Coordinate with the user through the Contracting Officer as to which type of door stops are acceptable for each door location.

All coordination of doors and door hardware is the responsibility of the construction contractor.

Door hardware at exterior double doors shall be coordinated so that any keyless access controls at doors do not hinder the unlocking and opening of doors with keys, as in the case of emergency access.

#### 2.3.4.1 Door Closers

Automatic door closers shall be used on exterior doors (including all inner and outer sets of vestibule doors), fire doors, and restroom doors. Doors that receive closers entering open offices and private offices shall be equipped with hold-open devices - when allowed by prevailing codes and criteria. Provide fusible links on applicable fire rated doors with hold-open device.

#### 2.3.4.2 Keyed Access Entry Control Systems

Provide cylinders and cores for all new keyed locksets. Provide cylinders compatible with base core requirements. To meet the USAFA master key plan, provide all keyed locksets with Yale or Yale-compatible 6-pin, #1210 cylinder, with a #626 finish. Provide master keyed cores in one system for this project. The contractor shall validate functionality of all keys for the respective core including the master key(s). Coordinate additional lock requirements with the Facility Manager, Base Lock Shop, and Installation Physical Security through the KO.

The contractor shall install and utilize compatible temporary construction cores to secure all exterior doors for the facility throughout construction. Construction cores shall have colored faces to distinguish from final installed, cores, and all construction cores shall be keyed alike. Upon construction completion, leave all construction cores installed and turn over all keys to the Government

The contractor shall provide all permanent core and required number of keys to the USAFA Base Lock Shop in zero-bitted condition. The Base Lock Shop will pin the lock cylinders and cut all keys. The Base Lock Shop will install permanent cores. The contractor shall conduct a pre-installation meeting with the KO, Facility Manager, and Base Lock Shop to discuss requirements and pre-installation coordination of the cylinders. All lockable doors shall be provided with keyed and pinned cylinders, including all doors that will be operated by card readers, such that all cylinders can be keyed to fit with the Base Master Key System.

Access to Mechanical, Electrical and Telecommunications spaces shall be limited to authorized personnel through lockable doors. These rooms shall be keyed independently from the building master system for access by installation maintenance personnel. The telecommunication room door(s) shall be on a different core than other electrical and mechanical areas.

All cores shall include four keys for each interior doors and five keys for each exterior doors. Furnish a quantity of key blanks equal to 20-percent of the total number of file keys. Stamp all keys with "U.S. GOVERNMENT DO NOT DUPLICATE". In addition, stamp the keys and cores with the core number. Do not place room number on keys. Provide a key cabinet and control system for all facility keys, including a floor plan cross referenced to all key locations. Coordinate cabinet mounting location with Contracting Officer.

#### 2.3.4.3 Keyless Access Rough-In

Provide infrastructure (junction boxes with covers, electric strikes,

wiring from electric strike to junction box, cover plates, conduit, and pull strings) for a keyless entry control system. The procurement and installation of the keyless entry control system is a bid option. Keyless access infrastructure shall be installed at all primary building entrances and entering all spaces designated to have keyless access in the room data sheets.

Infrastructure shall extend from the required locations to a secure server rack in the facility telecom rooms. See 01 86 26 ELECTRICAL REQUIREMENTS for detailed requirements. Accommodations shall be made for associated low voltage and communications lines. USAFA's entry control specifications will be provided to the Contractor upon Contract Award.

#### 2.3.4.4 Low Energy Power Operated Doors

Provide Low Energy Power Operated Doors at both pairs of doors at the primary entrance vestibule. The powered opening of the low-energy door shall be initiated through push plate actuators. The push plates shall be wall mounted, have the International Symbol of Accessibility, and state "PUSH TO OPEN." Push plates shall only actuate one door in a pair at a time. Each door in a pair shall be actuated by its own push plate. Locate push plates for both entering and exiting the building. Coordinate push plate location with keyless card reader operation.

#### 2.3.4.5 Dorm Room Doors

Dorm Room doors shall be equipped with peepholes. Doors shall be equipped with mortise locks, ANSI/BHMA A156.13 Function F13 Dormitory or Exit Lock. Only staff will have key access. All dorm rooms shall be equipped with electromagnetic hold opens.

### 2.4 CURTAINWALL/STOREFRONTS

Glazing units shall be low-E, and insulated. Curtainwall units shall have a U-value (Winter nighttime) of 2.9 or lower. Spandrel glazing, as required, shall also be installed as a glazing unit. Frames shall be thermally broken aluminum. Curtainwalls and storefronts shall comply with applicable portions of UFC 4-010-01, DOD Minimum Antiterrorism Standards for Buildings.

### 2.5 WINDOWS

Windows shall be low-E, insulated units, except for interior glazing. Exterior window units shall have an U-value (Winter nighttime) of 0.29 maximum, and a maximum shading coefficient of 0.33. Provide windows with thermally broken frames. All operable windows shall have locks and insect screens, excluding interior windows. Windows shall comply with applicable portions of UFC 4-010-01, DOD Minimum Antiterrorism Standards for Buildings.

### 2.6 INTERIOR FINISHES

#### 2.6.1 Gypsum Board Assemblies

All gypsum wall board shall be 5/8" thick minimum. Provide fire-resistant gypsum board where required to achieve fire-ratings. Provide impact resistant gypsum board from top of slab to a minimum of 8 feet above finished floor in the following rooms: corridors. Provide glass-mat gypsum board on walls of all toilet and shower rooms. Provide water-resistant

gypsum board on all plumbing walls. Pre-decorated gypsum board panels and trim system or similar type products and assemblies are not permitted.

Non-load bearing steel stud framing walls shall have vertical studs spaced at 16 inches on center maximum.

Interior partitions requiring physical security, fire ratings, or sound ratings shall be designed and constructed in accordance with manufacturer's approved, tested system designs. These and other partitions extending to the underside of the roof structure shall be laterally braced to the structure and shall have slip tracks to accommodate structural deflection.

Gypsum board shall be finished per UFGS 09 29 00 GYPSUM BOARD with the following clarifications. Areas that are allowed by specification to receive lower levels of finish (I-IV) may still be finished to those respective levels:

- Level V finish shall be retained on walls and ceilings in vestibules and primary corridor system.
- Level IV finish is acceptable on walls and ceilings in all spaces to receive "eggshell" sheen paints.
- Level V finish shall be provided on walls and ceilings in any spaces to receive semi-gloss and higher sheen paints.

#### 2.6.2 Gypsum Board Ceilings

Gypsum board in toilet rooms, showers, janitor's closet and laundry shall be water/mold-resistant. Fire-resistant gypsum board shall be utilized where required to achieve fire-rating.

#### 2.6.3 Acoustical Ceiling Tiles

Provide acoustical ceiling tiles in the locations identified in SECTION 01 84 00 INTERIOR DESIGN REQUIREMENTS. Tiles shall be 24-inch by 24-inch panels on a medium duty suspension system. The suspension system shall have a 9/16" wide grid. Ceiling tiles shall have a Noise Reduction Coefficient (NRC) of 0.75 or higher, have a light reflectance of 0.8 or higher, have an Articulation Class (AC) of 180 or higher, and be sag resistant. Ceiling tiles shall have a "E" pattern designation, "lightly textured" per ASTM E1264. and have tegular edges. Sprinkler heads, smoke detectors, speakers, and other ceiling fixtures should be installed centered on the ceiling tile.

#### 2.6.4 Exposed Structural Ceilings

Paint exposed structural ceilings.

### 2.7 INFORMATION SPECIALTIES

#### 2.7.1 Bulletin Boards/Tackboards

Provide tackboards in quantity, sizes, and general locations identified in the and room data sheets.

#### 2.7.2 Wall-mount Television and Monitor Bracket

Provide universal, horizontal-sliding, vertical-tilt, wall-mount television brackets as identified as listed in the Room Data Sheets.

Brackets shall be capable of accepting a wide-array of flat panel televisions or flat panel commercial monitors. Bracket shall be able to accommodate screen sizes ranging from 32 inches to 75 inches and up to 150 pounds in weight. Bracket shall be capable of horizontal adjustments of 2" in each direction and tilting of 10 degrees in the vertical direction.

Provide continuous 3/4" plywood blocking in stud cavity behind mounting locations. Coordinate final mounting height and location with Contracting Officer's Representative.

## 2.8 COMPARTMENTS AND CUBICLES

### 2.8.1 Toilet Compartments

Toilet partitions shall be ceiling hung type. Material shall be stainless steel. Provide a nominal width of 1 inch. Panels shall be scratch and water resistant; graffiti resistant; non-absorbent. Prepare panels as required to receive toilet paper holders, grab bars, and other toilet accessories as appropriate.

### 2.8.2 Urinal Screens

Urinal screens shall be wall hung type. Secure wall hung urinal screens with continuous flanges that are full height of the screens. Fabricate screens from the same types of panels and pilasters as the toilet partitions. Use corrosion-resistant steel fittings and fasteners.

## 2.9 TOILET ACCESSORIES

Provide all toilet accessories typical in restrooms, in quantities proportional to the size and fixture count in the restroom. Provide ABA compliant fixtures in locations and quantities as required by ABA. Provide commercial-grade items in all spaces, preference is for stainless steel or satin nickel finish. Fixtures shall be automatic operating fixtures. Required items are listed in the Room Data Sheets.

### 2.9.1 Toilet Tissue Dispenser (TTD)

Surface mounted jumbo roll toilet tissue dispenser. TTD shall hold 1 roll up to 10" diameter. Cover shall be stainless steel. Cover shall be one piece construction hung on hinges, and shall be held closed by a keyed tumbler lock. Provide a viewing slot with clear plastic window. Opening on bottom shall have stainless steel teeth for toilet tissue tearing on both sides.

### 2.9.2 Paper Towel Dispenser and Waste Receptacle (PTDWR)

Provide semi-recessed convertible paper towel dispenser and waste receptacle. PTDWR shall have stainless steel, type 304 satin finish. Paper towel dispenser door shall have full length stainless steel piano-hinge, and be equipped with a semi-concealed keyed tumbler lock. Waste receptacle shall be secured to cabinet with a keyed tumbler lock. PTDWR shall accommodate either 600 C-fold or 800 multifold paper towels without adjustment or use of adapters. Waste receptacle shall have a capacity of 12 gallons.

### 2.9.3 Sanitary Napkin Disposer (SND)

Surface mounted, stainless steel, with full-length stainless steel piano

hinge cover.

## 2.10 SAFETY SPECIALTIES

### 2.10.1 Defibrillator Cabinets

Provide Defibrillator Cabinets for automated external defibrillators (AED) where indicated. Cabinets shall be compatible with all major defibrillator models. Cabinet doors shall clear acrylic windows for observing defibrillators. Provide cabinet with audible alarm powered by 9 volt battery. Alarm shall be configured to sound when door is opened, and sound for 3 minutes. Alarm shall have an audible low battery indicator. Provide cabinets with graphics identifying the cabinets as defibrillator cabinets. Provide cabinets with text warning that alarm will sound if cabinets are opened. Provide text stating that defibrillator shall be used by trained responders only. Provide v-shaped projection-style wall signs. Locate signs on wall above defibrillator cabinets to mark their locations. AEDs are part of the FF&E bid option.

## 2.11 EXTERIOR SPECIALTIES

### 2.11.1 Exterior Building Signage

Provide wall-mounted building number signage permanently attached to two sides (minimum) of each facility. Coordinate building number, mounting height, and location with the Contracting Officer. Signage shall match the signage found on adjacent buildings at the base.

Provide signage at mechanical room door, text: IN CASE OF EMERGENCY CALL 10CES CUSTOMER SERVICE AT (719) 333-2790. Confirm text and telephone number prior to fabrication.

## 2.12 FURNISHINGS AND ACCESSORIES

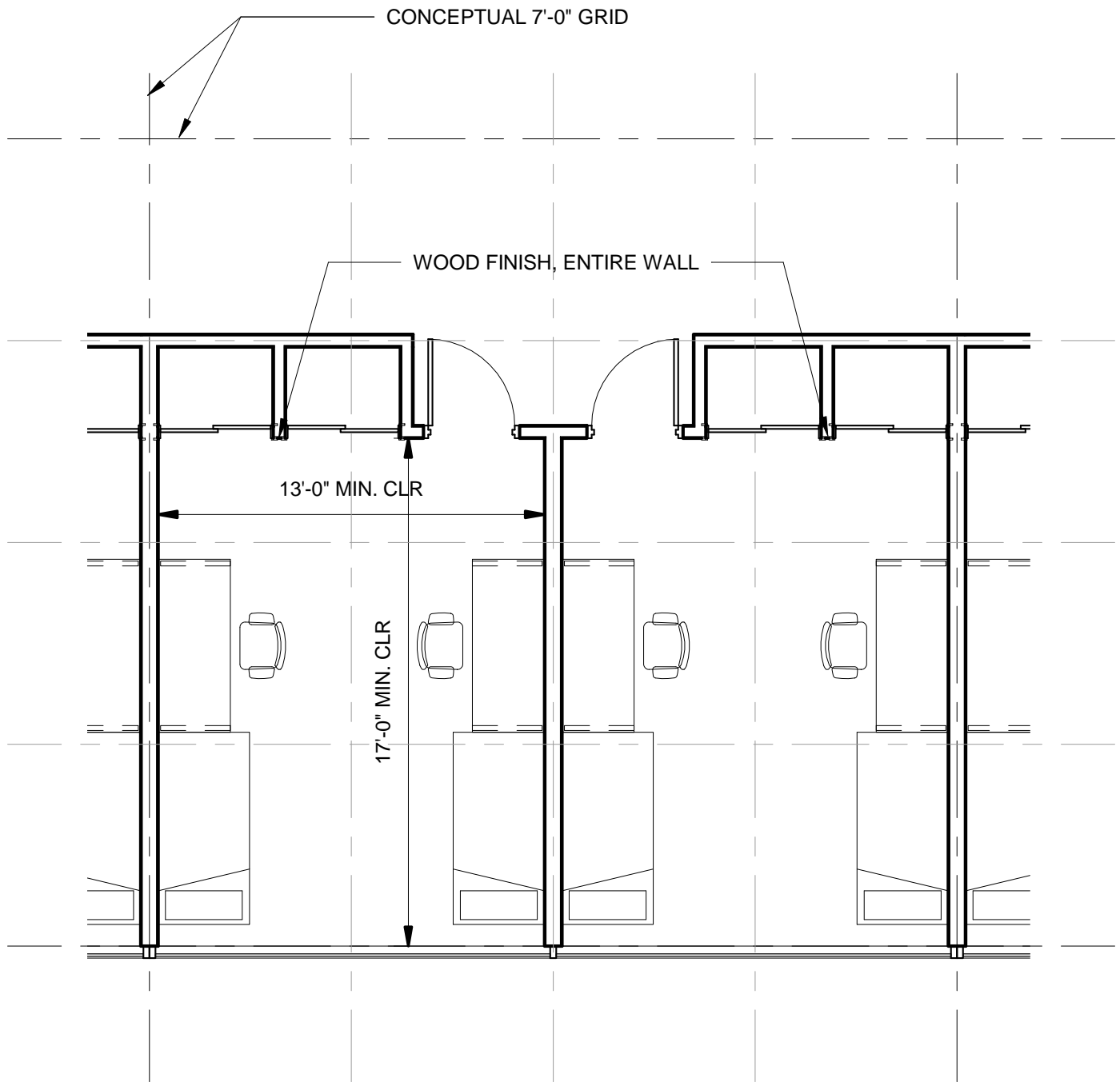
### 2.12.1 Entrance Floor Mats

Entrance floor mats shall be recessed, roll-up style consisting of anodized aluminum tread rails running perpendicular to the traffic flow. Rails shall have embedded carpet tread. See 01 84 00 INTERIOR DESIGN REQUIREMENTS for carpet requirements.

## PART 3 EXECUTION

NOT USED

-- End of Section --



# 1 TYPICAL DORM ROOM PLAN

3/16" = 1'-0"



US Army Corps of  
Engineers ®

U.S. AIR FORCE ACADEMY  
CONSOLIDATE PREP. SCHOOL  
DORMITORIES  
PNXQPZ104002 (FY20)  
TYPICAL DORM ROOM CONCEPT PLAN

SKETCH NO.  
**A-101**

DESIGN BY:  
A. WALZ  
DRAWN BY:  
A. WALZ

CKD BY:  
B. GORUP

SIZE:  
8 1/2" x 11"

PLOT DATE:  
8/11/2022 2:37:43 PM

PLOT SCALE:  
3/16" = 1'-0"

MARK	DESCRIPTION	DATE	APPR

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## SECTION 01 83 00

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## SECTION 01 83 00

## STRUCTURAL REQUIREMENTS

## PART 1 GENERAL

## 1.1 REFERENCES

The design publications listed below are sources of criteria for structural design. The criteria from these sources may be supplemented, but not supplanted, by applicable criteria contained in nationally recognized codes, standards, and specifications.

## U.S. AIR FORCE (USAF)

AFMAN 91-201	U.S. Air Force Explosives Safety Standards
AFI 10-245	Antiterrorism
USAF MFSG	(2004) U.S. Air Force Munitions Facilities Standards Guide

## U.S. Air Force Academy (USAFA)

USAFA DS	(Latest Approved Version) USAFA Design Standards
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## U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 1-200-01	DoD Building Code
UFC 3-220-01	Geotechnical Engineering
UFC 3-220-04F	Backfill for Subsurface Structures
UFC 3-220-10N	Soil Mechanics
UFC 3-301-01	Structural Engineering
UFC 4-010-01	DoD Minimum Antiterrorism Standards for Buildings
UFC 4-023-03	Design of Buildings to Resist Progressive Collapse
UFGS 05-40-00	Cold-Formed Metal Framing

## AMERICAN CONCRETE INSTITUTE (ACI)

ACI 117	(2010; Errata 2011) Specifications for Tolerances for Concrete Construction and Materials and Commentary
ACI 301	(2016) Specifications for Structural Concrete

ACI 302.1R (2015) Guide for Concrete Floor and Slab Construction

ACI 318 (2014; Errata 1-2 2014; Errata 3-5 2015; Errata 6 2016; Errata 7-9 2017) Building Code Requirements for Structural Concrete (ACI 318-14) and Commentary (ACI 318R-14)

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC 325 (2017) Steel Construction Manual

AISC 341 (2016) Seismic Provisions for Structural Steel Buildings

AISC 360 (2016) Specification for Structural Steel Buildings

AISC Steel Design Guide 11 (2003; ERTA 2012) Floor Vibrations Due to Human Activity

AISC Steel Design Guide 3 (2012) Serviceability Design Considerations for Steel Buildings (2nd Edition, 2004)

AISC Steel Design Guide 5 (2003) Low-and Medium-Rise Steel Buildings

AMERICAN IRON AND STEEL INSTITUTE (AISI)

AISI D100 (1991; R 2013) Cold-Formed Steel Design Manual

AISI S100 (2012) North American Specification for the Design of Cold-Formed Steel Structural Members

AISI S110 (2010; Suppl 1; Reaffirmed 2012) Standard for Seismic Design of Cold-Formed Steel Structural Systems - Special Bolted Moment Frames

AISI S240-15 (2015) AISI North American Standard for Cold-Formed Steel Structural Framing

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

ASCE 7 (2016) Minimum Design Loads for Buildings and Other Structures

ASTM INTERNATIONAL (ASTM)

ASTM A 36 (2014) Standard Specification for Carbon Structural Steel

ASTM A 53	(2012) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A 123	(2015) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 185	(2007) Specification for Steel Welded Wire Reinforcement, Plain for Concrete
ASTM A123/A123M	(2017) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A185/A185M	(2007) Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete
ASTM A325	(2014) Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
ASTM A490	(2014a) Standard Specification for Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength
ASTM A500/A500M	(2020) Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A615/A615M	(2020) Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A653/A653M	(2020) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A706/A706M	(2016) Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement
ASTM A992/A992M	(2011; R 2015) Standard Specification for Structural Steel Shapes
ASTM C 90	(2015) Specification for Loadbearing Concrete Masonry Units
ASTM C270	(2014a2019) Standard Specification for Mortar for Unit Masonry
ASTM C476	(2018) Standard Specification for Grout for Masonry
ASTM E 1745	(2011) Standard Specification for Plastic Water Vapor Retarder Used in Contact with

Soil or Granular Fill under Concrete Slabs

ASTM F1554 (2018) Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M (2020) Structural Welding Code - Steel

BRICK INDUSTRY ASSOCIATION (BIA)

BIA Technical Note 18A (2006) Accommodating Expansion of Brickwork

INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC (2021) International Building Code

NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM)

NAAMM MBG 531 (2017) Metal Bar Grating Manual

NAAMM MBG 532 (2009) Heavy Duty Metal Bar Grating Manual

MBG 533 (2009) Welding Specifications for Fabrication of Steel, Aluminum and Stainless Steel Bar Grating

NATIONAL CONCRETE MASONRY ASSOCIATION (NCMA)

TEK 10-2B (2008) Control Joints for Concrete Masonry Walls - Empirical Method

OCCUPATIONAL SAFETY & HEALTH ADMINISTRATION (OSHA)

OSHA All applicable OSHA regulations, including but not limited to 29 CFR 1926 Subpart R-Steel Erection

STEEL DECK INSTITUTE (SDI)

SDI/C-2011 (2011; ERTA 2015) Standard for Composite Steel Floor Deck

SDI/CDD2 (1997) Composite Steel Deck Design Handbook

SDI/DDM04 (2015) Diaphragm Design Manual, 4th Ed.

SDI/DM31 (2004) Design Manual for Composite Decks, Form Decks and Roof Decks - No. 31

SDI/MOC2 (2006) Manual of Construction with Steel Deck

SDI/NC-2010 (2010) Standard for Noncomposite Steel Floor Deck

SDI/RD-2010 (2010) Standard for Steel Roof Deck  
SDI/RDCH1 (2000) Roof Deck Construction Handbook  
SDI/COSP14 (2014) Standard Practice Details

STEEL JOIST INSTITUTE (SJI)

SJI-CJ-2010 (2010) Standard Specification for  
Composite Steel Joists, C-J Series

UNDERWRITERS LABORATORIES (UL)

UL 580 (2006; Reprint Oct 2013) Tests for Uplift  
Resistance of Roof Assemblies

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1 (2014) US Army Corps of Engineers Safety  
and Health Requirements Manual

#### 1.1.1 Project Description and Requirements

This project concerns the new construction of a preparatory school dormitory, located at the U.S. Air Force Academy, CO. Reference SECTION 01 81 00 Summary of Work, for project description and extent of work to be performed. The structural design shall be performed in accordance with the criteria, requirements, and guidance provided in ICC IBC, as modified by UFC 1-200-01, UFC 3-301-01, USAFA DS, the above referenced documents and the following requirements. The building shall be structurally designed and configured by the Contractor in accordance with the criteria indicated on the RFP documents and contained herein.

#### 1.1.2 Structural Building System

The structural engineer of record shall be responsible for the design of the complete structural building system. A complete structural system for the building shall include foundations, walls, roof framing, roof diaphragms, lateral load stability, framing and connection of any architectural features (if any), and the support of mechanical and electrical equipment. In addition, the structural engineer is responsible for the design of all lesser related structures such as utility vaults, light/equipment pole foundations, pits, retaining walls, etc., although they may be shown on other disciplines' drawings. Structural design of the building shall be compatible with the architectural design. Structural design shall be in accordance with the criteria, requirements, and guidance provided in ICC IBC, as modified by UFC 1-200-01 UFC 3-301-01, the above referenced documents and the following requirements.

The structural design calculations and drawings shall be sealed by a professional licensed by one of the 50 states (see "Structural Engineer of Record" below).

#### 1.1.3 General Design

The completed structural design shall include all elements for

foundations, wall framing, connections, roof framing and diaphragms and bracing. It shall also include lateral load stability analysis as well as support and lateral bracing for architectural features, and mechanical and electrical equipment.

#### 1.1.3.1 Structural System

The structural system and components shall be compatible with the intended functions and allow for future flexibility, renovation, and reconfigurations of the interior space. Do not locate columns, for instance, in rooms requiring visibility, circulation or open space, including, but not limited to entries and hallways. The structural clear heights of each floor and the openings in each floor shall be coordinated with the architectural ceiling height plus mechanical/electrical equipment.

#### 1.1.3.2 Materials and Systems

The facility will include a reinforced concrete slab on grade with a reinforced concrete foundation, and building that is structurally framed of either steel, concrete or masonry construction. When selecting the types and characteristics of materials used on the project, select materials and systems with consideration for climate conditions, high humidity, industrial atmosphere, water exposure or other adverse local conditions.

#### 1.1.4 Structural Engineer of Record

The structural engineer of record and any consultants providing structural design services shall be a registered engineer in one of the 50 states. The engineer of record for structural design of this project shall be responsible for:

##### 1.1.4.1 Development

Developing the plans, specifications, calculations and other contract documents.

##### 1.1.4.2 Coordinating

Coordinating the structural design with the architect and other engineering disciplines.

##### 1.1.4.3 Reviewing

Reviewing construction submittals to verify compliance with the design intent and the specified design criteria and to ensure coordination with the contract documents and other shop drawings.

##### 1.1.4.4 Quality Assurance

Providing Quality Assurance requirements for the structural work.

##### 1.1.4.5 Engineer of Record

Providing other engineer of record (ER) functions described in the referenced documents.



## 1.2 STRUCTURAL DESIGN LOADS AND CONDITIONS

Structural loading criteria shall be developed for the building using site and project specific criteria and the criteria and procedures indicated below. The preparatory dormitory building shall be classified as an "Risk Category II" facility for the determination of snow, seismic, and wind loads.

### 1.2.1 Antiterrorism / Force Protection (AT/FP)

The design and construction of all applicable structural elements shall incorporate the requirements for Antiterrorism/Force Protection (AT/FP) as given in UFC 4-010-01 "DoD Minimum Antiterrorism Standards for Buildings". Best Practices for DoD minimum antiterrorism standards for inhabited buildings. All design assumptions and criteria shall be clearly stated in the design calculations. Structural systems and materials shall be coordinated with site clear space distances to comply with UFC 4-010-01. The structure shall also comply with UFC 4-023-03.

### 1.2.2 Progressive Collapse

The building design shall incorporate Progressive Collapse requirements per UFC 4-023-03. The building is a risk II category building and shall either be designed for the Tie Force (TF) method in combination with the Enhanced Local Resistance (ELR) for the corner and penultimate columns at the first story, or the Alternate Path (AP) method for column and wall removal.

### 1.2.3 Dead Loads

Minimum design dead loads based on weights for common building materials shall be as applicable in accordance with UFC 3-301-01. Loads for materials not listed in UFC 3-301-01 and equipment loads shall be obtained from other recognized sources. Dead loads include the weight of all permanent materials and equipment in or on the structure, including the structure's own weight. Weight of connections shall be accounted for.

### 1.2.4 Roof Live Loads and Snow Loads

#### 1.2.4.1 Minimum Roof Live Load

A minimum roof live load of 20 psf shall be provided for in the design to account for construction and maintenance loads. The minimum roof live load shall not be reduced. The minimum roof live load shall be applied in accordance with UFC 3-301-01 and shall be used as a loading condition for the roof and independent of the calculated snow loads. Concurrent with the uniform roof live load, a 300-pound concentrated load shall be located anywhere at any point on the roof structure.

#### 1.2.4.2 Roof Snow Load

Roof snow load shall be applied in accordance with UFC 3-301-01 and the Pikes Peak Regional Building Code. The ground snow load ( $P_g$ ) used to calculate balanced snow loads shall be 45 psf. The balanced snow load that is added to the drift surcharge shall be calculated using 45 psf. Other factors used in determining snow loads are as follows:

- a. Terrain Category: C (UFC 3-301-01 Section 26.7.3, Exposure C)

- b. Snow Importance Factor,  $I_s$ : 1.0 (UFC 3-301-01 Table 1.5-2)

#### 1.2.4.3 Rain-On-Snow Load

A rain-on-snow load, if applicable, shall be applied in accordance with the UFC 3-301-01.

#### 1.2.5 Floor Live Loads

Floor live loads shall be in accordance with UFC 3-301-01 for the type of occupancy indicated, except as modified herein, and to accommodate any equipment maintenance or special requirements from the building user.

#### 1.2.6 Other Live Loads

Other live loads used for this facility shall be in accordance with UFC 3-301-01.

#### 1.2.7 Floor Slab

Minimum floor live loads are in accordance with UFC-301-01. The thicknesses of the floors will be a constant thickness throughout (as required for trailer testing). Slabs-on-grade shall meet ACI 117 Floor Surface Classification.

#### 1.2.8 Thermal Loads

The design shall consider changes of temperature that the structure will experience and the expansion and contraction caused by these thermal changes in accordance with ACI 318. Joints shall be provided to limit the amount of thermal movement.

#### 1.2.9 Collateral Loads

The design shall include an appropriate amount of uniform load for mechanical and electrical equipment and items supported from ceilings, roofs and floors. The collateral load shall be as required for the mechanical and electrical equipment required for this project, but shall not be less than 5 psf.

#### 1.2.10 Wind Loads

Wind loads for both the main wind force resisting system and for components and cladding shall be determined in accordance with UFC 3-301-01 and the Pikes Peak Regional Building Code using the following parameters:

- a. Basic Wind Speed,  $V$ (3-Second Gust): 130 mph
- b. Wind Exposure Category: C
- c. Internal Pressure Coefficient,  $G C_{pi}$ : plus or minus 0.55 for Partially Enclosed areas and plus or minus .18 for enclosed areas.  
(ASCE 7, Table 26.11-1.)

#### 1.2.11 Seismic Loads

Seismic loads shall be determined in accordance with the UFC 3-301-01. The total lateral seismic force shall be determined using the following parameters:

- a. Risk Category: II
- b. Seismic Importance Factor,  $I_e$ : 1.0 (ASCE Table 1.5-2)
- c. Mapped Spectral Response Acceleration,  $S_s$ : 0.184
- d. Mapped Spectral Response Coefficient,  $S_1$ : 0.061
- e. Site Classification: Class D \*

\* Preliminary Site Classification assumed per UFC 3-301-01 Final Seismic Design Category shall be based on the Site Classification determined and noted in the Final Geotechnical Report to be provided by the Contractor.

#### 1.2.12 Interior Partition Lateral Loads

Interior partitions shall be designed for a wind pressure of 10 psf normal to the partition. The deflection of interior partitions due to wind load shall not exceed  $1/360$  the span for walls with brittle finishes and  $1/240$  for walls with flexible finishes. Other design requirements such as seismic may be more restrictive and control the design of the partitions.

#### 1.2.13 Load Combinations

Load combinations shall be in accordance with the UFC 3-301-01 and used in combination with AISC Specifications.

#### 1.2.14 Wind Uplift Resistance

Wind uplift calculations shall be based on the criteria for Wind Loads contained herein.

#### 1.2.15 Deflections

Deflections of structural members shall not be greater than allowed by the applicable material standard (ACI, AISC, etc.) the limits set forth in UFC 3-301-01 or IBC Table 1604.3. Deflection limits are needed to restrict damage to ceilings, partitions, other fragile nonstructural elements. Member deflection due to live load shall not exceed the member length divided by 360. Member deflection due to live and dead load shall not exceed the member length divided by 240. In addition, any member supporting masonry vertically shall have a deflection limit of the span divided by 600.

#### 1.2.16 Drift

Lateral deflection or drift of structures and deformations of horizontal diaphragms and bracing systems due to code-specified wind effects shall not impair the serviceability of the structure. Drift limits applicable to loads shall be in accordance with UFC 3-301-01 including recommendations contained in Section 12.12, recommendations contained in AISC Steel Design Guide 3 "Serviceability Design Considerations for Steel Buildings" and AISC Steel Design Guide 5 "Low-and Medium-Rise Steel Buildings". The building structure shall be designed for the code-specified wind loads (criteria noted above) with a drift ratio of 0.002 (H/500) with a maximum inter-story drift of  $3/8$  inch. For

structures with brick or masonry veneer, story drift shall be no greater than story height divided by 600.

Story drift shall be based on the more stringent 10-year wind or seismic design cases.

Drift limits applicable to code-specified seismic loads (criteria noted above) shall be in accordance with the UFC 3-301-01.

#### 1.2.17 Vibrations

All vibration producing mechanical, electrical, or other equipment shall be mounted in manner as to prevent the transfer of vibrations to adjacent parts or areas of the building. If necessary, large vibration producing equipment installed within the facility on the ground level shall be supported on individual isolated foundations. The isolated foundations shall be separated from the building slab-on-grade by a continuous 3/4-inch expansion joint.

#### 1.2.18 Foundation and Slab-On-Grade Design Criteria

##### 1.2.18.1 Foundation Design

Foundation design criteria and the foundation type proposed to be built by the Contractor shall be based on recommendations contained in the Contractor's Final Geotechnical Investigation Report.

##### 1.2.18.2 Foundation Design Parameters

Minimum Depth of Exterior and Interior foundations	Unheated: 48 inches below final exterior grade or as required by the Contractor's Final Geotechnical Report, whichever is greater depth.
	Heated: 36 inches below final exterior grade or as required by the Contractor's Final Geotechnical Report, whichever is greater depth.
Minimum Factor of Safety Against Overturning and Sliding	1.5
Minimum Factor of Safety Against Uplift and Floatation	1.5
Minimum Factor of Safety Against Bearing	3.0

Maximum permissible settlement                      1/2 inch differential settlement  
criteria, unless otherwise approved      1 inch total settlement  
by the Government and unless  
detrimental to the structural  
system and materials designed by  
the Contractor.

#### 1.2.18.3      Subgrade Preparation

Based on preliminary information, the building may utilize a reinforced concrete shallow foundation system with isolated and continuous spread footing foundations, however, a deep foundation may be required to limit deflections; refer to the Preliminary Geotechnical Engineering Report in Appendix C for additional information. The underlying soils in the vicinity of the preparatory dormitory have been known to contain expansive soils. If borings confirm the presence of expansive soils, additional foundation work may be required to constrain the foundation and isolate the floor slabs from expansive forces. Refer to Section 01 89 00 SITE WORK REQUIREMENTS for overexcavation and subgrade preparation.

Final foundation and slab criteria, design, foundation type, and subgrade proposed to be built by the Contractor shall be based on recommendations contained in the Final Geotechnical Investigation Report which shall be provided by the Contractor. If expansive soils are present see UFC 3-220-01, UFC 3-220-04F and UFC 3-220-10N. If deep foundations are required, see UFC 3-220-01.

Exterior footings and interior spread footings for unheated areas shall be placed at least 59 inches below the final grade to provide adequate frost protection (see Foundation Design Parameters paragraph).

#### 1.2.18.4      Slabs-on-Grade Design

Slabs-on-grade (interior) shall be designed in accordance with the recommendations contained in the Contractor's Final Geotechnical Investigation Report and the guidelines of ACI 302.1R, "Guide to Concrete Floor and Slab Construction".

Proper construction methods, workmanship, slab-on-grade materials and preparation, and concrete mix proportioning specifications shall follow the guidelines of ACI 302.1R, "Guide to Concrete Floor and Slab Construction".

The floor finish systems for the building generally requires that the moisture/vapor transmission rate through the slab be limited to a maximum of 3 pounds per 1,000 square feet in a 24-hour period. This limit for moisture/vapor transmission rate can be achieved with a vapor retarder system in lieu of a vapor barrier system. As a minimum, a 15-mil thick, Class A, vapor retarder system meeting the requirements of ASTM E 1745, shall be required beneath all building slabs-on-grade.

The slab-on-grade supporting subgrade system shall be in accordance with the recommendations of ACI 302.1R and recommendations contained in the Final Geotechnical Investigation Report. All interior slabs-on-grade shall be constructed over a vapor retarder system over a compacted 6-inch capillary water barrier on compacted subgrade. The location of the vapor retarder system relative to the capillary water barrier shall be in accordance with recommendations contained in ACI 302.1R and the

Contractor's Final Geotechnical Investigation Report.

Slabs-on-grade shall be jointed and reinforced with temperature and shrinkage reinforcement located near the top of the slab in order to control shrinkage and limit curling. Slab-on-grade temperature and shrinkage reinforcement shall not be less than 0.18 percent per ACI 318 requirements. Maximum spacing of the slab-on-grade reinforcing bars shall not exceed three times the slab thickness. All slabs-on-grade shall, as a minimum, be reinforced with deformed steel reinforcing bars at 12- to 16-inch spacing in lieu of welded wire fabric.

1.2.18.5 Slabs-On-grade General Requirements

Slabs-on-grade shall be designed per the recommendations of the Contractor's Final Geotechnical Report without rigid edge support and lateral and vertical movement unrestrained. An isolation joint consisting of 30-pound felt or 1/2-inch expansion joint material, is required where slabs abut vertical surfaces.

Crack control measures shall be incorporated in the slab design. Control joint spacing and details shall be as delineated in ACI 302.1R, as applicable.

In no case shall a slab-on-grade be less than 4 inches thick. Thickened slabs shall be required for walls and partitions which have a vertical load of 300 pounds/foot to 720 pounds/foot. A separate isolated wall footing shall be used for walls having a vertical load in excess of 720 pounds/foot.

Slabs-on-grade placement shall be limited to 7500 square feet at one time. The area bounded by crack control joints shall not exceed 625 square feet and distance between crack control joints shall not exceed 25 feet. Crack control joints may be construction joints, contraction joints, expansion joints, or isolation joints. Reentrant corners in slabs shall be reinforced with two No. 4 bars, 4 feet long, placed diagonally to the corner. No joints shall be located under ceramic or terrazzo tile floors.

The flatness of the floors shall be carefully controlled and the tolerances shall be measured by the straightedge system as specified in paragraph 4.5.7 of ACI 117, using a 10-foot straightedge, within 72 hours after floor slab installation and before shores and/or forms are removed. The listed tolerances shall be met at any and every location at which the straightedge can be placed.

- a. Float Finish      1/4 inch
- b. Trowel Finish      1/4 inch

Tolerances may also be measured by the F-number system in accordance with Paragraph 4.5.6 and 4.5.6.1 of ACI 117.

Exterior steel embedded in concrete for such purposes as exterior railing, handrails, fence, base plates, anchor bolts, etc., shall be hot-dipped galvanized, unless otherwise directed.

All column base plates and anchor bolts shall be completely encased in concrete. All below grade steel shall be completely encased in concrete or coated with coal-tar epoxy.

Rubberized, keyed waterstops shall be provided in all construction joints below grade between the exterior and interior of the building.

#### 1.2.18.6 Exterior Equipment Pads

Exterior mechanical or electrical equipment shall be installed on concrete pads. Equipment pads shall be a minimum of 8 inches thick and reinforced with at least the minimum temperature and shrinkage reinforcement required by ACI 318. The pads shall be sized a minimum of 12 inches larger all around than the piece of equipment furnished and all edges of the pad shall be chamfered. The Contractor shall coordinate the design of the exterior equipment pads with the mechanical and electrical system design and the equipment selected to be installed by the Contractor.

### 1.3 STRUCTURAL MATERIALS DESIGN DATA

Materials for structural elements shall be as indicated herein.

#### 1.3.1 Reinforced Concrete

##### 1.3.1.1 Design

Reinforced concrete shall be designed and detailed in accordance with the ICC IBC as modified by ACI 318, ACI 301, and related current ACI publications that are applicable to the design. All concrete elements, including slabs-on-grade, shall be reinforced with temperature and shrinkage reinforcement as recommended by ACI as a minimum.

##### 1.3.1.2 Concrete Strength

The required 28-day concrete compressive strength (f'c) shall be left to the Contractor's discretion, except the following shall be the minimum used for the locations shown:

<u>Location</u>	<u>f'c (Min.)</u>	<u>Unit Weight</u>
Foundations	4,500 psi	145 pcf
Slabs-on-Grade	4,500 psi	145 pcf and minimum 650 psi flexural strength.

The water cement ratio for any strength of concrete strength shall not exceed 0.45. The appropriate type of cement to be used for concrete placed in contact with the native subsurface and fill materials shall be determined per the recommendations contained in the Contractor's Final Geotechnical Investigation Report. For concrete that is to be installed with exterior exposure, air-entrainment, producing a total air content in the concrete between 4-1/2 and 6 percent by volume, shall be required.

##### 1.3.1.3 Reinforcing Steel

Reinforcing bars (deformed) used in concrete design shall be ASTM A615/A615M, Grade 60 (Fy = 60 ksi). Reinforcing bars (deformed) required to be welded shall be ASTM A706/A706M, Grade 60 (Fy = 60 ksi). The minimum bar size is No. 4 except for stirrups and ties which may be No. 3 per ACI. Nosing bars shall not be used in exterior concrete stairs.

Welded Wire Fabric where used in exterior sidewalks and flat work shall be provided in flat sheets and conform to ASTM A 185 with a minimum yield strength,  $F_y = 60$  ksi.

#### 1.3.1.4 Concrete Joints

Control joints and contraction joints shall be located to limit concrete cracking to a minimum. All exposed concrete joints shall be sealed with appropriate joint sealant.

#### 1.3.2 Structural Steel

##### 1.3.2.1 Design

Structural steel shall be designed in accordance with the ICC IBC and the AISC Specifications including AISC 325, AISC 341 and AISC 360. All structural steel members shall be designed by the structural engineer to support all applicable loads. Structural drawings shall clearly show all structural members and their locations.

##### 1.3.2.2 Structural Steel Materials

Structural steel materials shall meet the following minimum requirements:

<u>Steel Type</u>	<u>ASTM</u>	<u>Grade</u>	<u>Min. Yield Strength, <math>F_y</math></u>
Structural Wide Flange Beams & Columns (W-Shapes)	ASTM A992/A992M	--	50 ksi
Structural Tees (WT-Shapes)	ASTM A992/A992M	--	50 ksi
Structural Channels & Angles (C, MC, & L-Shapes)	ASTM A 36	--	36 ksi
Structural Plates & Bars	ASTM A 36	--	36 ksi
Structural Steel Pipe	ASTM A 53	B, Type E or S	35 ksi
Structural Steel Tubing (TS-Shapes)	ASTM A500/A500M	B	46 ksi
Rectangular or Square	ASTM A500/A500M	C	50 ksi
Hollow Structural Sections (HSS Shapes)			
Structural Anchor Rods	ASTM F1554	--	36 ksi
High Strength Structural Bolts	ASTM A325	--	$F_u=120$ ksi
	ASTM A490	--	$F_u=150$ ksi



Welding Rods (Structural Steel	--	E70XX	Fu=70 ksi
Welding Rods (Steel Decking)	--	E60XX	Fu=60 ksi

### 1.3.2.3 Connections

Types of connections shall be consistent with the design assumptions for the basic type of steel construction used. Connections shall be designed and detailed to provide adequate capacities for the applied forces and moments. Connection design shall be the responsibility of a licensed structural engineer and shall not be delegated to the steel fabricator. Welding shall be in accordance with AWS D1.1/D1.1M or appropriate code for materials other than steel. Bolted connections shall be in accordance with AISC 325, AISC 341, AISC 360.

### 1.3.3 Steel Joists

#### 1.3.3.1 Design

The design and selection of steel joists shall be governed by the Steel Joist Institute (SJI) and AISC 341 and AISC 360. The wind uplift requirements shall be clearly delineated on the design drawings or with the specifications. Joists requiring special design to resist wind uplift and non-uniform loads shall be designated as such on the drawings, and the required design loads provided. The designer shall provide joist-loading diagrams on the drawings for all joists with geometric configurations outside the scope of the SJI standards. Joist end supports and anchorage to resist uplift shall be designed to accommodate the applied forces, including those resulting from wind and seismic loading.

Joists shall be anchored to steel supports by bolting or field welding. Provide steel insert plates in concrete work. Where top chords are extended, provide required section modulus of extensions on the drawings. Bridging shall conform to the requirements of SJI.

### 1.3.4 Steel Decking

#### 1.3.4.1 Design

The design and selection of steel deck shall be in accordance with the provisions of the Steel Deck Institute. The designation of the steel roof decking type and gauge shall conform to SDI standards. Steel roof deck manufacturer's designations shall not be used. The minimum required section properties of the steel roof deck shall be required to be specified or noted on the design drawings and shall be determined as prescribed by the appropriate specifications of the SDI/RDCH1, SDI/CDD2, SDI/CDD2 and SDI/DDM04.

Steel deck designed to function as a shear diaphragm shall be designed in accordance with the provisions of the SDI/DDM04.

#### 1.3.4.2 Steel Decking Material

##### 1.3.4.2.1 Requirements

Steel decking materials shall meet the following minimum requirements:

- a. Type: Minimum Yield Strength,  $F_y$
- b. Steel Roof Deck (Wide Rib): 33 ksi, ASTM A653/A653M galvanized

##### 1.3.4.2.2 Form Deck

All form deck shall be galvanized steel. Non-composite steel form deck shall have a minimum thickness of 0.0179 inch (26 gage). See SDI/C-2011 and SDI/NC-2010.

##### 1.3.4.2.3 Metal Roof Deck

Metal roof deck material shall have a minimum thickness of 0.0295 inch (22 gage). A structural metal roof deck shall be provided under all roofs. Where metal deck or form is used, show required section modulus and moment of inertia on drawings. Steel roof and form deck shall have a G-90 galvanized coating thickness. See SDI/RD-2010

##### 1.3.4.2.4 Structural Metal Roof Deck

Structural metal roof decks shall be attached to structural supports and to adjoining units using mechanical fasteners, such as screws, powder actuated or pneumatically driven fasteners, or welding.

##### 1.3.4.2.5 Metal Grating

See NAAMM MBG 531, NAAMM MBG 532 and MBG 533.

#### 1.3.5 Cold-Formed Metal Framing (CFMF)

##### 1.3.5.1 Design

Design and detailing of wall systems using cold-formed metal framing (CFMF) members to anchor masonry veneers shall be in accordance with the provisions of ICC IBC. Wall systems shall be specified using UFGS 05-40-00

Cold-Formed Metal Framing. Wind load deflection of wall systems to which masonry veneer is anchored shall be no more than 1/600 of the span of the wall. Design assumptions and details shall be coordinated with the specifications.

##### 1.3.5.2 Cold-Formed Metal Framing Material

Cold-formed steel framing shall be formed from steel that conforms to the requirements of ASTM A653/A653M, Grade 33 or higher, having a minimum yield of 33 ksi. Minimum uncoated steel thickness (design thickness times 0.95) shall be 0.0329 inch (20 gage). All cold-formed steel framing shall receive a G-60 galvanized coating. All cold-formed steel framing connectors shall receive a G-90 galvanized coating. Deflection of exterior wall studs supporting masonry shall be limited to 1/600.

#### 1.4 Location of Structural Elements

The structural design and corresponding selection and location of the

structural elements shall be compatible with the floor and roof plans, elevations, and other information included in the RFP documents. Use of structural vertical bracing shall be minimized, and shall be limited to locations where bracing can be concealed at interior and exterior wall lines without obstructing windows, doors, other openings, or interior furnishings. Vertical bracing, where used, shall be located in coordination with the architectural partition and other building discipline requirements.

#### 1.5 Roof Framing System

The roof construction assembly shall meet the wind uplift resistance requirements of the ASCE 7.

The design of the roof framing members shall include consideration of any concentrated loads from supported or suspended mechanical, fire, electrical, and communications equipment, including HVAC units and cable trays. The location and magnitude of suspended equipment loads shall be closely coordinated with the mechanical, electrical, and communications systems design and requirements.

Roof mounted mechanical equipment shall not be used.

#### 1.6 Walls and Partitions

The exterior walls of the building shall utilize materials stated in the architectural portions of this RFP.

Interior non-structural partitions shall be constructed of steel studs and gypsum wallboard or demountable partitions.

#### 1.7 MISCELLANEOUS REQUIREMENTS

##### 1.7.1 Exterior Door Jambs and Headers

Exterior door jambs and headers shall be framed with structural members for increased strength and stiffness.

##### 1.7.2 Structural Steel

Structural steel members shall be shop-primed with a primer consistent with any required fireproofing and architectural finishes and coatings.

##### 1.7.3 Dissimilar Metals

Where dissimilar metals are in contact, or where aluminum is in contact with concrete, mortar, masonry, wet or pressure-treated wood, or absorptive materials subject to wetting, the surfaces shall be protected with a coating of bituminous paint or asphalt varnish.

#### 1.8 QUALITY CONTROL

##### 1.8.1 Specifications

The Contractor shall provide specifications for all applicable structural

components. All requirements contained in the RFP document must be incorporated into the specifications and/or drawings.

#### 1.8.2 Structural Engineer

The structural engineer of record shall provide adequate site observation and submittal reviews to verify that construction follows the design intent and shall provide special inspection information per UFC 1-200-01 and IBC Chapter 17 on the drawings and specifications.

#### 1.8.3 Documents

All structural drawings, specifications and calculations shall be sealed by the registered, or licensed professional engineer under whose immediate personal supervision they were prepared. The structural engineer of record shall indicate approval of delegate engineered submittals with his or her submittal review stamp.

#### 1.8.4 Design Submittal Requirements

All design submittal requirements and considerations contained in the RFP document must be incorporated into the specifications and/or drawings.

Prior to submitting preliminary, interim and final design drawings, calculations and specifications from subcontracted designers, manufacturers and suppliers of structural elements and systems (for example: engineered components, precast concrete) to the Government, the Structural Engineer/Designer of Record shall review the documents for conformance with the project design criteria and for coordination. Also see Paragraph 2-1.1.1 in UFC 3-301-01.

Calculations shall show all basic load cases and load combinations for each structure in the facility. Serviceability criteria and deflection limits shall be provided. References shall be provided for establishing load, serviceability and deflection criteria.

Calculations for connections, member deflections and overall structural deflections shall be provided and compared to the criteria.

Computer generated calculations must identify the program name, source and version. Provide input data, including basic loads, load diagrams, load combinations, node diagrams, material properties and documentation to illustrate the design. Schematic models must show, at a minimum, nodes/joints names, elements/member names, member materials/properties, section sizes, loadings. Results shall include output listings for maximum/minimum stresses, forces deflections for each element and for the structure as a whole, reactions for each load case and combination and design code checks.

### PART 2 PRODUCTS

Not Used.

### PART 3 EXECUTION

Not Used.

-- End of Section --

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## SECTION 01 84 00

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## SECTION 01 84 00

## INTERIOR DESIGN REQUIREMENTS

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## PART 1 INTERIOR DESIGN REQUIREMENTS

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only. Comply with the latest edition of the UFGS guide specification.

## AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS (AATCC)

- |           |   |
|-----------|---|
| AATCC 134 | (2016) Electrostatic Propensity of Carpets              |
| AATCC 174 | (2016) Antimicrobial Activity Assessment of New Carpets |

## ASTM INTERNATIONAL (ASTM)

- |                 |   |
|-----------------|---|
| ASTM C109/C109M | (2020a) Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens)       |
| ASTM C423       | (2009a) Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method                                     |
| ASTM D635       | (2018) Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position          |
| ASTM D1335      | (2017; E 2018) Standard Test Method for Tuft Bind of Pile Yarn Floor Coverings  |
| ASTM D256       | (2010; R 2018) Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics                            |
| ASTM D2047      | (2017) Standard Test Method for Static Coefficient of Friction of Polish-Coated Floor Surfaces as Measured by the James Machine |
| ASTM D2859      | (2016) Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials                           |
| ASTM D7330      | (2015) Standard Test Method for Assessment of Surface Appearance Change in Pile Floor Coverings Using Standard Reference Scales |

ASTM E1155	(2014) Standard Test Method for Determining Floor Flatness and Floor Levelness Numbers
ASTM E84	(2020) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM E648	(2019a) Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source
ASTM F510	(2014) Standard Test Method for Resistance to Abrasion of Resilient Floor Coverings Using an Abrader with a Grit Feed Method
ASTM F793	(2010a) Wallcovering by Durability Characteristics
ASTM F1066	(2004; R 2014; E 2014) Standard Specification for Vinyl Composition Floor Tile
ASTM F1303	(2004; R 2014) Sheet Vinyl Floor Covering with Backing
ASTM F1344	(2015) Rubber Floor Tile
ASTM F1700	(2020) Standard Specification for Solid Vinyl Floor Tile
ASTM F1859	(2014; E 2016) Standard Specification for Rubber Sheet Floor Covering Without Backing
ASTM F1861	(2016) Standard Specification for Resilient Wall Base
ASTM F1913	(2004; R 2014) Vinyl Sheet Floor Covering Without Backing
ASTM F2034	(2008; R 2013) Sheet Linoleum Floor Covering
ASTM F2169	(2015; R 2020; E 2020) Standard Specification for Resilient Stair Treads
ASTM F2195	(2013) Linoleum Floor Tile

## AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A137.1	(2019) American National Standards Specifications for Ceramic Tile
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## CSA GROUP (CSA)

CSA B45.5-17/IAPMO Z124	(2017; Errata 2017; Errata 2018) Plastic Plumbing Fixtures
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## CARPET AND RUG INSTITUTE (CRI)

CRI 104	(2015) Carpet Installation Standard for Commercial Carpet
CRI 105	(2015) Carpet Installation Standard for Residential Carpet
CRI Test Method 103	(2015) Standard Test Method for the Evaluation of Texture Appearance Retention of Carpet Standards Program

## NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 101	(2021) Life Safety Code
NFPA 265	(2015) Standard Methods of Fire Tests for Evaluating Room Fire Growth Contribution of Textile Coverings on Full Height Panels and Walls
NFPA 286	(2015) Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth
NFPA 701	(2015) Standard Methods of Fire Tests for Flame Propagation of Textiles and Films

## SAE International

AMS-STD-595	Colors Used in Government Procurement
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## U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 3-120-01	Design: Sign Standard
UFC 3-120-10	Interior Design
UFC 3-600-01	Fire Protection Engineering for Facilities

## U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS CCC-W-408	(Rev D; Notices 1, 2) Wallcovering, Vinyl Coated
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## U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

16 CFR 1630	Standard for the Surface Flammability of Carpets and Rugs (FF 1-70)
36 CFR 1191	Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines

## UNDERWRITERS LABORATORIES (UL)

UL 723	(2008; Reprint Dec 2017) Test for Surface
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Burning Characteristics of Building  
Materials

U.S. Air Force Academy (USAFA)

USAFA DS (Latest Approved Version) USAFA Design  
Standards

USAFA IFS United States Air Force Academy  
Installation Facilities Standards

## 1.2 DESIGN CRITERIA

Design this building in accordance with this document, NFPA 101, 36 CFR 1191, UFC 3-600-01, UFC 3-120-10, and UFC 3-120-01. Comply with the flame spread and smoke development limits herein and the requirements of NFPA 101 for all interior finish materials.

Both the USAFA IFS and USAFA DS are included as applicable criteria for this RFP. In cases of conflicts between the requirements in the USAFA IFS and the USAFA DS, the requirements of the USAFA IFS apply. For both criteria, the requirements and allowances of this specification section as listed below override the requirements of both criteria.

## 1.3 BUILDING INTERIOR FINISHES

Reference the Appendix B Room Data Sheets for minimum requirements of interior finishes.

### 1.3.1 Floor Surface Preparation and Materials

Prepare substrate and provide surface preparation materials, including any recommended underlayments, in accordance with the flooring manufacturer recommendations for the subfloor conditions.

### 1.3.2 Carpet

Provide antistatic carpet with a pattern containing a minimum of three distinctly different colors or a bold multi-colored tweed for maximum soil-hiding properties. Carpet must be broadloom or tile, 100% continuous filament, solution dyed, branded nylon with loop construction. Provide synthetic primary and secondary backing materials that are customarily used and accepted by the trade for each type of carpet. Preference should be given to products containing recovered material when possible. Carpet must meet the following minimum requirements:

#### 1.3.2.1 Minimum Pile Characteristics

Provide carpet with tufted construction, loop pile, minimum 1/8" gauge and minimum pile density of 4725. Provide carpet with a greater than or equal to 3.5 (Severe) TARR traffic level classification in accordance with ASTM D7330 or CRI Test Method 103.

#### 1.3.2.2 Static Control

Provide static control that is appropriate for the function of the room.

#### 1.3.2.3 Flammability and Critical Radiant Flux Requirements

Carpet must comply with 16 CFR 1630 or ASTM D2859. Provide carpet in corridors and exits with a minimum average critical radiant flux of .45 watts per square centimeter when tested in accordance with ASTM E648.

#### 1.3.2.4 Tuft Bind

Comply with ASTM D1335 for tuft bind force required to pull a tuft or loop free from carpet backing with a minimum 10 pound average force for loop pile broadloom and 8 pound average force for modular carpet tile.

#### 1.3.2.5 Warranty

Provide manufacturer's standard performance guarantees or warranties including minimum ten year wear warranty, two year material and workmanship and ten year tuft bind and delamination.

#### 1.3.2.6 Recycling of Existing Carpet

Recycle existing carpet to be removed so it does not go to a landfill. Add requirement to the carpet specification that carpet is to be removed with delivery to a manufacturer that accepts recycled carpet. Removal and handling of existing carpet must be per the manufacturer's recommendations. Include a submittal requirement (SD-07 Certificate) in the carpet specification for recycled carpet that shows compliance with these requirements. It is recommended that this requirement be included in UFGS 01 74 19 CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT.

#### 1.3.2.7 Installation

Perform all work by manufacturer's approved installers in accordance with the manufacturer's printed instructions and CRI 104/CRI 105. For warranties to be valid install all carpet in accordance with the installers guidelines, including preparation of subfloor. Install broadloom carpet direct glue down. Install carpet tile with release adhesive or a manufacturer approved adhesive tab system. Provide water resistant, mildew resistant, nonflammable, and nonstaining adhesives and concrete primers for carpet installation as required by the carpet manufacturer.

#### 1.3.3 Tread Inserts for Entrance Mat

Provide tread inserts consisting of carpet/bristle filament mix, or serrated aluminum.

#### 1.3.4 Vinyl Composition Tile

Provide vinyl composition tile that conforms to ASTM F1066, Class 2, (through pattern tile), Composition 1, asbestos-free and 1/8 inch thick. Solid color tiles are recommended for use as an accent only in small quantities and not as the floor field color. Tile shall have the color and pattern uniformly distributed through the thickness of the tile.

#### 1.3.5 Luxury Vinyl Tile

Conform to ASTM F1700 Class III printed film (minimum wear layer thickness 0.030 inch (30 mil) and minimum overall thickness 0.098 inch or 0.118 inch. Provide tile with a factory protective finish that enhances cleanability

and durability. Provide minimum 15 year manufacturer's standard performance warranty.

#### 1.3.6 Rubber Flooring

Conform to ASTM F1344 for tile, Class 1 homogeneous, Type A (solid color) or Type B (through mottled). Conform to ASTM F1859 (flooring without backing) for sheet flooring, Type I homogeneous, minimum 36 inches wide. Provide smooth, hammered or raised dot surface.

#### 1.3.7 Stair Treads, Risers, and Stringers

Conform to ASTM F2169 for rubber treads, risers, and stringers. Provide treads with raised dot surface. Provide either a one piece nosing/tread/riser or a two piece nosing/tread design with a matching coved riser. Provide stringer angles on both the wall and banister sides of the stairs, and landing trim.

#### 1.3.8 Resilient Granite Tile and Base

Provide tile consisting of marble chips embedded in a flexible thermoset polyester resin matrix, 3/8 inch thick, and a nominal 12 inches x 12 inches or larger square. Tiles must have a smooth polished finish with uniform color distribution of chips and marble chips with manufacturer's standard gradation. Flooring to meet or exceed the following criteria: Compressive Test of 203 to 351 kilograms/centimeter squared in accordance with ASTM C109/C109M, Coefficient of Friction of 0.70 to 0.74 average in accordance with ASTM D2047, Class 1 as per ASTM E648, and Abrasive Wear of volume loss/cm cubed of 0.0196 in accordance with ASTM F510.

#### 1.3.9 Stained Concrete Flooring

Provide stained concrete flooring similar or equal to L.M. Scofield Lithochrome Chemstain system. The installer must be approved by the manufacturer and have a minimum of 5 years experience in installing the product.

#### 1.3.10 Ground and Polished Concrete

Ground and polished concrete must be Grade 2 (salt and pepper finish), Class 2 (Medium Reflectivity, 800 grit). Concrete floor to have a Floor Flatness Factor of FF50 or better per ASTM E1155. Use a manufacturer approved grout filler to patch any voids that may have been exposed by the grinding process. Use a lithium densifier that chemically reacts to the concrete and fills holes and a sealant on floor slabs to provide a durable and easily maintainable finished surface.

#### 1.3.11 Wall Base

Conform to ASTM F1861 for rubber base. Provide coved (installed with resilient flooring) and straight (installed with carpet) base, 4 inches high and a minimum 1/8 thick with job formed corners.

#### 1.3.12 Transition Strips

Provide transition strips where flooring termination is higher than the adjacent finished flooring and at transitions between different flooring materials. When transition strips are required at doors install them under door centerlines. Transition strips are not required at doorways

where thresholds are provided. Provide tapered mouldings of vinyl or rubber unless otherwise specified. Provide an aluminum transition strip between porcelain or ceramic tile and other flooring types. Provide types as recommended by flooring manufacturer for both edges and transitions of flooring materials specified.

#### 1.3.13 Ceramic Tile/Porcelain

Conform to ANSI A137.1, moderate to heavy grade only. Provide glazed or unglazed porcelain tile, base and trim with the color extending uniformly through the body of the tile. Provide floor tiles with a wet dynamic coefficient of friction (DCOF) value of 0.42 or greater when tested in accordance with ANSI A137.1 requirements.

#### 1.3.14 Paints and Coatings

Provide paints and coatings appropriate for the exposure condition, required performance characteristics, and type of substrate to accept such finish. Surface preparation and material requirements must comply with sustainability VOC limitations.

The following surfaces are not to be painted:

- a. Metal surfaces of aluminum, stainless steel, chromium plate, bronze, copper, or similar finish materials.
- b. Surfaces of hardware, fittings, sprinkler heads, fire protection equipment, and other factory finished items not requiring a painted finish.
- c. Factory finished surfaces must not be painted unless specifically listed to receive paint.

#### 1.3.15 Vinyl Wallcovering

Vinyl wallcovering shall be vinyl coated woven or nonwoven fabric, contain bactericides and mildew inhibitors and conform to FS CCC-W-408 Type II. Wallcovering shall have a class A flame spread rating of 0-25 and smoke development rating of 0-50 when tested in accordance with ASTM E84 or NFPA 286. Clear plastic corner guards shall be provided at all exposed corners with vinyl wallcovering.

#### 1.3.16 Textile Wallcovering

Textile wallcovering shall be fabricated of woven fabric with paper or acrylic backing and be colorfast, stain, and soil resistant. Test in accordance with NFPA 265 or NFPA 286. Meet the requirements of Class A when tested in accordance with ASTM E84 or UL 723.

#### 1.3.17 Dry Erase Magnetic Wall Wallcovering

Dry erase magnetic wall material shall accept dry erase markings and magnets. Wallcovering to extend horizontally from left corner to right corner in room. Locate bottom edge of material above chair and table height to protect it from furniture and traffic. Provide wallcovering with an aluminum trim frame at top of wallcovering edge and full length tray at bottom edge of wallcovering. Markings shall be removable with a felt eraser or cloth without ghosting. Provide each unit complete with eraser/cloth, four different color compatible dry erase markers, 8 ounce

bottles of liquid surface cleaner and 20 magnets recommended by the manufacturer.

#### 1.3.18 Interior Signage

Signage must conform to 36 CFR 1191 (ABA), NFPA 101, UFC 3-120-01 Design: Sign Standards and USAFA DS. Provide signage for all rooms, including toilets, unless otherwise directed by the Contracting Officer. Provide stairwell and tactile exit signs as required by NFPA 101. Also, provide no smoking signs at building entrances as required by the User and for sustainability. Provide all signs with exception of those for toilets, mechanical, electrical and communications rooms, stairwell, no smoking and exit signs with a clear sleeve that will accept a paper insert, unless otherwise noted by the Base Civil Engineer (BCE) Office. Provide paper and software for creating text and symbols for computers identified by owner for Owner production of replacement paper inserts required after project completion. Provide building directories and directional signage. Coordinate all signage requirements, including message content and room numbering, and placement of signs with User and Contracting Officer.

#### 1.3.19 High Impact Wallcovering/Panels

Provide wall covering/panels consisting of high impact rigid acrylic vinyl or polyvinyl chloride resilient material. Provide panel sizes of 3 x 8 or 4 x 8 feet and a minimum .060" thick. Minimum impact resistance must be 18 ft-lbs/sq. inch when tested in accordance with ASTM D256 (Izod impact, ft-lbs per sq inch notched). Fire rating must be Class 1 when tested in accordance with ASTM E84, having a maximum flame spread of 25 and a smoke developed rating of 450 or less. Material must be rated self extinguishing when tested in accordance with ASTM D635. Label and test material by an approved nationally known testing laboratory. Finish top edge and seams of wallcovering/panels.

#### 1.3.20 Solid Surface Material

Provide solid surface material for countertops, backsplashes, lavatories and window sills. Solid surface material to be homogeneous filled solid polymer, not coated, laminated or of a composite construction, meet CSA B45.5-17/IAPMO Z124 requirements and be composed of cast 100 percent acrylic. Color and pattern must go through the thickness of the material. Provide minimum of 1/2 inch thick material for countertops and window sills.

#### 1.3.21 Shower Surrounds and Shower Pans

Solid surface material may be provided for shower surrounds and shower pans. Material to be homogeneous filled solid polymer, not coated, laminated or of a composite construction, meet CSA B45.5-17/IAPMO Z124 requirements and be composed of cast 100 percent acrylic (basis of design - Corian). Precast terrazzo shower pans are also acceptable. Color and pattern must go through the thickness of the material.

#### 1.3.22 Warranty

Provide warranties that comply with the UFGS specification minimum requirements, unless otherwise noted. When manufacturers standard performance guarantees or warranties exceed the minimum requirements identified, provide the standard performance guarantee or

warranty.

#### 1.3.23 Installation of Finishes

All finishes must be installed as per manufacturer's recommended installation instructions, to include recommended equipment, adhesives and other related items. Furnish and install all finishes and related accessory components necessary for a complete, functional and finished installations.

#### 1.3.24 Extra Materials

Provide extra material for all finishes in minimum quantities of 2% to 5%. Required quantity for range of percentage must be coordinated with the Contracting Officer.

### 1.4 BUILDING FINISH COLORS

The word "color" as used herein includes surface color and pattern. Color selections must provide an aesthetically pleasing, comfortable, easily maintainable and functional environment for the occupants. Coordination of interior and exterior building colors and finishes is necessary for a cohesive design. Color selection must be appropriate for the building type. Limit the number of similar colors for each material.

**Grout:** Provide medium range colors for ceramic and porcelain tile grouts to help hide soiling.

**Plastic Laminate and Solid Surface Material:** Provide materials that are patterned or are mottled, flecked or speckled; solid colors are not acceptable. Countertops at sinks must be light to medium range in color to help hide water spotting. Dark color solid surface materials are not recommended since they show scratches more readily.

**Carpet:** Solid color carpet may be used as a border or small area of accent in higher profile spaces to add interest.

**Patterns:**

- Use variation of color or floor patterns to visually shorten long corridors and add interest.

**Accent Walls:** Recommend the use of accent walls when appropriate to add interest.

**Stained Woodwork:** Match stained woodwork throughout the facility.

**Miscellaneous Items:** Finish colors of fire extinguisher cabinets, receptacle bodies and plates, fire alarms/warning lights, emergency lighting, and other miscellaneous items must be coordinated with the building interior design. Match color of equipment items on ceilings (speakers, smoke detectors, grills, etc.) with the ceiling color.

#### 1.4.1 Color Schedule

Finish colors are listed to establish design direction for the facility. The manufacturers referenced are not intended to limit the selection of equal colors from other manufacturers. Colors for finishes not identified must be compatible and coordinate with the listed finish colors and must be coordinated with the Contracting Officer.

#### 1.4.1.1 Interior Finish Colors

Coordinate interior finishes and colors with the User. Incorporate accent colors for floors two, three and four that match the individual squadron color of the squadron housed on that floor.

#### 1.4.1.2 Exterior Finish Colors

See Section 01 82 00 ARCHITECTURAL REQUIREMENTS for exterior finish and color information.

### 1.5 FURNITURE, FIXTURES AND EQUIPMENT (FF&E)

#### 1.5.1 FF&E Design

Provide FF&E design and conform to the requirements of the UFC 3-120-10 Design: General Interior Design Requirements. Coordinate product and functional requirements with the User. Consider quality, function, aesthetics, comfort, safety, and sustainability during the selection of furnishings. Furniture items to be included in the FF&E package include desks, seating, tables, storage, filing, dorm room furniture (including bed, under bed storage, desk and desk chair), artwork, appliances, and accessories. Coordinate furniture styles, finishes and upholsteries with the building design. Design the furniture package in accordance with the Federal Acquisition Requirements, the User Requirements and the Contracting Office's procurement methodology.

#### 1.5.2 Reuse of Existing Furniture

The furniture design includes new furniture. Existing furniture will not be reused.

#### 1.5.3 Furniture Requirements

##### 1.5.3.1 General

Provide furniture that complies with the following:

- a. Specify furniture from within a manufacturer's family wherever possible while ensuring aesthetic, quality and functionality are not compromised.
- b. Specify furniture that is compatible with the international architectural style of the installation (clean lines, minimalistic, function follows form, etc.). Provide furniture that is inspired from the existing industrial style furniture in the Cadet Area Dormitories.
- c. Provide fire retardant Materials to the maximum extent possible and comply with U.L. listings where applicable.
- d. Specify user friendly features such as radius edges. Sharp edges and exposed connections are not acceptable. Conceal clips, screws, and other construction elements where possible. When specifying furniture, consider features that prevent damage from vacuum cleaners and maintenance products.
- e. Specify casters and glides that are appropriate for the floor material they are located on. Universal casters that are appropriate for use on both hard surface flooring and carpet are preferred.



- f. Completely finish all sides of desks and storage.
- g. Coordinate electrical and communication requirements with 01 86 26 Electrical Requirements and 01 86 29 Communication Requirements.
- h. Items such as desks must include all necessary components to be structurally sound, finished, and must not be attached to the wall.
- i. Desks, storage, and tables must have leveling devices to compensate for uneven floors.
- j. Office furniture (desks, storage, etc.) to have the same pulls and finish to provide a coordinated and compatible furniture design. Door and drawer pulls shall be an attached exterior pull. Coordinate style and finish with the overall building and furniture aesthetic.
- k. Fabric. Provide patterned upholstery fabric when necessary to help hide soiling. Upholstery fabric shall meet Wyzenbeek Abrasion Test; 50,000 minimum double rubs. It is recommended that heavier use areas have a minimum 100,000 double rubs. A topical or inherent soil retardant treatment is required. Vinyl, Polyurethane, Silicone, Crypton, or hard surface material must be used in heavy use areas as coordinated with the User and Corps Interior Designer. Provide mid grade fabrics.
- l. Finishes. Finishes must be able to be cleaned with ordinary household cleaning solutions. Wood finishes must be able to be cleaned with damp cloth as directed by the manufacturer. The finish of steel surfaces must be the manufacturer's most durable finish such as factory powder coat or baked enamel unless otherwise noted. Grommet colors must be compatible and coordinated with desk and table finish colors. Finishes must be neutral and not too light in color to help hide soiling. Plastic laminate worksurfaces and table tops must be neutral in color and must have a pattern to help hide soiling.
- m. Locks. Excluding dorm room furniture, all drawers and doors (such as overhead storage cabinets, wardrobe storage, supply and storage type cabinets, desk pedestals, and filing cabinets) must be lockable. Key each desk differently and key locks within each office alike. Provide two keys for each grouping of office furniture alike. Also provide two keys for each miscellaneous item such as filing cabinets, supply cabinets, storage cabinets, and similar type furniture items. See dorm room furniture items below for dorm room desk and storage locking requirements.
- n. Keyboard Tray. Where indicated, provide worksurfaces that are capable of accepting an articulating keyboard tray. The keyboard tray must be capable of fully recessing under the work surface and extending to give the user full access to the keyboard. The keyboard tray must have height adjustability and positive and negative tilting capability and have 180-degree swing side travel rotation. The keyboard tray must have a wrist support and include a mouse pad at the same level as the keyboard that can accommodate both right and left handed users.
- o. Monitor Arm. Provide a monitor arm on desks, excluding dorm room desks. Specify a dual monitor arm for 2 screens that allows 360 degree monitor rotation for portrait and landscape viewing, and 60 degree range of lateral and vertical monitor tilt for additional viewing adjustability.

#### 1.5.3.2 Warranty

Provide manufacturer performance guarantees or warranties for single-shift service and include parts, labor and transportation as follows, unless otherwise noted:

- a. Desks - 12 year minimum
- b. Filing and Storage - 12 year minimum
- c. Seating
  - (1) Seating, unless otherwise noted - 10 year minimum
  - (2) Seating Mechanisms and Pneumatic Cylinders - 10 year minimum
  - (3) Stacking Chairs - 12 year minimum
- d. Tables
  - (1) Unless otherwise noted - 10 year minimum
  - (2) Table Mechanisms - 5 year minimum
  - (3) Table Ganging Device - 1 year minimum
- e. Miscellaneous
  - (1) Fabric - 3 year minimum
  - (2) LED Task Lighting - 5 year minimum
  - (3) Podium - 12 year minimum, except 1 year warranty for electrical assemblies/components

Provide items not listed with a minimum 1 year minimum. When manufacturers standard performance guarantees or warranties exceed the minimum requirements identified, provide the standard performance guarantee or warranty. Submit manufacturer's warranty information for all furniture items.

#### 1.5.3.3 Furniture Electrical, Data and Voice

- a. Electrical. Complete the final furniture connections to the building electrical system for furniture requiring hardwiring.
- b. Furniture Data Voice. Provide all IT cables (i.e. NIPRNET, etc.) and phone wiring up to and including the face plate/box of furniture as applicable and the services to install cables/phone wiring and face plates/boxes in the furniture. This is applicable for furniture with phone and data capability.

#### 1.5.3.4 Certified Installers and Licensed Electricians

When recommended by the furniture manufacturers, furniture shall be handled by an authorized dealer with certified installation crew. All furniture requiring electrical connection to the building shall be completed by a licensed electrician, the certified installers shall be on site if questions arise during connection.

#### Furniture Items

Specify furniture from within a manufacturer's family wherever possible while ensuring aesthetic, quality and functionality are not compromised.

#### DESKS:

##### U-SHAPED DESK

Provide U-shaped desk with:

- Desk and storage to be steel construction with high pressure plastic laminate worksurfaces. Plastic laminate self edges are not acceptable.
  - Configuration: U-Shaped Desk consisting of a primary work surface with a grommet, box/box/file pedestal, pencil drawer; height adjustable bridge with grommet and keyboard tray; and credenza work surface (located behind primary worksurface) with file/file pedestal. Locate overhead storage above the credenza work surface. Overhead storage to extend the length of the credenza worksurface and have doors, fabric covered tackboard, and full length undercabinet LED task light. Height of overhead storage shall allow area below to be used as a worksurface. Desk to have full modesty panel at primary worksurface. Full modesty panels are not required at walls; if provided at walls, modesty panels must allow access to wall electrical and communication outlets. Provide kneespace that is not obstructed by panels/legs that interfere with kneespace of seated person.
  - Wardrobe storage to be freestanding and have a full height wardrobe with coat rod that is large enough to hold a uniform.
  - Pedestals shall be the longest depth suitable for the depth of the worksurface.
  - Storage to be lockable.
- Minimum Desk Dimensions: Primary Worksurface - 72"w x 30"d x 29"h; Return - 42"w x 24"d x 29"h; Credenza Worksurface - 72"w x 24"d x 29"h; Overhead Storage - 72"w x 14 1/2"d x 38"h
- Minimum Wardrobe Storage Dimensions: 15"w x 24"d; to be same height as the overhead storage.

#### L-SHAPED DESK

Provide L-shaped desk with:

- Desk and storage to be steel construction with high pressure laminate worksurfaces. Plastic laminate self edges are not acceptable.
  - Configuration: L-Shaped Desk consisting of a primary work surface with a grommet, box/box/file pedestal, pencil drawer and a height adjustable return with grommet and keyboard tray. Locate overhead storage above the return work surface. Overhead storage to extend the length of the return worksurface and primary worksurface and have doors, fabric covered tackboard, and full length undercabinet LED task light. Height of overhead storage shall allow area below to be used as a worksurface. Desk to have full modesty panel at primary worksurface. Full modesty panels are not required at walls; if provided at walls, modesty panels must allow access to wall electrical and communication outlets. Provide kneespace that is not obstructed by panels/legs that interfere with kneespace of seated person.
  - Wardrobe storage to be freestanding and have a full height wardrobe with coat rod that is large enough to hold a uniform.
  - Pedestals shall be the longest depth suitable for the depth of the worksurface.
  - Storage to be lockable.
- Minimum Desk Dimensions: Primary Worksurface - 72"w x 30"d x 29"h; Return - 42"w x 24"d x 29"h; Overhead Storage - 72"w x 14 1/2"d x 38"h
- Minimum Wardrobe Storage Dimensions: 15"w x 24"d; to be same height as the overhead storage.

#### SINGLE PEDESTAL DESK

Provide single pedestal desk with:

- Desk to be steel construction with high pressure laminate worksurface. Plastic laminate self edge is not acceptable.
- Pedestal to be full depth box/box/file pedestal. Pedestal shall be the

longest depth suitable for the depth of the worksurface.

- Height of desk modesty panel to allow access to wall electrical and communication outlets.

- Storage to be lockable.

Dimensions: 4'w x 2'd x 29"h

#### DORM ROOM FURNITURE:

##### BED

Provide bed with:

- Steel construction with powder coated finish
- Twin XL unbunked beds
- Twin XL mattress that is moisture and bed bug resistant
- Storage drawers beneath the bed that are integral to the bed frame
  - Storage to be four drawers on metal glides
  - Maximize storage space
  - Storage beneath bed does not need to be lockable

##### DESK

Provide desk with:

- 24"d x 60"w
- Steel construction with powder coated finish frame and plastic laminate worksurface
  - Plastic laminate worksurface edge is not acceptable
- Tackboard
- Double pedestal with minimum of one pedestal containing box drawers that are lockable with a padlock
- Open, single tier overhead storage with integral lighting beneath

#### MISCELLANEOUS ITEMS:

##### SMALL TRASH RECEPTACLE

Provide rubber or vinyl trash receptacle, rectangular in shape with a 28 quart capacity.

Dimensions: 14"w x 10"d x 15"h

##### LARGE TRASH RECEPTACLE

Provide rubber or vinyl trash receptacle, rectangular in shape with a 10 gallon capacity.

Dimensions: 15"w x 11"d x 20"h

##### RECYCLING CENTER

Provide recycling center with stainless steel front, side and back, and plastic liners. Center consists of three 28 gallon units with open top configuration. Include standard labels and openings for paper, plastic and cans recycling. Containers to be easily connected to keep aligned. Each unit to have a door to access and remove contents.

##### LACTATING MOTHERS ROOM REFRIGERATOR

Provide refrigerator with a minimum refrigeration capacity of 5.6 cubic feet. Refrigerator shall be Energy Star Qualified and ABA compliant and smudge proof stainless steel finish.

#### TOP-FREEZER REFRIGERATOR

Provide refrigerator with automatic defrosting freezer on top and refrigerator below with minimum two vegetable bottom baskets, adjustable refrigerator compartment and door shelves. Refrigerator shall be Energy Star Certified and ABA compliant, minimum 18 cubic feet storage, and smudge proof stainless steel finish. An ice maker is not required, but can be provided. Dimensions: Coordinate size of refrigerator with architectural plan to ensure that refrigerators will fit and doors will open properly.

#### ICE MACHINE

Provide ice machine with tamper proof dispenser that produces small ice with 420lbs of storage capacity. Ice machine to be Energy Star Certified.

#### MICROWAVE

Provide a microwave that sits on counter, has glass window door, automatic interior light, digital time controllers, electronic touch control panel, minimum 1.6 cubic feet and a stainless steel finish. Location to be ABA compliant.

#### WASHER

Provide washer from the same manufacturer as the dryer. Washer to be Energy Star Certified, ABA compliant, high efficiency, front load, minimum 4.2 cu ft capacity, stainless tub, and be UL listed. Provide all necessary components and accessories (including stack kit, hoses, etc.) to provide an operational stacked washer and dryer. Coordinate type of connection electric (including voltage, etc.) or gas with building design.

#### DRYER

Provide dryer from same manufacturer as the washer. Dryer to be Energy Star Certified, front load, minimum 7.4 cu ft capacity, and be UL listed. Provide all necessary components and accessories (including stack kit, etc.) to provide an operational stacked washer and dryer. Coordinate type of connection electric (including voltage, etc.) or gas with building design.

#### TV, 42"

Provide a wall mounted, Energy Star Certified flat screen TV with computer interface as required by the User. Wall mount bracket to provided and installed as part of the base bid. Coordinate and ensure sure that TV and bracket are compatible.  
Dimensions: 42" Diagonal

TV, 75"

Provide a wall mounted, Energy Star Certified flat screen TV with computer interface as required by the User. Wall mount bracket to provided and installed as part of the base bid. Coordinate and ensure sure that TV and bracket are compatible.

Dimensions: 75" Diagonal

#### SEATING:

##### DESK CHAIR

Provide an ergonomic desk chair with five star base and casters, adjustable height arms with durable soft arm caps, waterfall front, swivel, tilt, variable back lock, adjustable lumbar support, pneumatic seat height adjustment, minimum 2.5" minimum adjustable seat depth, and padded, contoured upholstered seat and back. Desk chair shall have an adjustable seat height range of 4 1/2", range to include 16 1/2-20". Minimum overall chair height of 38". Chair must be able to support up to 300 lbs. Chair base to be metal type finish with silver or similar color to help hide soiling and dust.

##### GUEST CHAIR

Provide guest chairs that are compatible in style, finish and color with the desk. Provide chair with arms and four legs. Seat and back to be cushioned and upholstered. Chair must be able to support up to 300 lbs.

##### BREAK ROOM CHAIR

Provide cafe height chair with sled or four leg base. Legs to be steel construction with powder coat finish. Chair seat and back to be plastic or polypropylene. Chair must be able to support up to 300 lbs each.

##### LOUNGE SEATING

Provide durable lounge seating that includes upholstered seat and back with arms. Upholstery to meet or exceed 100,000 Wyzenbeek double rubs. Lounge seating must be able to support 300 lbs. Provide glides as necessary for the flooring type.

##### ROCKER/GLIDER

Provide rocker/glider with vinyl upholstered seat and back and enclosed arms with soft radius edged wood arm caps. Rocker/glider to have a high back and support up to 300lbs.

#### STORAGE:

##### INDUSTRIAL SHELVING

Provide heavy duty industrial shelving with boltless assembly. Shelves to be particle board and be adjustable on 1.5" centers with 3 adjustable shelves per unit. Each shelf to hold minimum of 1200 lbs. Finish on frame to be baked powder coating.

#### LATERAL FILE WITH BOOKSHELF ABOVE

Provide storage unit with two drawer lateral file with bookshelves above. Storage piece to be from the same manufacturer, compatible style, finish and with the same hardware as the U-shape and L-shape desks. Bookshelf component to have enclosed top, sides and back with two adjustable shelves. Lateral file storage to include hanging rails for filing side to side and front to back, counterweights as required and be lockable.

#### LATERAL FILE CABINET

Provide a lateral file cabinet from the same manufacturer and compatible style as the single pedestal desk. Lateral file to be of steel construction, include hanging rails for filing side to side and front to back, counterweights as required and be lockable.

#### TABLES:

##### BREAK ROOM TABLE

Provide cafe height table to accommodate four chairs. Provide table with high pressure plastic laminate top with flat vinyl or PVC edge. A 90 degree plastic laminate self edge is not acceptable. Table top shall be constructed to prevent warpage. Base shall be "X" style with chrome, polished aluminum or silver (or similar color) powder coat finish.

##### CONFERENCE TABLE

Provide conference table with high pressure plastic laminate top with flat vinyl or PVC edge. A plastic laminate self edge is not acceptable. Table top to be constructed to prevent warpage. Table legs shall be appropriate for a conference room. Table to seat 10 chairs.

##### SIDE TABLE

Provide side table for lactating mothers room. Table to have plastic laminate top and protective edge. A 90 degree plastic laminate self edge is not acceptable. Table top shall be constructed to prevent warpage. Minimum size required is 15"w x 20"d.

#### 1.5.4 Furniture Plans

Furniture layout must be functional and coordinate with the building design to assure that locations of electrical outlets and switches, communication outlets, and lighting within the building are appropriate. The layout must also be coordinated with other building features such as architectural elements, thermostats, location of TVs, etc. Locate

furniture in front of windows only if the top of the item falls below the window. The furniture layout must conform to requirements specified in 36 CFR 1191, and NFPA 101.

#### 1.5.5 Roller Window Shades

Provide roller window shades as part of the FF&E package bid option. Roller window shades to have a manual operated chain drive and be mounted in recessed soffit pockets as per 01 82 00 ARCHITECTURAL REQUIREMENTS. Roller tube must operate smoothly and be of sufficient diameter and thickness to prevent excessive deflection. The shade cloth must meet the performance described in NFPA 701, small scale test. Provide hardware that allows for field adjustment or removal of shade roller tube and other operable hardware component without requiring removal of brackets and end or center supports.

Provide roller window shades with room darkening shade cloth at all dorm room windows.

Provide roller window shades with light filtering shade cloth with 1% openness factor in the following rooms if the rooms are located on the perimeter of the building:

- Day Room
- Study Room
- Offices
- Lactating Mother's Space

#### 1.5.6 Purchase and Installation

FF&E purchase and installation is a bid option to the construction contract.

PART 2 NOT USED

PART 3 NOT USED

-- End of Section --



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## DIVISION 01 - GENERAL REQUIREMENTS

## SECTION 01 86 10

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## SECTION 01 86 10

## MECHANICAL REQUIREMENTS

## PART 1 MECHANICAL REQUIREMENTS

## 1.1 MECHANICAL SYSTEM CRITERIA

## 1.1.1 General Parameters/References

Mechanical systems including HVAC systems, plumbing systems, heating and chilled water piping, Ground Source Heat Pump System including vertical well-field and piping(if selected), equipment, building temperature controls, gas distribution system shall be designed to comply with this section and the documents listed below. The publications are referred to in the text by basic designation only. The latest edition of the following standards and codes in effect and amended as of the date of the supplier's proposal, and any subsections thereof as applicable, shall govern design and selection of equipment and material supplied:

## ASSOCIATED AIR BALANCE COUNCIL (AABC)

AABC MN-1	(2002; 6th ed) National Standards for Total System Balance
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## AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A13.1	(2015) Scheme for the Identification of Piping Systems
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## AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)

ASHRAE FUN IP	(2021) Fundamentals Handbook, I-P Edition
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ASHRAE HVAC APP IP HDBK	(2016) HVAC Applications Handbook, I-P Edition
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ANSI/ASHRAE 15 & 34	(2013) ANSI/ASHRAE Standard 15-Safety Standard for Refrigeration Systems and ANSI/ASHRAE Standard 34-Designation and Safety Classification of Refrigerants
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ASHRAE 55	(2010) Thermal Environmental Conditions for Human Occupancy
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ASHRAE 62.1	(2010) Ventilation for Acceptable Indoor Air Quality
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ASHRAE 90.1	(2013) Energy Standard for Buildings Except Low-Rise Residential Buildings
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ASHRAE 135	(2016) BACnet-A Data Communication
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Protocol for Building Automation and  
Control Networks

ASHRAE 189.1 (2014) Standard for the Design of  
High-Performance Green Buildings Except  
Low-Rise Residential Buildings

## AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME CSD-1 (2021) Control and Safety Devices for  
Automatically Fired Boilers

## ASTM INTERNATIONAL (ASTM)

ASTM A53/A53M (2020) Standard Specification for Pipe,  
Steel, Black and Hot-Dipped, Zinc-Coated,  
Welded and Seamless

ASTM B117 (2019) Standard Practice for Operating  
Salt Spray (Fog) Apparatus

ASTM D1785 (2015; E 2018) Standard Specification for  
Poly(Vinyl Chloride) (PVC), Plastic Pipe,  
Schedules 40, 80, and 120

## INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC (2021) International Building Code

ICC IMC (2021) International Mechanical Code

ICC IPC (2021) International Plumbing Code

## NATIONAL ENVIRONMENTAL BALANCING BUREAU (NEBB)

NEBB-01 (2009) Procedural Standards for Whole  
Building Systems Commissioning of New  
Construction; 3rd Edition

## NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 54 (2021) National Fuel Gas Code

NFPA 70 (2020; ERTA 20-1 2020; ERTA 20-2 2020; TIA  
20-1; TIA 20-2; TIA 20-3; TIA 20-4)  
National Electrical Code

NFPA 90A (2021) Standard for the Installation of  
Air Conditioning and Ventilating Systems

SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION  
(SMACNA)

SMACNA Guidelines (2007) IAQ Guidelines for Occupied  
Buildings Under Construction, 2nd Edition

SMACNA 1966 (2020) HVAC Duct Construction Standards  
Metal and Flexible, 4th Edition

## U.S. AIR FORCE (USAF)

AFI 90-1701                      Energy Management; Energy Policy Act of  
2005,16 July 2009

## U.S. Air Force Academy (USAFA)

USAFA DS                      (Latest Approved Version) USAFA Design  
Standards

## U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 1-200-01                      DoD Building Code

UFC 1-200-02                      High Performance and Sustainable Building  
Requirements

UFC 3-301-01                      Structural Engineering

UFC 3-400-02                      Engineering Weather Data

UFC 3-401-01                      Mechanical Engineering

UFC 3-410-01                      Heating, Ventilating, Air Conditioning  
Systems

UFC 3-410-02                      Direct Digital Control for HVAC and Other  
Building Control Systems

UFC 3-420-01                      Plumbing Systems

UFC 3-430-01FA                      Heating and Cooling Distribution Systems

UFC 3-430-07                      Operations and Maintenance: Inspection and  
Certification of Boilers and Unfired  
Pressure Vessels

UFC 3-450-01                      Noise and Vibration Control

UFC 3-470-01                      Utility Monitoring And Control System  
(UMCS) Front End And Integration

UFC 3-490-06                      Elevators, With Change 1

UFC 4-010-01                      DoD Minimum Antiterrorism Standards for  
Buildings

UFC 4-010-06                      Cybersecurity of Facility-Related Control  
Systems

## U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

PL 109-58                      Energy Policy Act of 2005 (EPAct05)

PL 110-140

Energy Independence and Security Act of  
2007

## 1.2 FACILITY DESCRIPTION

See Specification Section 01 81 00 for a description of new facility, functional requirements, and overall scope of work under this contract.

## 1.3 DEMOLITION

Refer to Specification Section 01 82 00 paragraph 1.4.2 for the general requirements of the existing Preparatory School Dormitory buildings 5210, 5212, and 5214 that are subject to demolition as a part of this contract. Refer to Specification Section 02 41 00 for the detailed demolition requirements and preparation of demolition plans. At a minimum, the existing utility services including Medium or High Temperature Hot Water (MTHW or HTHW) supply and return lines to the existing dormitory buildings shall be demolished up to the nearest main and shall be capped and plugged unless otherwise directed by the 10th Civil Engineer Squadron (10th CES).

## 1.4 GENERAL REQUIREMENTS

### 1.4.1 Summary Of Work

The mechanical portion of this project shall consist of the design and construction of the mechanical systems including plumbing systems for a new Consolidated Preparatory School Dormitory (a four story building-forty two (42) dorm rooms per floor excluding the first floor (i.e. total of 126 dorm rooms )) to be located at the U.S. Air Force Academy, Colorado Springs, Colorado. The Contractor shall develop a complete design, provide equipment, and install mechanical systems in order to provide complete and operational building systems for the new dormitory building. The mechanical systems including but not limited to terminal units, ventilation systems, and cooling and heating plants shall be integrated with operable window operations (by providing occupancy sensors, window switches, or other control devices to disable systems in zones where windows are open) that will allow the systems to operate as "mixed-mode" to improve efficiency. The systems design shall fully incorporate all specific requirements outlined in the latest approved version of USAFA Design Standards- USAFA DS as well as UFC 3-401-01, PL 109-58, and PL 110-140. The design build contractor shall specify Energy Star® and FEMP-recommended products be procured as part of this project and require the submission of energy efficiency specifications during the design submittal evaluation process.

Contractor shall perform all calculations necessary to determine required capacities and sizes of equipment, ductwork, and piping. Contractor shall develop all mechanical distribution systems in accordance with UFC 3-410-01 including but not limited to; low pressure ductwork, building chilled and hot water loop piping, ground source heat pump system and piping (if system has been selected based on Life Cycle Cost Analysis-LCCA), domestic service water system and piping, exterior / interior gas piping, system controls, etc..

Mechanical systems, including HVAC systems, plumbing, and controls shall be designed to comply with the requirements defined in this chapter, including the applicable requirements contained in the documents referenced above. System design allowed for the Contractor's selection

shall be based on the combined factors of energy conservation, beneficial life cycle cost analyses, first cost considerations, related first cost(initial/construction) limitations, and recurring maintenance costs using the criteria listed hereafter and acceptable analytic computer systems later in this section of the RFP. The LCCA Shall include a minimum of three(3) energy efficient alternatives to the ASHRAE 90.1 baseline systems and design the system to achieve at least 30% energy consumption reduction from ASHRAE 90.1-(2013) baseline systems.

The optimal and innovative mechanical systems shall be explored, investigated, and determined by a Life Cycle Cost Analysis (LCCA) of three or more feasible systems that to be performed after initial HVAC load calculations. LCCA shall be calculated using a 40-year building life and equipment lives. Individual components or systems life expectancies must be reflected by inclusion of appropriate replacement and salvage values in the appropriate year of this analysis.- All supporting documents including design analysis, narratives, calculations, assumptions, inputs and outputs from the program software shall be submitted for review.

The contractor shall submit the following documentation as a minimum throughout the design review submissions.

- Code Compliance Documentation
- Performance Rating Report
- HVAC Mandatory Provisions
- Service Water Heating Compliance Documentation
- Equipment selections and alternatives documented in a Life Cycle Cost Analysis (LCCA)

The LCCA shall utilize the:

- Latest edition of BLCC 5.3 or higher, or other Life-Cycle Costing software approved by USAFA.
- Building heating and cooling load calculation summary output from a a computer program or programs that integrate architectural features such as windows for daylighting, air-conditioning, heating, lighting, and other energy producing or consuming systems. These programs shall be capable of simulating the features, systems, and thermal loads used in the design. The program shall be capable of performing 8,760 hourly calculations.
- Provide an electronic archive of the building models from the software system used to perform the simulations along with a brief description of the software and release version used to perform the simulation.

The utility rates to be utilized for LCCA are;

- Water - \$5.06 per HCF
- Electricity - \$0.0596 per KWH
- Natural Gas - \$0.45 per Therm

Energy consumption for the purposes of calculating the 30% savings shall include space heating, space cooling, ventilation, service water heating, lighting, and all other energy consuming systems normally specified as part of the building design excluding receptacle and process loads. The calculations shall include the reducing fossil fuel reduction required by AFI 90-1701.

The contractor shall provide mechanical equipment control systems compatible with the existing USAFA installation wide EMCS to accommodate

data communications between the buildings. The systems shall not be proprietary. The systems shall be BACnet compatible meeting the ASHRAE 135 standard and the controls equipment shall be compatible with Siemens programming, logic, and interface. The control systems shall include features for programmed stop/start, duty cycling, scanning, indicating, reset, systems display, critical and maintenance alarms, intercom, maintenance scheduling, demand monitoring, and trend analysis. Advanced metering devices shall be installed and connected to the USAFA Siemens central Energy Monitoring and Control System (EMCS) to monitor quantity and quality of utilities consumed. Contractor shall coordinate with 10th Civil Engineer Squadron(10th CES) staffs to specify a direct digital control system that is fully compatible with the existing cabling, hardware, and software solutions.

Provide new mechanical systems, complete and ready for operation. The design and installation of all mechanical systems, including manufacturer's products shall meet the instructions and requirements contained herein and the requirements of the referenced technical guide specifications. Where conflicts between these instructions and the guide specifications or criteria exist, more stringent requirements shall take precedence.

No Mechanical Equipment including but not limited to solar panels/collectors, air handling equipment, air cooled condensing units, etc. will be allowed on the roof. Low profile intake/exhaust hoods may be allowed on the roof but not desired. Solar thermal hot water system(providing 30% of annual hot water demand) required per EISA 2007 Section 523 will not be considered for this project as the system has been found to be not cost effective(see attached LCCA).

Roof drains shall be provided at the low points of the roof and interior drainage system piping shall be provided. Secondary (emergency) roof drains or scuppers shall be provided where the roof perimeter construction extends above the roof. Roof drain bodies and piping shall be insulated. Roof drains shall be in accordance with the 2018 International Plumbing Code. To make the most efficient use of ceiling space, drain lines shall be sloped at 0.125 inch per ft. minimum.

## 1.5 DESIGN CONDITIONS

The following conditions shall be taken into consideration for the design. Location and weather related design information is provided by UFC 3-400-02, Design: Engineering Weather Data and shall be used in designing the mechanical systems.

### 1.5.1 Site Elevation

Site elevation is approximately 7,000 feet above sea level. Equipment performance shall be appropriately de-rated for site-specific elevation and the equipment schedules shall indicate the site elevation.

### 1.5.2 Latitude

38.97° North

### 1.5.3 Longitude

104.81° West



#### 1.5.4 Outside Design Conditions

Summer Conditions: 87°F dry bulb - 1%; 57°F MCWB - 1%

Mean Daily Range: 26°F dry bulb

Winter Conditions: 0°F dry bulb - 99.6%; 4°F MCWB - 99%

Cooling Degree Days: 2445; Note: MCDD50

Heating Degree Days: 7029; Note: MHDD65

#### 1.5.5 Inside Design Conditions

Design conditions for spaces shall be in accordance with UFC 3-410-01 and ASHRAE 55. Include provisions for energy saving opportunities such as: unoccupied temperature setback of temperatures, demand control ventilation, seasonal temperature adjustments, transferred air from other spaces, and any other innovative sustainable solutions.

Occupied Areas: 68 F DB 30% RH - (Heating); 78 F DB 50% RH - (Cooling).

Comm Room: 72 deg F - Year Around

Mechanical Room: 55 deg F dry bulb - (Heating); 10 deg F above Ambient (Mechanical Ventilation for Cooling)

Outside Air: ASHRAE 62.1-2016 Requirements shall be met.

Building shall be maintained at a slight positive pressure when operating during both the summer and winter months. Excess outside air shall first be relieved through areas generating odors (such as restroom area) then through exhaust system in conjunction with Makeup Air Units (MAUs), Air Handling Units(AHUs) or Dedicated Outside Air Systems (DOASs) operation. Air Flow Measuring Stations (AFMS) shall be installed in main supply and exhaust Ducts.

Supply air temperature leaving Fan Coil Units(FCUs) or other terminal units shall not exceed 55 deg F DB in the cooling mode. Leaving air temperature from FCUs or other terminal units shall be between 95 and 105 degrees F in the heating mode to minimize the air stratification.

Areas conditioned for comfort heating shall maintain a minimum 30% RH and areas conditioned for comfort cooling shall maintain a maximum 50% RH.

Duct Velocities:

Supply air: Main Ducts 1200 FPM

Supply air: Branch Ducts 0.07 inch of water per 100 feet of duct

Return air: 800 FPM maximum

Exhaust air: 1200 FPM maximum

(Exposed ductwork shall not be allowed in rooms with ceilings. Offsets and turns shall be gradual and built to maintain uniform flow.)

#### 1.5.6 Noise Levels

Noise levels shall remain within acceptable criteria as defined by UFC 3-450-01.

#### 1.5.7 Structural

Attach interior ceiling mounted fixtures to the supporting structural system (i.e., use seismic detailing from UFC 1-200-01 and UFC 3-301-01) in structures. This includes mechanical equipment, ducting, and piping.

Equipment and piping requiring structural support shall be located in such a way to minimize support steel costs while providing adequate maintenance access.

#### 1.5.8 Operation

The system shall be designed to operate automatically year round, twenty four (24) hours per day, seven (7) days per week. Contractor shall take into account that the majority of the building could be unoccupied or minimally occupied between mid May through early August. The building load calculations and selection of the mechanical systems including terminal units, ventilation system, and cooling plant equipment shall reflect the expected occupancy schedules stated above and the systems shall be capable to operate efficiently at given low load conditions.

#### 1.5.9 Mechanical/Electrical Equipment Coordination

Arrangement of all mechanical equipment ductwork and piping shall be coordinated with electrical work to prevent interference with electrical conduits. Electrical conduits and mechanical piping and ductwork shall not restrict access to the mechanical equipment for maintenance or repair. Clearances required by NFPA 70 above and in front of electrical panels and devices shall be maintained. Mechanical equipment (pipes, ducts, etc.) shall not be installed OVER OR WITHIN SPACE which is dedicated to transformers, panels, panelboards, or other electrical equipment unless items solely serve the area and the installation meets all applicable codes. When electrical equipment is located in a mechanical equipment space, the dedicated electrical space shall be indicated by a dashed line and noted "Electrical Equipment Space".

#### 1.5.10 Utility Interruption

Certain limitations on utility interruptions will apply. Unauthorized utility interruptions will not be permitted. Any work that requires a utility interruption shall be scheduled in advance. Outages are subject to postponement or cancellation by site authorities without prior notification. All utility interruptions shall be identified with notes on the project drawings.

#### 1.5.11 Spare Parts List

Proprietary spare parts lists that require more than a 60 day lead time, and/or any special service tools shall be provided to the Government prior to acceptance of the system.

### 1.6 HVAC SYSTEM GENERAL REQUIREMENTS

In general, the selection of the HVAC equipment efficiencies shall be based on the ASHRAE 90.1-2013 (as a minimum). It is design build contractor's full responsibility to investigate availability and to use higher efficiency equipment when proven life cycle cost effective. Efficiency during part-load operating conditions shall also be analyzed

and included in energy simulation modeling and calculations. The Refrigeration system shall be complied with requirements of ANSI/ASHRAE 15 & 34. Equipment and systems shall be designed for remote monitoring capability.

HVAC general requirements herein;

a. If Ground Source Heat Pump (GSHP) System has been selected based on LCCA, all ground source(Water to Water)heat pumps(central type) shall be supplied with condenser water via new condenser water loop piping and well-field constructed under this contract. New condenser water loop piping shall be of High-Density Polyethylene (HDPE) and comply with UFGS 23 81 47 Water-Loop and Ground-Loop Heat Pump Systems. It shall be the contractor's responsibility to determine the location of the borefield site ,perform the thermo-conductivity test, and to verify the design of the borefield.

b. Air Handling Units(AHUs) or Makeup Air Units(MAUs) shall be designed and fabricated indoor application, with features to include unitized double wall construction with 2" closed cell insulation (minimum R-value of 12.5), double-wall roof, solid galvanized steel floor, and painted external unit casing in accordance with the ASTM B117 salt-spray test. Each AHU compartment shall be fully accessible for maintenance and service through access doors or panels. In addition, consideration shall be given to the access required to replace motors and equipment from mechanical equipment rooms or spaces. At a minimum, space shall be included to allow unobstructed removal of heating or cooling coils. Provide Variable Frequency Drives (VFDs) for all AHU supply and return fans over 5 hp and on all VAV system AHUs.

c. All ductwork shall be designed in accordance with the ASHRAE and SMACNA Guidelines and SMACNA 1966 . Supply air ducts, from all terminal units and/or Air Handling Units, shall be built to pressure standards(2" w.c). All ductwork is required to be built to seal class "A". All interior ductwork to rooms must be metal and may be round, oval or rectangular at design-build contractor's option. Exhaust air ducts(each vertical riser shall be provided with cleanout access) from each dryer shall be directly discharged out to the exterior of the dormitory building(close coordination required to meet the campus and building aesthetics).

d. All air systems shall be designed and constructed per specification section 23 30 00 HVAC Air Distribution. Dryer vents shall be routed to exterior of the building with weather hood and backdraft damper. Design the vent system to minimize the penetrations through the exterior of the building.

e. Insulated flexible ducts may be used for connection to supply air diffusers only with maximum length of 5 ft. Do not use flexible duct for elbow, turns, or above rigid ceilings. All elbows and sharp turns shall be standard sheet metal fittings. Flexible ducts shall be connected with mechanical draw bands.

f. All supply air ducts including supply and exhaust air ducts shall be insulated. Concealed ducts shall be wrapped and exposed duct shall have rigid type insulation. Return, exhaust, and outside air ducts in mechanical room shall be insulated. Ductwork and piping shall be insulated in accordance with specification Section 23 07 00 THERMAL INSULATION FOR MECHANICAL SYSTEMS.

- g. Piping and ductwork shall not be installed in or over locations of electrical rooms, or communication/telephone rooms. Piping required over occupied areas shall be held to a minimum.
- h. Any piping exposed to freezing conditions must be protected. Piping shall be arranged and pitched to facilitate seasonal draining if practical.
- i. Velocities in piping systems shall be limited to 4 feet per second.
- j. The design shall incorporate minimum distance between fresh air intakes and all exhaust, vent pipe, or other building outlets per applicable standards.
- k. Air diffusers in living quarters shall be 12" x 12" with louvered face unless otherwise specified in the USAFA Design Standard. Return grilles shall be perforated 12" x 12" with provisions to block light and sound transmission (Provide surface mount air devices in hard ceilings with access panel for balancing). Supply and return air ducts shall be ducted from and to each respective terminal unit.
- l. HVAC equipment shall be selected for efficient operation per ASHRAE 90.1.-2013.
- m. All mechanical equipment subject to vibration shall have vibration isolations selected per table 45 "Selection Guide for Vibration Isolation" of ASHRAE HVAC APP IP HDBK and meet the requirement of UFC 3-450-01.
- o. Window or wall perimeter hydronic radiant heaters/baseboard type heaters shall not be utilized in dormitory rooms and / or corridors.
- p. High efficiency modular condensing hot water boiler systems(if selected) shall be provided and the system shall fully utilize energy savings associated with boiler low water return temperatures and maintain system operation in condensing mode to the greatest extent possible. A minimum of two boilers shall be provided with each boiler sized for 70% of the entire building heating load. All boilers shall meet the provisions of the ASME Boiler and Pressure Vessel Code. Boilers shall also conform to ASME CSD-1, Controls and Safety Devices for Automatically Fired Boilers.
- q. When chiller system has been chosen to serve as a primary cooling plant for the new dormitory building, the Trane chiller equipment shall be provided. Optimal number of chillers shall be determined considering the significantly low load conditions as described in the paragraph 1.6.11 Operation. N+1 number of chilled water system pumps shall be provided.
- r. The individual water to air type heat pump units shall not be provided in the dormitory rooms as the type of terminal units usually require frequent maintenance than other types of terminal units such as fan coil units, VAV boxes, etc.
- s. Provisions shall be made to maintain access to all pieces of mechanical equipment requiring maintenance. Manufacturer required maintenance clearances shall be coordinated with equipment layouts. Coordinate locations of access panels for hidden equipment and valves.

#### 1.7 AIR SUPPLY AND DISTRIBUTION SYSTEM

The design of all systems shall comply with the American Society of

Heating, Refrigerating, and Air Conditioning Engineers - ASHRAE FUN IP-Handbooks, to the requirements of NFPA 90A and the requirements of UFGS Section 23 00 00 AIR SUPPLY, DISTRIBUTION, VENTILATION, AND EXHAUST SYSTEMS.

- a. Equipment capacities and flows shall be corrected for altitude on project contractor's drawings, and shall be identified as such on the contractor's drawings.
- b. Minimum outdoor air ventilation rates shall be provided for occupants and spaces by mechanical ventilation system as required by ASHRAE 62.1-2016.
- c. Noise Criteria shall be in accordance with 2016 ASHRAE HVAC APP IP HDBK and UFC 3-450-01 (2003) NOISE AND VIBRATION CONTROL.

#### 1.8 EQUIPMENT IDENTIFICATION AND ABBREVIATIONS

This section contains requirements for the identification and abbreviation of mechanical equipment.

##### 1.8.1 Abbreviations

The following list of abbreviations shall be used to describe the mechanical equipment types:

Air-Cooled Chiller	ACC
Air Filter	AF
Air Handling Unit	AHU
Variable Air Volume Box	VAV
Air Separator	AS
Airflow Measuring Station	AFMS
Building Automation System	BAS
Boiler	B
Cabinet Unit Heater	CUH
Exhaust Fan	EF
Expansion Tank	ET
Control Valve	CV
Supply Diffuser	SD
Chilled Water	CH

Domestic Hot Water	DHW
Gov't Furnished Design Build Contractor Installed	GFCI
Gov't Furnished Gov't Installed	GFGI
Return Grille	RG
Cooling Coil	CC
Heating Coil	HC
Heating Hot Water	HW
Intake Hood	IH
Local Control Panel	LCP
Louver	L
Motor Operated Damper	MOD
Chilled Water Pump	CHWP
Heating Water Pump	HWP
Boiler Pump	BP
Register	R
Supply Fan	SF
Unit Heater	UH
Utility Monitoring and Control System	UMCS

The proposal shall indicate any abbreviations to be used for mechanical equipment not listed.

#### 1.9 SEISMIC PROTECTION FOR MECHANICAL PIPING AND EQUIPMENT

Structural bracing and mounting of mechanical piping and equipment shall be designed in accordance with UFC 3-301-01.

##### 1.9.1 Piping

Piping within the facility, except fire protection piping, is required to have seismic restraints complying with UFC 3-301-01.

##### 1.9.2 Miscellaneous Equipment

Miscellaneous items which consist of a number of individual components built into an assembly by the manufacturers may require additional internal reinforcements to meet the requirements of UFC 3-301-01.

## 1.10 THERMAL INSULATION OF MECHANICAL SYSTEMS

Insulation of hydronic water piping systems and equipment shall meet the more stringent of ASHRAE 189.1, and UFGS 23 07 00. Hydronic water piping shall be required to follow tabulated thicknesses. Where the insulation requirements differ between UFGS 23 07 00 and ASHRAE 189.1, the more stringent requirement shall be applied.

### 1.10.1 Insulation Covers

Provide removable and reusable insulation covers at all check valves, control valves, strainers, filters, or any other piping components requiring access for routine maintenance. Exposed exterior insulation shall be covered by an embossed aluminum metal jacket.

## 1.11 HYDRONIC SYSTEM REQUIREMENTS

### 1.11.1 Hydronic Piping Requirements

#### 1.11.1.1 Piping Layout

All piping shall be pitched up in the direction of flow, shall be designed without pockets that would permit accumulation of air, and shall be provided with air vents at high points and drains at low points. Piping shall be routed in the space between the suspended ceiling and the floor, chase spaces between each floor.

#### 1.11.1.2 Pipe Sizing

Pipe sizing friction loss shall be based on the following:

Pipe Size	Maximum Velocity	Maximum Pressure Drop
Up to 2"	4.0 ft/sec	4.0 ft./100 LFt
2 1/2" to 6"	5.5 ft/sec	2.5 ft/100 LFt

#### 1.11.1.3 Pipe Materials

Heating or cooling water piping within the facility shall be black steel conforming to ASTM A53/A53M, Schedule 40 or copper as specified in UFGS Section 23 64 26 CHILLED, CHILLED-HOT, AND CONDENSER WATER PIPING SYSTEMS.

#### 1.11.1.4 Pipe Joints

Heating or cooling water pipe joints shall be of the following types:

- a. Piping installed within the facility shall utilize threaded, brazed or welded joints.
- b. Connections to equipment shall utilize unions for pipe 2 inches and smaller and flanges for pipe 2-1/2 inches and larger.

#### 1.11.1.5 Pipe Expansion

In runs of pipe 50 feet and longer, or in shorter runs where required, indicate on project mechanical drawings the location of all anchors, bends, loops, expansion joints and pipe guides to adequately limit and provide for pipe expansion. Do not use expansion joints in piping unless absolutely necessary and justified. Where expansion joints are used they

shall be the bellows type. Slip joint type expansion joints shall not be used. Anchors and guides shall be indicated on the project mechanical drawings and detailed for installation in the building structure provided.

#### 1.11.1.6 Isolation Valves

Isolation valves shall be provided at each piece of equipment served by the hydronic piping system and shall be provided in each connection of branch piping to main piping and where required to isolate piping zones in the hydronic system. Valves shall be manual and shall allow isolation of the equipment from the piping system or isolation of segments of the piping system in order to allow for repair or maintenance of the equipment and piping without affecting the remainder of the hydronic system. Isolation valves shall be provided on the suction and discharge side of each pump.

#### 1.11.1.7 Identification of Piping

All piping in accessible spaces shall be identified with color coded bands and titles in accordance with ANSI A13.1.

Identification of the contents of a piping system shall be by lettered legend, giving the name of the contents in full or abbreviated form. Arrows shall be used to indicate direction of flow. Where flow can be in both directions, arrows in both directions shall be displayed. Contents shall be identified by a legend with sufficient additional details such as temperature, pressure, etc., as are necessary to identify the hazard. Legends shall be applied close to valves or flanges and adjacent to changes in direction, branches, and where pipes pass through walls or floors; and at intervals on straight pipe runs sufficient for identification. Identification may be accomplished by stenciling, the use of tape, or markers.

Color should be used to identify the characteristic hazards of the pipe contents. Color should be displayed on or contiguous to the piping by any physical means, but in combination with legend. Color may be used in continuous, total length coverage or in intermittent displays. Proposal response shall designate colors for the following, but not limited to, service fluids: fire quenching fluids, natural gas, fuel oil, propane, potable water, chilled water, heating hot water, and condenser water.

#### 1.11.2 Heating Water Boilers

Boilers shall be sealed combustion, gas-fired, low NOx, condensing type, and shall have a minimum efficiency of 93 percent at a return water temperature of 120 degrees F. Boiler capacity shall be based on a natural gas heating value of 805 btu/cubic foot. Boilers shall be installed on 6 inch thick concrete housekeeping pads. Boilers shall be provided with dedicated recirculation pumps if required by the manufacturer. Provide two boilers at a minimum and each boiler shall be sized to meet 70% of the entire building heating loads for the redundancy. Boiler sizing shall be based on peak heating load of the building including maximum ventilation loads even if energy recovery wheels are provided. The operation of the boilers shall be controlled by local building controls (provided as part of the work of this solicitation) such that the boiler supply water temperature is reset based on the heating load in the building. Reset of boiler supply water temperature based on outside air temperature is not acceptable.



### 1.11.3 Heating Water Circulating Pumps

N+1 number of pumps shall be provided for redundancy. Pumps shall be base mounted, end suction, centrifugal type pumps. Each pump shall be sized for the peak (design) heating water flow requirement (flow rate and head pressure). Pumps shall be non-overloading at all points on their characteristic curve.

### 1.12 CYBERSECURITY

The design and construction of control systems for all HVAC equipment, mechanical systems, utility meters, and integration into the existing base wide EMCS front-end shall comply with applicable requirements of UFC 4-010-06, Cybersecurity of Facility-Related Control Systems. Refer to 01 81 00 SUMMARY OF THE WORK and 01 86 26 ELECTRICAL REQUIREMENTS for additional requirements.

### 1.13 BUILDING TEMPERATURE CONTROL SYSTEM

The temperature controls (HVAC controls) system for new equipment installed in the facility shall be direct digital controls (DDC) and shall be tied into and fully integrated with the existing Installation wide energy management and control system. Access to the building HVAC control system by the Installation EMCS operator shall be seamless via the EMCS operator work station. The design of the control systems for the HVAC equipment shall be in accordance with UFC 3-410-02, UFC 3-470-01, UFC 4-010-01 and UFC 4-010-06. Installation shall be in accordance with Specification Section 23 09 93.01 DIRECT DIGITAL CONTROL FOR HVAC & OTHER LOCAL BUILDING SYSTEMS and other associated Division 23 control system specifications. System integration shall include developing interfaces for each piece of equipment and provide a graphical representation of the equipment and control menu screen. Historical data for equipment, buildings, and systems shall be stored for use in determining system maintenance and equipment operation. System integration shall include developing algorithms, analog, and discrete logic to fully automate the starting and stopping of all system equipment. The logic shall also provide for manual operator override, set point adjustments, and control loop adjustments. The control system shall be designed to provide continuous and automatic control of all HVAC equipment indicated in this specification section. Programmable controllers and equipment provided with a packaged control systems, such as boilers shall interface with the control system using a new building control system network. The equipment control systems shall allow monitoring and control of equipment from the building HVAC control system and /or the Installation wide EMCS. The temperature control panel shall be located in the mechanical room. The control system shall allow the EMCS operator to easily adjust setpoint, operating times and other system parameters, if and when necessary, once the building control system has been integrated into the EMCS.

#### 1.13.1 General DDC Requirements

All mechanical systems and equipment, shall be controlled by local direct digital control (DDC) equipment located in the facility's Mechanical room. The DDC system shall be capable of operating in a stand alone fashion. To facilitate maintenance and to allow manual starting and stopping of equipment by maintenance personnel, a hard-wired Hand-Off-Automatic control switch shall be provided for each air handling unit, pump and exhaust fan.

a. Temperature Control Contractor Experience - The temperature control Contractor shall have a minimum of 5 years experience installing DDC systems. The Contractor shall provide for approval the names and qualification of supervisory personnel (i.e. Project Manager and/or Superintendent) that will be used on this project. The Contractor shall also provide a list of references to be contacted from recent projects on which the proposed personnel performed similar duties. Approval shall be based on previous experience with the DDC system to be installed, qualifications and demonstrated ability of proposed personnel to manage resources in an efficient and effective manner. Experience and supervisory personnel qualifications must be submitted and approved before submittal of any technical data.

b. Emergency Service During Warranty - The Government will initiate service calls when the installed DDC and integration to EMCS is not functioning properly. Qualified personnel shall be available to provide service to the complete DDC/EMCS installed under this project. Qualified personnel shall be defined as a factory trained journeyman in the brand of control system provided, this level of training shall be considered a minimum. The Government shall be furnished with a telephone number where the service supervisor can be reached at all times. Service personnel shall be at the site within 3 hours after receiving a request for service. The control system shall be restored to proper operating condition within 3 calendar days after receiving a request for service.

c. Software - The Contractor shall provide all software updates and verify operation in the system. These updates shall be accomplished in a timely manner, fully coordinated with base operators, and shall be incorporated into the operations and maintenance manuals, and software documentation provided as submittals for review by the Government. There shall be at least one scheduled update near the end of the first years warranty period, at which time the Contractor shall install and validate the latest released version of the Contractor's software. All software shall be licensed for use by the Air Force Academy Base 10th Civil Engineer Squadron.

d. Fuses shall not be used for surge protection. Provide transient voltage surge suppression (TVSS).

e. Scheduled inspections shall be at the beginning of construction.

f. System descriptions and analyses submittal shall indicate how the new system will interface with the existing EMCS.

#### 1.13.2 Alarm Monitoring

Alarm monitoring shall be provided for the boilers. Indication of failure shall alarm at the EMCS Operators work station. The maximum allowable time for the EMCS to display an alarm condition is 10 seconds starting from the time the alarm condition first exists. The maximum allowable time for equipment to respond to manual EMCS commands is 10 seconds starting from the time the command is initiated at the work station. Alarm monitoring shall include, but not limited to the following alarm indications:

- 1) Loss of Flow
- 2) High and low temperature
- 3) Boiler General Alarm
- 4) Start/stop actual status different from commanded state

### 1.13.3 Stand-Alone Operation

The control system / equipment installed as part of this contract shall be fully capable of stand-alone operation on a continuous basis. All programs, including those based upon real-time clock or calendar events, shall reside in the local DDC equipment.

### 1.13.4 Input / Output Devices

The control system shall utilize off-the-shelf input and output instruments (e.g., RTD sensors, space temperature sensors, actuators) which are commercially available from third party vendors and who are independent from the DDC system manufacturers. All sensing devices shall be capable of removal from the system without disruption of service to the system in which they are installed.

### 1.13.5 Cable and Wiring

Cable and wire for the DDC system shall be separate from the distribution system serving any other system. All cable and wiring shall be installed in conduit. The data transmission media (DTM) shall be provided by the Contractor. The Contractor shall provide data transmission media (DTM) shall be as specified and extended as on the D/B electrical contractor's drawings in accordance with Section 01 86 26 ELECTRICAL REQUIREMENTS.

### 1.13.6 Control Valves

Sizing of control valves shall take into account upstream and downstream fittings and shall be in accordance with Instrument Society of America standard ISA S75.01-1985.

### 1.13.7 Valve Actuators

All valves shall be provided with 4-20 mA-operated valve actuators.

## 1.14 TESTING, ADJUSTING, AND BALANCING (TAB) OF HVAC SYSTEMS

Testing, adjusting, and balancing shall meet the requirements of UFGS Section 23 05 93.00 10 TESTING, ADJUSTING AND BALANCING OF HVAC SYSTEMS. The work required by this Section shall be complete, including all test and inspection reports, before starting the commissioning functional testing.

### 1.14.1 Balancing Firm Qualifications

TAB shall be performed by an independent firm, hired directly by the Design Build Contractor only, using certified technicians under the direct supervision of a registered engineer. Technicians shall be certified by the National Environmental Balancing Bureau (NEBB) or the Associated Air Balance Council (AABC). The firm shall select AABC MN-1 or NEBB-01 as the standard for providing TAB of the mechanical systems.

### 1.14.2 Balancing, Commissioning and Integration

Design Build Contractor shall include additional time required for full balancing and commissioning once the construction of all systems are complete. Commissioning shall meet the requirements of UFC 1-200-02 and other applicable criteria.

### 1.15 COMMISSIONING OF HVAC SYSTEMS

This section contains instructions and engineering information relating to the commissioning of HVAC systems, including pre-commissioning checks and functional performance tests. The commissioning of HVAC systems shall meet the requirements of UFGS Section 01 91 00.15 TOTAL BUILDING COMMISSIONING, UFC 1-200-02, and ASHRAE 189.1.

#### 1.15.1 General

The purpose of commissioning is to bring the project HVAC systems to a state of dynamic operation by verifying the operation of individual components, subsystems, and systems. The commissioning process shall be planned, scheduled, and prepared for, as an integral portion of the project, from design, through construction, to final acceptance. Commissioning shall begin only after all work required in sections entitled "BUILDING TEMPERATURE CONTROL SYSTEM" and "TESTING, ADJUSTING, AND BALANCING (TAB) OF HVAC SYSTEMS" has been successfully completed, and all test and inspection reports and operation and maintenance manuals required in these Sections have been submitted and approved. Commissioning and endurance testing of all systems and equipment shall be a prerequisite to final acceptance of the facility.

#### 1.15.2 Commissioning Firm Qualifications

System Commissioning shall be done by an independent firm experienced in this type of work.

#### 1.15.3 Checklists

The commissioning test requirements shall be in detail, with all specific steps and procedures clearly formulated for a complete checkout of the systems. The prewritten pre-commissioning and functional performance tests checklists provided in the D/B contractor's specifications are examples only and shall be completely edited, by adding or deleting items, to provide the necessary commissioning test requirements of the actual equipment installed. If there is no example checklist for an item of equipment in the project, the designer shall formulate a checklist and include it in the D/B contractor's specifications.

#### 1.15.4 Pre-commissioning Checks

Pre-commissioning checks, done in accordance with the prewritten checklists, shall be performed for each item of mechanical equipment. Deficiencies discovered during these checks shall be corrected and retested prior to start of the Functional Performance Tests.

#### 1.15.5 Functional Performance Tests

Functional performance tests, done in accordance with the prewritten checklists, shall be performed for each equipment item. Functional performance tests shall begin only after all pre-commissioning checks have been successfully completed.

### 1.16 OPERATION AND MAINTENANCE REQUIREMENTS

Facility Operation and Maintenance (O&M) Manuals, including associated Training Course and Training Manuals, shall be provided for the mechanical systems and shall meet the requirements of the individual Unified

## Facilities Guide Specifications (UFGS) Sections.

### 1.16.1 Facility Operation and Maintenance Manuals

The intent of the O&M Manuals is to promote and maximize the efficiency, economy, safety, and effectiveness of the life cycle operation, maintenance, and repair of the facility. Comprehensive, self-contained manuals shall include all of the identified building's interior systems, plus the exterior portions of systems that support the building. Draft O&M Manuals are required to be delivered a minimum of seven days prior to O&M systems training.

#### 1.16.1.1 Technical Writer Qualifications

Obtain the services of a firm experienced in technical writing to prepare the Operation and Maintenance Manuals.

### 1.16.2 Operation and Maintenance Training Course and Manuals

Training courses shall be conducted for 5 operating staff members designated by the Contracting Officer in the maintenance and operation of all systems. Two-week notice shall be given to the Contracting Officer before the start of training. Training shall consist of one (1) training day. A training day is defined as 8 hours of classroom instruction, including breaks and lunchtime, Monday through Friday, during the daytime shift in effect at the training facility. For guidance in planning the required instruction, the Contractor shall assume that the attendees will have a high school education or equivalent, and are familiar with the systems. No training shall be scheduled until training manuals and O&M manuals have been approved by the Government. A minimum of 5 O&M manuals shall be provided for the instructions and 2 manuals for the facility shall be given to the Contracting Officer to turnover to the Directorate of Public Works. The training course shall cover all of the items contained in the O&M Manuals.

#### 1.16.2.1 Training Course Content

The courses shall be taught at the project site for a period of one (1) training day(s). The training courses shall cover all the material contained in the Operating and Maintenance Instructions, and O&M manuals the layout and location of each system and shall include the following for each system:

- a. Troubleshooting
- b. Diagnostics
- c. Calibration
- d. Adjustment
- e. Commissioning
- f. Repair procedures

Typical systems and similar systems may be treated as a group, with instruction on the physical layout of one such system. The results of the performance verification tests and the calibration, adjustment and commissioning reports shall be presented as benchmarks of the system(s)

performance by which to measure operation and maintenance effectiveness. Draft or completed O&M Manuals shall be used during training.

#### 1.16.2.2 Video Taping

Video taping, in DVD format, shall be provided for all operation and maintenance training.

### 1.17 TECHNICAL SPECIFICATIONS

Government provided Unified Facility Guide Specification (UFGS) shall be completely edited and fully coordinated with the drawings to accurately and clearly identify the product and installation requirements for the facility. THE SPECIFICATIONS SHALL NOT BE EDITED IN A MANNER THAT REDUCES THE LEVEL OF QUALITY FOR EQUIPMENT, SERVICES PROVIDED, OR MATERIALS. The specifications shall be edited in accordance with the designer notes associated with each specification and with the Specification Requirements (Division 01 General Requirement Specifications). In case of a conflict, the criteria found in the Specification Requirements (Division 01 General Requirement Specifications) shall take precedence. The provided specifications define the minimum requirements for items of equipment, materials, installation, training, operating and maintenance instructions, O&M manuals and testing that shall be provided for the facility. Where items of equipment, materials, installation, training, operating and maintenance instructions, O&M manuals or testing requirements are not specified in the provided specifications, special paragraphs within each applicable guide specification shall be prepared to specify those items. Government approval is required for any addition of materials, equipment, or installation requirements not covered in the guide specifications. Specific items of equipment identified in the provided specifications but not required for the facility shall be edited out.

### 1.18 TRAINING

Training courses shall be conducted for 2 operating staff members designated by the Contracting Officer in the maintenance and operation of all systems. Two-week notice shall be given to the Contracting Officer for start of training. Training shall consist of 1 hour of classroom instruction and 2 hours of instruction in the facility, Monday through Friday, during the daytime shift in effect at the Installation. For guidance in planning the required instruction, assume that the attendees will have a high school education or equivalent, and are familiar with the systems. No training shall be scheduled until training manuals and O&M manuals have been approved by the Government. A minimum of 2 manuals for the facility shall be given to the Contracting Officer to turnover to Base Civil Engineer.

#### 1.18.1 Training Course Content

The courses shall be taught at the project site or other location within Air Force Academy. The training courses shall cover all the material contained in the Operating and Maintenance Instructions, and O&M manuals the layout and location of each system and shall include the following for each system:

- a. Troubleshooting
- b. Diagnostics

- c. Calibration
- d. Adjustment
- e. Commissioning
- f. Repair procedures

Typical systems and similar systems may be treated as a group, with instruction on the physical layout of one such system. The results of the performance verification tests and the calibration, adjustment and commissioning reports shall be presented as benchmarks of the system(s) performance by which to measure operation and maintenance effectiveness. Draft or completed O&M Manuals shall be used during training.

#### 1.19 BALANCE OF EQUIPMENT AND MATERIALS

Equipment and materials to achieve a complete balance of the system not detailed in this specification such as, but not limited to, valves, fittings, heat exchangers, pumps, insulation, etc., shall be selected to meet SECTION 1.2 GENERAL REQUIREMENTS, applicable codes and standards, and provide a beneficial life cycle cost.

#### 1.20 PLUMBING SYSTEM

##### 1.20.1 General Requirements

The plumbing scope of work consists of providing new domestic water service entrance with a reduced pressure type backflow preventer, natural gas service entrance with piping, and all plumbing fixtures and systems for the new dormitory building. Condensate drain lines shall be provided for any mechanical equipment requiring condensate removal.

Domestic hot and cold water supply distribution system (hot water recirculation piping and system shall be provided); fixtures, and fixture traps; soil, waste, and vent piping system; shall be designed and provided for the new building.

Provide two station(dual height) wall mounted electric water coolers in accordance with Section 01 82 00. One water cooler shall be ABA accessible. Water coolers shall include a bottle filler.

The design of all plumbing systems shall comply with the 2018 International Plumbing Code (IPC), UFC 3-420-01 Plumbing Systems and shall meet the requirements of UFGS Section 22 00 00 PLUMBING, GENERAL PURPOSE. Traps for lavatories and sinks shall be chromium-plated, adjustable-bent tube, 20-gauge brass, where exposed without cleanouts. Lead content in the water distribution system (including in-line devices) shall comply with the SDWA w/amendments and the safe drinking water requirements of ANSI/NSF 61, section 9. In-line devices shall include water meters, building valves, check valves, meter stops, valves and fittings and backflow preventers. Underground soil, waste, and drain may be cast iron piping.

##### 1.20.2 Water Service

A load analysis shall be provided to ensure that the required water pressure at the farthest fixture will provide the required pressure to deliver the design flow. A new meter shall be provided with a direct

non-resettable digital readout. Meter shall produce an output compatible with the Base EMCS. Meter shall have tele-metering capability. Meter is required in accordance with UFC 1-200-02. Meter configuration must comply with UFC 4-010-06.

#### 1.20.3 Sanitary Drainage and Vent System

Any required revisions to the sanitary drainage system shall be designed and installed per the 2018 IPC. Sanitary soil/waste piping shall slope a minimum of 1/8 inch per foot. All vent piping shall be installed to grade back to the soil or waste piping. Vent pipe extensions through the roof shall be located a minimum of 20 feet away from any air intake openings on the building or on mechanical equipment. Vents through the roof shall be increased to 4 inch for frost closure.

#### 1.20.4 Domestic Water Systems

The domestic water system must be protected from backflow and back siphonage by code complying, lead free, use of air gaps and reduced pressure principle backflow prevention devices listed in accordance with FCCC & HR.

Water pipe sizing shall be based on a maximum velocity of 8 FPS for anticipated flow rate.

Domestic hot water will be produced and sized to meet the required size capacity for the peak hot water building load. Each building's domestic hot water system shall include a domestic hot water recirculating pump and domestic hot water recirculating piping. The domestic hot water heater shall be sized based on a 140° F storage temperature and heater capacity equal to the probable maximum demand of all fixtures served.

Provide flow limiting measuring devices to prevent high velocity water flow damage to recirculation piping.

Water at the site will be categorized in accordance with UFC 3-420-01 and IPC 2018. The pipe materials for the domestic hot/cold water systems shall be selected accordingly. Steel pipe shall not be used as part of the domestic hot or cold water piping systems.

#### 1.20.5 Water Hammer Arresters

Commercially available water hammer arresters in accordance with applicable standards shall be provided at all new quick closing valves such as solenoid valves and piping to clothes washing machines and shall be installed according to the manufacturer's recommendations. Vertical, capped pipe columns are not permitted.

#### 1.20.6 Cleanouts

On straight runs of pipe, cleanouts shall be provided at not more than 50 feet apart. Cleanouts shall be provided per the IPC.

#### 1.20.7 Plumbing Vents

All vent lines through roof shall be 4 inch and terminate a minimum of 6 inch above finished roof and shall not be visible from grade level.



### 1.20.8 Fixture Requirements

#### 1.20.8.1 General

All plumbing fixtures shall comply with latest approved version of USAFA Design Standards, and UFGS Section 22 00 00 PLUMBING GENERAL PURPOSE. End-point devices shall meet lead leaching requirements of ANSI/NSF 61, Section 9, such as lavatory faucets, kitchen and bar faucets, residential refrigerator icemakers, supply stops and endpoint control valves. In-line devices, such as drains and backflow preventers, do not have to meet ANSI/NSF 61, Section 9. Plumbing fixtures shall conform to ASME standards with lead-free faucets.

#### 1.20.8.2 Water Closets

White vitreous china office and industrial type with elongated bowl, exposed large diaphragm top supply flush-o-meter with side oscillating handle, siphon jet wall outlet, wall hung on heavy-duty chair carrier, and white open front anti-microbial molded plastic seat. Water closet flush valves: Provide manual low flow flushometers at all water closets. Dual flush units shall be used in all Women's, Uni-sex, and single stall toilet rooms.

#### 1.20.8.3 Urinals

White vitreous china, bowl type with integral flush distribution, wall hung with integral trap and extended shields, blowout or siphon jet flushing action, large exposed diaphragm handle operated flush-o-meter. Provide manual low flow flushometers at all urinals.

#### 1.20.8.4 Lavatories

White vitreous china straight back with single center set compression faucets, strainer drain, angle stops, complete with adjustable type P-trap with separate long tube to wall. Provide manual (wrist blade, single lever, dual lever) faucets with low flow aerator for tempered water supply at all lavatories.

#### 1.20.8.5 Mop Basins

In Janitor's Closets, provide floor receptor type sinks, complete with faucet. Provide floor mounted receptor with protective guards on exposed sides, drain body with removable strainer, and faucet with 3/4" threaded hose outlet with vacuum breaker.

#### 1.20.8.6 Showers

Shower floors shall have stainless steel entry cap and threshold. Showers shall have mixing valve and low flow shower head.

#### 1.20.8.7 Hose Bibbs

Exterior hose bibbs shall be non-freeze type and shall be protected from physical damage as required. Provide hose bibbs every 100 ft. around the periphery of the building. Wall hydrants with lockable/tamper-proof covers shall be used in public accessible locations.

## 1.21 EXTERIOR GAS DISTRIBUTION SYSTEM

This Section contains instructions and engineering requirements relating to the design of the exterior natural gas distribution system where required, including the building gas service line and gas service regulator assembly. The gas distribution system shall be designed in accordance with NFPA 54, and shall meet the requirements of UFGS section 33 51 15 Natural-Gas / Liquid Petroleum Gas Distribution. Gas main shall remain operational during construction. Contractor shall closely coordinate with Colorado Springs Utilities in design and installation of exterior gas service line to the new building.

### 1.21.1 Service Line Sizing

The size of the service line shall be sufficient to supply the peak gas demand for the complete facility without excessive pressure drop and shall not be less than 1 inch in size. It shall be contractor's responsibility to fully coordinate with local utility company when designing service line to the new building.

### 1.21.2 Service Line Materials

All new above ground lines shall be steel. All new underground lines shall be HDPE.

### 1.21.3 Gas Meters

A new gas meter shall be provided as part of the service regulator assembly. The meter shall be provided with a direct non-resettable readout. The meter shall produce an output compatible with the building HVAC control system and Base EMCS. The gas meter shall be sized to handle the peak gas demand for the complete facility. The gas meter shall be located in an inconspicuous location so as not to be visible from the front entrance to the facility. If this is not possible the meter shall be hidden by shrubs or a screen wall. Meter shall have tele-metering capability. Meter is required in accordance with UFC 1-200-02. Meter configuration must comply with UFC 4-010-06.

## 1.22 INTERIOR GAS PIPING SYSTEM

The interior gas piping system shall extend from the outlet of the meter set and service regulator assembly to the point of connection of each gas utilization device. The aboveground gas piping system shall be steel, designed in accordance with NFPA 54 and shall meet the requirements of UFGS section 23 11 25 Facility Gas Piping.

### 1.22.1 Gas Pipe Sizing

Piping shall be sized in accordance with NFPA 54. Minimum interior gas pipe size shall be 3/4 in. The heating value of the natural gas to be used in calculations for sizing equipment and piping is 805 Btu per cubic foot. Gas piping shall be shown on the Plumbing Drawings of the contractor's drawings.

### 1.22.2 Equipment Connections

The final connection to gas equipment shall be made with rigid metallic pipe and fittings or flexible connectors. Accessible gas shutoff valve, 6 in long full-size dirt leg, and coupling are required.

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## SECTION 01 86 13

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## SECTION 01 86 13

## FIRE PROTECTION REQUIREMENTS

## PART 1 GENERAL

## 1.1 REFERENCES

The publications are referred to in the text by the basic designation only. The most current edition shall be used whenever a specific edition is not mentioned.

## ASTM INTERNATIONAL (ASTM)

ASTM E 84 (2009c) Standard Test Method for Surface Burning Characteristics of Building Materials

## INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC (2021) International Building Code

## NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 1 Fire Code

NFPA 10 Standard for Portable Fire Extinguishers

NFPA 13 Standard for the Installation of Sprinkler Systems

NFPA 24 Standard for the Installation of Private Fire Service Mains and Their Appurtenances

NFPA 70 National Electrical Code

NFPA 72 National Fire Alarm and Signaling Code

NFPA 90A Standard for the Installation of Air Conditioning and Ventilating Systems

NFPA 101 Life Safety Code

NFPA 291 Recommended Practice for Fire Flow Testing and Marking of Hydrants

## U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 1-200-01 DoD Building Code

UFC 3-600-01 Fire Protection Engineering for Facilities

UFC 4-010-06 Cybersecurity of Facility-Related Control Systems

UFC 4-021-01 Design and O&M: Mass Notification Systems

## UFC 4-021-02

## Electronic Security Systems

This project is a new Prep School Dorm at US Air Force Academy in Colorado. Any new egress, suppression system (sprinklers), and alarm and mass notification systems shall meet the requirements stated herein. Fire protection shall be based on sound fire protection engineering principles and shall give safeguards against loss of life and property by fire, consistent with the mission, risk involved, and economical utilization. A Life Safety/Building Code analysis shall be provided by the Fire Protection Engineer for the new facility. Special attention needs to be provided in providing rooms and areas of the facility to shelter in place or for weather calamities. At final submission, the Fire Protection Engineer shall stamp and seal the Life Safety/Building Code plans. Fire protection criteria shall also be based on the codes listed above and on the following code requirements:

ADA and ABA Accessibility Guidelines for Buildings and Facilities  
([www.access-board.gov/ada-aba/final.cfm](http://www.access-board.gov/ada-aba/final.cfm))

Omaha District Design Guide

UFC criteria as well as other relevant design guides can be found on the Whole Building Design Guide (WBDG) website. Contractor shall provide a design and construct according to ECB 2018-17: New Requirements for Visual Notification for Mass Notification Systems.

All requirements of the latest aforementioned codes shall be incorporated into the design. A Fire Protection Engineer shall be part of the design team in accordance with UFC 3-600-01 and shall be a single person. The Fire Protection Engineer shall provide a Life Safety Code Analysis and Building Code Analysis of the new facility as well as be responsible for the design of the new fire alarm, fire sprinkler, and mass notification systems. At 100% design submission, the Fire Protection Engineer of Record shall submit a letter to USACE certifying the project meets all of the mentioned codes, and NFPA 101 criteria.

NFPA 101 relative to this design shall give special attention to the application of fire codes as they relate to Life Safety. Features of fire protection based on the following shall be included in the design: Automatic operating devices; Exiting for inhabitants and the protection of egress components; Personnel safety in hazardous areas; Appropriate ratings of fire and smoke partitions, doors and windows; Travel distances; Common paths of travel; Occupancy types; Hazard of occupancies and their contents; and Isolation from the remainder of the facility.

Applicable requirements of the International Building Code shall also be included in the design. These shall include the following: Types of construction; Fire area limitations; Increases to allowable floor areas; and Separation of structures.

All military construction must comply with the code requirements set forth in UFC 1-200-01, UFC 4-021-01, UFC 3-600-01, and UFC 4-021-02. Also, the facility construction must comply with the following: NFPA 1, NFPA 10, NFPA 13, NFPA 24, NFPA 70, NFPA 72, NFPA 90A, NFPA 101, and NFPA 291

All fire protection design shall be done by a Fire Protection Engineer in accordance with UFC 3-600-01. Refer to section 28 31 15 INTERIOR FIRE ALARM AND MASS NOTIFICATION SYSTEM for additional information regarding



qualification requirements for the fire alarm and mass notification system designer. The fire protection engineer shall perform a Life Safety/Building Code analysis for the facility including egress capacity and pathways. At final submission, the Life Safety/Code Analysis shall be stamped and sealed by the Fire Protection Engineer of Record. The life safety analysis shall be submitted with the first submittal for review. Life safety analysis shall comply with UFC 3-600-01 and NFPA 101. The new floor plans shall be evaluated for compliance with NFPA 101.

## 1.2 OCCUPANCY FOR THE PROJECT

The project will be classified in accordance with NFPA 101. According to Chapter 4 and Chapter 5 of the International Building Code (IBC), the project facility will be classified as part of the Life Safety Code and Building Analysis. Review all applicable occupancies such as assembly, dormitories, storage, and business occupancies.

## 1.3 CONSTRUCTION PER 2021 INTERNATIONAL BUILDING CODE (IBC)

Construction type of the facility shall be determined and classified by the IBC. The hourly fire rating requirements for walls and columns for the building systems and components shall not be less than those specified in the performance specifications sections of IBC.

## 1.4 CORRIDORS

Review NFPA 101 to determine fire rating of all corridors and exits.

Separation of incidental use areas shall be provided per NFPA 101.

## 1.5 INTERIOR FINISHES

Interior wall and ceilings of exits shall be in accordance with NFPA 101. Review based upon occupancy.

Interior floor finishes in exits shall be in accordance with NFPA 101. Review based upon occupancy.

No downgrade in finish Class due to complete coverage by an automatic sprinkler system shall be allowed.

## 1.6 EGRESS CAPACITY

Egress capacities shall be in accordance with NFPA 101 and included as part of the scope of work and Life Safety Code Analysis.

## 1.7 MEASUREMENT OF TRAVEL DISTANCE TO EXITS:

NFPA 101, SEC 7.6 - Review as part of the Life Safety Code Analysis. Maximum distance shall be based upon most stringent occupancy requirements in NFPA 101 for the facility.

## 1.8 FIRE EXTINGUISHER CABINETS:

NFPA 101 AND NFPA 10 - Review as part of the Life Safety Code Analysis.

## 1.9 AUTOMATIC SPRINKLER SYSTEMS:

Provide a new sprinkler system throughout the entire facility. Provide a

new water service into the building with a new Post Indicator Valve. The new PIV shall have a tamper switch tied to the building fire alarm system. Provide a new fire sprinkler service entrance with a vertical double check valve assembly. Provide a forward flow test assembly for the new back flow prevention device. Provide a new fire department connection with check valve. All valves shall be provided with a tamper switch tied to the fire alarm system. System shall be designed per UFC 3-600-01. Also, provide fire sprinkler systems for any overhangs, canopies, or storage areas where required by NFPA 101 or UFC 3-600-01. Areas and densities shall comply with UFC 3-600-01. Hydraulically calculate the new system per NFPA 13. Obtain a current fire hydrant flow data for the design of the system. A structural engineer shall be part of the contractor's design team. The structural engineer shall review all piping supports for the new structure. The new sprinkler system shall not overload the building's structural capacity. Only UFGS fire suppression specifications shall be edited and used for this project (Section 21 13 13.00 10, and/or 21 13 17.00 10). For underground fire mains, water velocity shall not exceed 10 fps for any plastic pipe. Provide surge pressure analysis for the plastic pipe system. Provide a new fire hydrant flow test for any fire sprinkler designs in accordance with NFPA 291.

#### 1.10 PRESENCE OF DISABLED OCCUPANTS

Disabled personnel will potentially be present. Provisions for accessibility and usability will be made for physically handicapped individuals for exiting these facilities. Refer to Paragraph 1.18 for fire alarm system requirements.

#### 1.11 FUNCTIONAL AND TECHNICAL REQUIREMENTS

##### 1.11.1 Building Construction Type

The facility's construction type shall be as classified in IBC. Review as part of the Life Safety/Building Code Analysis.

##### 1.11.1.1 Exterior Walls

Exterior walls of the facilities will not be rated as long as minimum distances from other buildings are maintained and the area and size of the structure does not require it per IBC. Review as part of the Life Safety/Building Code Analysis.

##### 1.11.1.2 Roof

The facility's roof coverings shall be in accordance with UFC 3-600-01. Review as part of the Life Safety/Building Code Analysis.

##### 1.11.1.3 Interior Walls

All penetrations in fire and smoke rated walls (conduits, pipes, cable trays, etc.) shall be fire or smoke stopped according to their respective wall/floor/ceiling rating at each penetration. Review all building walls as part of the Life Safety/Building Code Analysis and provide smoke and fire rated walls as necessary as part of NFPA 101.

##### 1.11.1.4 Interior Finishes

Interior finish materials on walls, ceilings, partitions, and furnishings of all types in all exits shall be as defined in NFPA 101. All other

areas will have interior finish materials for walls, ceilings, and furnishings as required by NFPA 101. Smoke Developed Ratings will not exceed 450 for Class A, B, or C materials when tested in accordance with ASTM E 84 in accordance with UFC 3-600-01.

Provide self-closing hardware and gasketing at all fire-rated doors as well as smoke rated doors.

#### 1.12 FIRE ALARM AND DETECTION SYSTEMS

Installation of the Fire Alarm and Mass Notification System (MNS) shall require a Certification and Accreditation to be obtained, refer to section 01 86 29 COMMUNICATIONS REQUIREMENTS for additional information.

##### 1.12.1 Fire Alarm and Mass Notification Panel

This project shall provide a new addressable fire alarm and mass notification system and panel (FACP) for the facility. All new circuits to the addressable type fire alarm system shall comply with NFPA 72, UFC 3-600-01, and NFPA 101. Contractor shall install new detectors and initiating devices as required. Provide appropriate interfaces at the new panel to allow all new alarm detection, new fire alarm devices and new initiation devices to be connected to the addressable panel. System shall meet the US Air Force Academy's requirements and all other applicable standards. Provide new transmission device to send fire alarm and mass notification signals to the receiving equipment located at the base fire department.

The system shall be addressable to each reporting device and with turnkey MNS. MNS devices shall be combination speaker/strobe on ceilings or walls. The system shall be complete with the control panel in the building and required devices. The addressable system shall transmit and receive addresses and data between the control panel and the new devices. Comply with UFC 4-021-01 for all aspects of the Mass Notification System.

##### 1.12.2 Initiating and Notification Devices

The new system shall include addressable manual pull stations, addressable heat detectors, addressable duct smoke detectors, addressable spot type smoke detectors, and audible and visual notification appliances that comply with ADA requirements.

##### 1.12.3 Mass Notification System

Refer to Section 28 31 76, UFC 4-021-01, and ECB 2018-17: New Requirements for Visual Notification for Mass Notification Systems for requirements for the Mass Notification System. Provide a new Mass Notification System for the new building.

##### 1.12.4 Interfaces to Other Systems

The new system shall shut down appropriate air handling equipment, smoke dampers, and release magnetic door holding devices as necessary for proper operation of the facilities. Provide a "Sequence of Operations Matrix" to coordinate with alarm functions in Section 28 31 76 ADDRESSABLE FIRE ALARM AND MASS NOTIFICATION SYSTEMS for the new building. The "Sequence of Operations Matrix" shall be approved by the Contracting Officer. Systems shall meet requirements of UFC 4-021-02, if applicable.

#### 1.12.5 Layout Considerations

Duct smoke detectors shall be provided on all new air handling supply fans over 2000 CFM, and all new return fans over 15,000 CFM. Smoke detectors, shall be provided where electromagnetic door holders are used. Audible and visual notification appliances shall be provided to meet these specifications. This includes all new interior egress doors. Design shall comply with ADA Requirements, NFPA 101 and NFPA 72. Provide an audible notification appliance on the exterior at each exit door. Addressable initiating device circuits modules shall be provided for each non-addressable device, excluding notification appliances. Visual strobes shall be located in every space within the building.

#### 1.13 FIRE PROTECTION SPECIFICATIONS (SUBMITTALS AND ACCEPTANCE TESTS)

The sprinkler and fire alarm submittals shall be reviewed and approved by the Base Fire Chief or designated representatives as well as USACE Omaha District Fire Protection Engineer. Only UFGS fire alarm and fire suppression specifications shall be edited and used for this project. All submittals shall be stamped and sealed by a Registered Fire Protection Engineer.

Representatives of the Base Fire Department shall inspect and witness all final acceptance testing prior to the Contracting Officer accepting the sprinkler and fire alarm systems.

Fire water service shall be installed and tested in accordance with NFPA 24 guidelines. Fire sprinkler system shall be tested in accordance with NFPA 13 guidelines. Fire alarm and mass notification shall be tested in accordance with NFPA 72 guidelines.

#### 1.14 DESIGN OBJECTIVES AND PROVISIONS

##### 1.14.1 Zoning and Treatment of Each Potential Hazard

##### 1.14.1.1 Limiting Fire Spread

Every horizontal opening and hazardous locations as defined by NFPA 101.

##### 1.14.2 Provision and Maintenance of an Unobstructed Emergency Egress System

All corridor widths, clear space requirements relative to exit doors, etc., shall be in accordance with the Uniform Federal Accessibility Standards and the Americans with Disabilities Act for unobstructed egress. Emergency lighting shall be installed in accordance with NFPA 101.

##### 1.14.3 Maximum dead ends.

Maximum dead ends shall be as per NFPA 101 based upon most stringent occupancy requirements. Verify as part of the Life Safety/Building Code Analysis.

##### 1.14.4 Egress locations

All egress locations shall be marked with exit signs per NFPA 101. Review as part of the Life Safety/Building Code Analysis.

## 1.14.5 Outside Exit Doors

All outside exit doors shall swing in the direction of exit travel. Outside exit doors shall be equipped with panic hardware mounted 44 inches above the finish floor and have a minimum clear width of 34 inches to allow for egress. Exit doors requiring security hardware shall be reviewed as part of the Life Safety/Code Analysis. Review per NFPA 101.

## 1.14.6 Required Fire Exits

All required fire exits from the building shall lead to a public way or to a clear safe area at a minimum distance of 75-feet from the building.

## 1.15 CYBERSECURITY

The design and construction of fire protection systems shall comply with applicable requirements of UFC 4-010-06, Cybersecurity of Facility-Related Control Systems. Refer to 01 81 00 SUMMARY OF THE WORK and 01 86 26 ELECTRICAL REQUIREMENTS for additional requirements.

-- End of Section --

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## SECTION 01 86 26

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ATTACHMENTS:

Sole Source Justification for IDS Equipment

Sole Source Justification for CISCO Switch

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## SECTION 01 86 26

## ELECTRICAL REQUIREMENTS

## PART 1 ELECTRICAL DESCRIPTIONS AND NARRATIVES

## Attachments:

Sole Source Justification for IDS Equipment  
Sole Source Justification for CISCO Switch

## 1.1 GENERAL

The design publications listed below shall be used as sources of criteria for the electrical design. Where a date is not specified, the most current edition of the code or standard in effect, including errata and addenda available at the RFP proposal submission deadline shall be used as criteria for the design. The criteria from these sources may be supplemented but not supplanted, by applicable criteria contained in nationally recognized codes and standards.

## 1.2 REFERENCES

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING  
ENGINEERS (ASHRAE)

ASHRAE 90.1 - IP (2013) Energy Standard for Buildings  
Except Low-Rise Residential Buildings

U.S. Air Force Academy (USAFA)

USAFA DS (Latest Approved Version) USAFA Design  
Standards

PSMP (2019) USFA Preparatory School Master Plan

AF 91-501 Air Force Consolidated Occupational Safety  
Standard

AFGM 2017-32-01 (2 Feb 2017) Air Force Guidance  
Memorandum, Civil Engineer Control Systems  
Cybersecurity

AFI 32-1054 (2014) Corrosion Control

U.S. ARMY CORPS OF ENGINEERS (USACE)

ODDG (March 2010 Edition, Revised Dec 2012)  
Omaha District Design Guide for Design  
Solicitations.  
[https://www.nwo.usace.army.mil/html/ed-di/SoS\\_](https://www.nwo.usace.army.mil/html/ed-di/SoS_ODDG_Supplement_Information/ODDGIFB.pdf)  
[ODDG\\_Supplement\\_Information/ODDGIFB.pdf](https://www.nwo.usace.army.mil/html/ed-di/SoS_ODDG_Supplement_Information/ODDGIFB.pdf)

EM 385-1-1 (2014) Safety and Health Requirements  
Manual

## U.S. DEPARTMENT OF DEFENSE (DOD)

DoDi 6055.17	DoD Installation Emergency Management (IEM) Program
DoDi 8500.01	Cybersecurity
UFC 1-200-01	DoD Building Code (General Building Requirements)
UFC 1-200-02	High Performance and Sustainable Building Requirements
UFC 3-490-06	Elevators
UFC 3-501-01	Electrical Engineering
UFC 3-520-01	Interior Electrical Systems
UFC 3-530-01	Interior and Exterior Lighting and Controls
UFC 3-550-01	Exterior Electrical Power Distribution
UFC 3-560-01	Electrical Safety, O & M
UFC 3-580-01	Telecommunications Interior Infrastructure Planning And Design
UFC 3-600-01	Fire Protection Engineering for Facilities
UFC 4-010-01	DoD Minimum Antiterrorism Standards for Buildings
UFC 4-010-06	Cybersecurity of Facility-Related Control Systems
UFC 4-021-01	Design and O&M: Mass Notification Systems, With Change 1
UFC 4-021-02	Electronic Security Systems

## U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

36 CFR 1191	Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines
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## NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA FB 1	(2014) Standard for Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable
NEMA MG 1	(2018) Motors and Generators
NEMA 250	(2020) Enclosures for Electrical Equipment (1000 Volts Maximum)

NEMA AB 3	(2013) Molded Case Circuit Breakers and Their Application
ANSI C12.1	(2014; Errata 2016) Electric Meters - Code for Electricity Metering
ANSI C80.1	(2020) American National Standard for Electrical Rigid Steel Conduit (ERSC)
ANSI C80.3	(2020) American National Standard for Electrical Metallic Tubing (EMT)
ANSI/NEMA OS 1	(2013; R 2020) Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports
NEMA ST 20	(2014) Dry-Type Transformers for General Applications
NEMA WD 6	(2016) Wiring Devices Dimensions Specifications
NEMA Z535.1	(2017) Safety Colors
NEMA Z535.4	(2011; R 2017) Product Safety Signs and Labels

## INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE 1100	(2005) Emerald Book IEEE Recommended Practice for Powering and Grounding Electronic Equipment
IEEE 142	(2007; Errata 2014) Recommended Practice for Grounding of Industrial and Commercial Power Systems - IEEE Green Book
IEEE 519	(2014) Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems
IEEE C37.96	(2012) Guide for AC Motor Protection
IEEE 399	(1997) Brown Book IEEE Recommended Practice for Power Systems Analysis
IEEE Std 242	(2001; Errata 2003) Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems - Buff Book

## ILLUMINATING ENGINEERING SOCIETY (IES)

IES HB-10	(2011; Errata 2015) IES Lighting Handbook
IES LM-80	(2019) Measuring Lumen Maintenance of LED Light Sources
IES TM-21	(2019) Projecting Long Term Lumen Maintenance of LED Light Sources

## INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC (2021) International Building Code

## INTERNATIONAL ELECTRICAL TESTING ASSOCIATION (NETA)

NETA ATS (2021) Standard for Acceptance Testing  
Specifications for Electrical Power  
Equipment and Systems

## NACE INTERNATIONAL (NACE)

NACE SP0169 (2013) Control of External Corrosion on  
Underground or Submerged Metallic Piping  
Systems

## NATIONAL ELECTRICAL CONTRACTORS ASSOCIATION (NECA)

NECA/BICSI 568 (2006) Standard for Installing Building  
Telecommunications Cabling

## NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 1 (2021) Fire Code

NFPA 101 (2021) Life Safety Code

NFPA 70 (2020) National Electrical Code

NFPA 70B (2019) Recommended Practice for Electrical  
Equipment Maintenance

NFPA 70E (2021) Standard for Electrical Safety in  
the Workplace

NFPA 72 (2019; TIA 19-1; ERTA 2019) National Fire  
Alarm and Signaling Code

## UNDERWRITERS LABORATORIES (UL)

UL 67 (2018; Reprint Oct 2019) UL Standard for  
Safety Panelboards

UL 83 (2017; Reprint Apr 2020) UL Standard for  
Safety Thermoplastic-Insulated Wires and  
Cables

UL 360 (2013; Reprint Nov 2018) UL Standard for  
Safety Liquid-Tight Flexible Metal Conduit

UL 489 (2016; Reprint Apr 2019) Molded-Case  
Circuit Breakers, Molded-Case Switches,  
and Circuit-Breaker Enclosures

UL 845 (2005; Reprint Oct 2018) UL Standard for  
Safety Motor Control Centers

UL 943 (2016; Reprint Feb 2018) Ground-Fault

## Circuit-Interrupters

UL 4248	(2017) UL Standard for Safety Fuseholders
UL 870	(2016; Reprint Mar 2019) UL Standard for Safety Wireways, Auxiliary Gutters, and Associated Fittings

## 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Cybersecurity Subject Matter Expert (Qualifications)

## 1.4 FACILITY DESCRIPTION

See Specification Section 01 81 00 for a description of new facility, functional requirements, and overall scope of work under this contract.

## 1.5 DEMOLITION

Refer to Specification Section 01 82 00 paragraph 1.4.2 for the general requirements of the existing Preparatory School Dormitory buildings 5210, 5212, and 5214 that are subject to demolition as a part of this contract. Refer to Specification Section 02 41 00 for the detailed demolition requirements. All demolition work shall be done in accordance with UFC 3-501-01.

## 1.6 SCOPE OF WORK

This work includes creating an electrical power system, lighting system, grounding system, and fire alarm system. It will also include a rough-in for security and audio/visual systems, with the complete design and install as separate, contractual options. Design and provide completely functional systems, including details and schedules, as described herein for the Consolidated Prep Dormitory located at the Air Force Academy, CO. The proposal shall be designed under the supervision of a registered professional electrical engineer for quality assurance.

The facilities impact levels for cybersecurity confidentiality, integrity and availability (C-I-A), shall be considered to be "low, low, low," for each of the facilities, until otherwise notified. See paragraph Cybersecurity" below for more information.

The information presented within the specification shall be used to form the RFP documents. The electrical system shall meet the following standards and criteria:

ICC IBC, ASHRAE 90.1 - IP, UFC 3-520-01, UFC 3-530-01, UFC 3-560-01, UFC 3-600-01, and UFC 4-021-02.

## 1.7 COORDINATION OF ELECTRICAL CRITERIA

Electrical criteria provided in the following sections shall be coordinated with the architectural, mechanical, and all other sections of

this RFP. The types of electrical equipment indicated in the electrical requirements are approximate. During the site visit, all other additional electrical systems, associated equipment and devices, not indicated in the drawings provided, shall be incorporated into the scope of this project. Contractor design shall meet the intent of the electrical requirements provided in the scope of this project. Contractor shall coordinate the final locations of electrical equipment with the COR.

#### 1.8 SPECIAL ENVIRONMENTAL CONDITIONS

Electrical equipment such as facility assemblies shall be derated for altitude - 5900-feet.

Transformers meeting NEMA ST 20 shall be derated for altitude (1/2 percent for each 330-feet or fraction thereof above 3300-feet mean sea level).

#### 1.9 ACCOMMODATION OF DISABILITIES

Designs shall incorporate provisions of the Architectural Barriers Act ( 36 CFR 1191) and ICC IBC. All aspects concerning placement and sizing from these standards shall be incorporated. In case of a conflict between the ABA, the UFCs, the ICC IBC, ABA shall govern. Provisions pertaining to clearances shall generally be accommodated by other disciplines, however the design shall observe some precautions such as avoiding equipment configurations which would project into restricted clear space in corridors.

#### 1.10 ELEVATORS

All work involving elevators and associated equipment shall be done in accordance with UFC 3-490-06.

#### 1.11 ANTITERRORISM/FORCE PROTECTION

The design shall comply with UFC 4-010-01. Ensure that obstructions within 33-feet of inhabited buildings or portions thereof do not allow for concealment from observation of objects 6-inches or greater in height.

### PART 2 ELECTRICAL EQUIPMENT AND HARDWARE

The Contractor shall install meeting standards, UL 67, IES HB-10, IEEE 399 and system components, including; switchboards, panels, lighting, equipment connections, etc., including Government furnished equipment, and appurtenances in accordance with the manufacturer's instructions and shall furnish necessary connectors, terminators, interconnections, services, and adjustments required for a complete and operable system. Interior wiring, including low voltage wiring, shall be installed in steel conduit. Flexible cords or cord connections shall not be used to supply power to any components, except where specifically allowed in writing by the Contracting Officer and meeting UL 360. Grounding shall be installed per IEEE 519, IEEE 1100. Design shall preclude ground loops, noise, and surges from adversely affecting system operation. The installation wiring shall use terminal strips, wire nuts, or crimp terminals meeting . Devices shall use terminal points, strips or screw terminals for the wiring connections points - pigtail connections are not acceptable. If the manufacturer needs to use special cable e.g. twisted and shielded, then the minimum wire size and insulation voltage rating shall be met.

## 2.1 ELECTRICAL EQUIPMENT

The preferred location of electrical equipment such as switchboards, new equipment, or materials, is outside the unobstructed space.

## 2.2 EQUIPMENT ENCLOSURES

Enclosures shall meet NEMA 250. If walls or other screening devices with more than two sides are placed around electrical or mechanical equipment within the unobstructed space, enclose the equipment on all four sides and the top. Openings in screening materials and gaps between the ground and screens or walls making up an enclosure shall not be greater than 6-inches. Secure any surfaces of the enclosures that can be opened so that unauthorized personnel cannot gain access through them.

## 2.3 UTILITY DISTRIBUTION AND INSTALLATION

Route critical utilities and those necessary for life-safety so that they are not on exterior walls.

## 2.4 SERVICES OF "CORROSION EXPERT"

Obtain the services of a "corrosion expert" to supervise, inspect, and test the installation and performance of the cathodic protection system. "Corrosion expert" refers to a person, who by thorough knowledge of the physical sciences and the principles of engineering and mathematics, acquired by professional education and related practical experience, is qualified to engage in the practice of corrosion control of buried or submerged metallic surfaces.

- a. Such a person must be accredited or certified by the National Association of Corrosion Engineers (NACE) as a NACE Accredited Corrosion Specialist or a NACE certified Cathodic Protection (CP) Specialist or be a registered professional engineer who has certification or licensing that includes education and experience in corrosion control of buried or submerged metallic piping and tank systems, if such certification or licensing includes 5 years experience in corrosion control on underground metallic surfaces of the type under this contract.
- b. The "corrosion expert" shall make at least 3 visits to the project site. The first of these visits shall include obtaining soil resistivity data, acknowledging the type of pipeline coatings to be used and reporting to the Contractor the type of cathodic protection required. Once the submittals are approved and the materials delivered, the "corrosion expert" shall revisit the site to ensure the Contractor understands installation practices and laying out the components. The third visit shall involve testing the installed cathodic protection systems and training applicable personnel on proper maintenance techniques. The "corrosion expert" shall supervise installation and testing of all cathodic protection.
- c. Submit evidence of qualifications of the "corrosion expert" including their name and qualifications certified in writing to the Contracting Officer prior to the start of construction. Certification shall be submitted giving the name of the firm, the number of years of experience, and a list of not less than five (5) of the firm's installations, three (3) or more years old, that have been tested and found satisfactory.

## 2.5 SACRIFICIAL CATHODIC PROTECTION SYSTEM

A sacrificial anode cathodic protection system shall be provided for underground metallic lines, fittings, valves, and fire hydrants. If underground lines are non-metallic, then associated metallic fittings, valves, hydrants, Tee's and 90's, etc., shall be protected and shall be provided with a tracer wire over the pipeline. A dedicated galvanic anode shall be used for each fitting, valve, hydrant, etc. Galvanic anodes shall be connected to the structure through a test station. At least one test station shall be provided on each valve, fire hydrant, and metallic pipe. Isolate new piping from existing piping. Insulated flanges or couplings, if not accessible, shall have a test station which is connected to either side of the insulated flange or coupling. Connections to structures shall be done with two conductors: one is the active conductor and one is a spare. A conductor color coding system shall be used: black for anode, red for main structure, blue for a second structure, yellow for foreign line crossing. In addition to the anodes, metallic pipes must be provided with a coating system. Coating compound shall be cold-applied wax base material. Wax-tape primer and #1 wax-tape shall be used to cover bolts and exposed uncoated metal fittings. (Trenton Corporation, 313-426-3955, Waxtape primer / #1 Wax-tape or approved equal). The cathodic protection systems shall be designed and installed in accordance with AFI 32-1054 and NACE SP0169 Standards. The design of the system shall be a minimum of 25 years with a soil resistivity as measured by the corrosion expert. The highest-quality, high-potential magnesium anode shall be used. Criteria for determining the adequacy of protection shall be in accordance with NACE SP0169 and shall be selected by the corrosion engineer as applicable. Provide proper protection by showing that one of the criteria in NACE TM0497 is met. Anode wires shall be #10 AWG. Continuity bonds between different metallic structures shall consist of two #8 AWG. Conductor shall be rated for use in direct bury wet environments per NFPA 70.

Design shall be by a corrosion protection engineer.

### 2.5.1 Test Stations

1. Flush, curb-type that is in 1-foot X 1-foot concrete pads and H-20 rated.
2. Standard, off-the-shelf product. (Handley or equal).
3. Install in a concrete ring that is at least 4 inches thick and 12-18 inches in diameter.
4. Lockable cover.
5. Labeled "C.P. Test".
6. Test stations shall be located not more than 10 feet from the metallic structure.
7. Test station cover shall be color coded to match the type of structure as follows:
  - a. Yellow - Gas, oil, dangerous materials.
  - b. Blue - Water systems
  - c. Green - Sewer systems
8. Test stations shall have two leads to the structure and one lead from the anode. Provide an appropriately rated shunt to tie the anode and one structure lead together. The second structure lead is a spare.

### 2.5.2 Cathodic Protection for Tracer Wire

Design and construction of the sacrificial anode system shall comply with



all the applicable items indicated for metallic fittings on a non-metallic line and the following additional items:

- (a) Protect underground utility tracer wires with a 1-lb anode for every 400-feet of wire (no CP test station is needed for this situation).
- (b) Where possible combine the cathodic protection test station, utility locate tracer wire test station and valve box in the same concrete pad.

### 2.5.3 Installation Documentation.

The following items are common to all sacrificial anode systems, except for the tracer wire cathodic protection:

- (a) Identify each protected fitting(s)/structure with a unique alphanumeric number.
- (b) Identify each protected fitting(s)/structure with a GPS coordinate.
- (c) Provide photographs for each installation of a protected fitting(s)/structure showing the following:
  - 1. Location of the anode in reference to the protected fitting/structure. (Both items should be visible in the picture)
  - 2. Alpha numeric reference number; (that can be related to an exact location on the drawings).
  - 3. Date of installation.
  - 4. Contract description.
  - 5. Contract number.
- (d) Conduct and document soil resistivity testing. Soil resistivity testing must be performed to help verify the assumptions made in the calculations. Provide information in the report on where the soil sample was obtained and show soil resistivity locations on the scaled CADD drawings.
- (e) Provide a test report with the readings for each location. This shall include the date, time, native, instant off and connected.
- (f) Provide a scaled CADD drawing showing the protected fitting(s)/structure with its unique alphanumeric number, structure layout and route, location of anodes, GPS coordinates, and location of soil samples. Provide sufficient landmark information to easily find the items.
- (g) Corrosion Expert shall provide training for the system installed.

### 2.6 EQUIPMENT BRACING

Mount overhead utilities and equipment weighing 31 pounds or more to minimize the likelihood that they will fall and injure building occupants. Design equipment mountings to resist forces of 0.5 times the equipment weight in any direction and 1.5 times the equipment weight in the downward direction. This does not preclude the need to design equipment mountings for forces required by other criteria such as seismic standards.

### 2.7 INTERRUPTING CAPACITIES

Equipment ratings shall be determined based on results of the short circuit analysis per , NEMA AB 3 and IEEE Std 242. Minimum standard interrupting ratings shall be identified on the plans preferably on a one-line diagram or alternately in panel schedules. Ratings may be called out in the specifications when single items are involved. The designer shall identify variables (such as equipment impedances) which could affect available short circuit current and verify that equipment acceptable under contract plans and specifications would not permit fault current levels

higher than the specified interrupting ratings.

## 2.8 NUISANCE TRIPPING

For a period of one year after construction, the contractor shall be responsible for correcting problems which may arise from nuisance tripping. Nuisance tripping shall be defined as having breakers or fuses activating under an overload condition while the equipment was operating within manufacturer parameters. These situations shall be corrected by making changes to the installation at no cost to the Government. These corrections can increase the trip setting or fuse size, as long as the increased setting is still at or below setting maximums given in NFPA 70. Any change could impact other items not listed such as conductor sizing and upstream coordination settings.

## 2.9 STANDARD PRODUCTS

Material and equipment shall be a standard product of a manufacturer regularly engaged in the manufacture of the product and shall essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening. The label or listing of the Underwriters Laboratories, Inc., will be accepted as evidence that the materials or equipment conform to the applicable standards of that agency. In lieu of this label or listing, a statement from a nationally recognized, adequately equipped testing agency indicating that the items have been tested in accordance with required procedures and that the materials and equipment comply with all contract requirements will be accepted.

## 2.10 INTERIOR ELECTRICAL DISTRIBUTION SYSTEM

Select electrical characteristics of the power system to provide a safe, efficient, and economical distribution of power, based upon the size and types of loads to be served. Use distribution and utilization voltages of the highest level that is practical for the load to be served.

The effect of nonlinear loads such as computers and other electronic devices shall be considered and accommodated as necessary. These loads generate harmonics, which can overload conventionally sized conductors or equipment and thereby cause safety hazards and premature failures. Circuits serving such devices shall be equipped with a separate neutral conductor not shared with other circuits. Panelboards and any dry type transformers shall be rated accordingly.

The electrical room shall contain the main service to the building. Locate all panel boards in the electrical room or non public area. Do not install panel boards in hallways or general access areas. There shall be electrical room on each floor to serve the power needs of each respective floor.

### 2.10.1 Coordination Study

Provide a electrical hazard study meeting UFC 3-560-01, EM 385-1-1, NFPA 70E, NFPA 70B and IEEE Std 242 with recommended changes to coordination of the protective devices. Provide warning/danger labels and signs per, UFC 3-560-01 meeting NEMA Z535.4, and NEMA Z535.1 at the equipment. Provide the design services of a registered professional engineer to perform electrical hazard and protective device coordination study.

### 2.10.2 Panelboards

Lighting and appliance branch-circuit panelboards shall be of the circuit breaker conforming to UL 489 and UL 67.

- a. All panelboards shall have a minimum of 25 percent spare capacity for all loads. This includes circuit breaker expansion capability in all panelboards.
- b. Voltage drop shall be taken into account when sizing branch circuits. Feeder conductors shall be sized for a maximum voltage drop of 2 percent at design load. Branch circuit conductors shall be sized for a maximum voltage drop of 3 percent at design load.
- c. The phase loading on panelboards shall be balanced as much as practical by the type of loads on the panel. This includes equally disbursing the spares between the phases.
- d. All panelboards must have arc fault circuit interrupter (AFCI) protection breakers.

### 2.10.3 Motors

Motors, including circuits designed per IEEE C37.96, shall be of sufficient size for the duty to be performed and shall not exceed the full-loading rating when the driven equipment is operating at specified capacity under the most severe conditions encountered.

- a. All motors shall have open frames and continuous-duty classification and be based on a 40 degree C ambient temperature reference.
- b. All motors shall be derated for altitude - 6200 feet. Permanently wired polyphase motors of 1 horsepower or more shall meet the minimum full-load efficiencies in NEMA MG 1 for NEMA Premium™ Efficiency Electric Motors, except that motors provided as an integral part of motor driven equipment are excluded from this requirement if a minimum seasonal or overall efficiency requirement is indicated for that equipment by the provisions of another section.
- c. Disconnect switches for motors shall be heavy duty type. Exterior switches shall be rain-tight. Disconnect switches, meeting UL 4248, for packaged HVAC equipment shall be as required by the equipment manufacturer.
- d. Reduced voltage starters shall meet UL 845 and be used on motors which are 20 Hp or larger as a minimum.
- e. Three-phase motors shall have phase loss protection.

### 2.10.4 General Purpose Receptacles

Duplex receptacle outlets for general purpose applications shall be NEMA WD 6 Type 5-20R, 20 amp, 125 volt, 2-pole, 3-wire grounding type. Receptacles shall be gray. A maximum of six duplex general purpose receptacles may be connected to a 20A, 120V receptacle circuit. Receptacle circuits shall not supply lighting and motor loads.

### 2.10.5 Special Receptacles

Duplex receptacles for the applications noted below shall be 20 amp, 125 volt, 2-pole, 3-wire grounding type. Ground Fault Interrupter (GFI) receptacles shall be provided in all wet locations. Weatherproof receptacles for exterior use, shall be mounted in a box with a gasketed, weatherproof, cast-metal cover plate and gasketed cap over each receptacle opening. Provide duplex receptacles in the following locations:

- a. Provide weatherproof duplex receptacles with ground fault interrupters meeting UL 943 at the exterior of building.
- b. Provide outlets, meeting ANSI/NEMA OS 1, where required for servicing HVAC equipment.
- c. Provide two 120V / 20A dedicated circuits per each individual telecommunication rack or full height floor mounted telecommunication cabinet. The 120V / 20A circuits will each host double duplex NEMA 5-20R receptacles, but each circuit will be on a separate phase of the panelboard. For rack power installations, receptacles shall be mounted 12 inches to the rear of the rack and centered on the power. Vertical cable management units. For cabinet power installations, the receptacles shall be installed inside the cabinet and mounted to the lower rear outer walls of the cabinet

### 2.10.6 Mechanical Connections

Contractor shall provide branch circuits, disconnect switches, magnetic starters, and all other related electrical equipment and material for all mechanical equipment to be installed in the facility. This shall include all HVAC units, unit heaters, pumps, exhaust fans, and all other mechanical equipment. Contractor shall coordinate this electrical requirement with the mechanical requirements.

## 2.11 EXTERIOR ELECTRICAL

### 2.11.1 Exterior Primary Electrical Distribution System

The exterior primary electrical distribution system at the Air Force Academy is a 7200/12470 Volt, 3-phase, 4-wire (grounded neutral) system, managed by Colorado Springs Utilities. The design shall include any exterior work required for a fully functional system.

### 2.11.2 Protective Coordination Study

Protective devices proposed shall be based on recommendations of this study. The Government shall not be held responsible for any changes to equipment, device ratings, settings, or additional labor for installation of equipment or devices ordered and/or procured prior to approval of the study. Data consisting of manufacturer's time-current characteristic curves for individual protective devices, recommended settings of adjustable protective devices, and recommended ratings of non-adjustable protective devices shall be submitted. Coordinate medium voltage system fusing with the Contracting Officer's Representative for fuse size or available system fault data.

### 2.11.3 Field Testing

The proposed test plan, prior to field tests, consisting of complete field

test procedure including tests to be performed, test equipment required, and tolerance limits, including complete testing and verification of the ground fault protection equipment, where used. Performance test reports in booklet form showing all field tests performed to adjust each component and all field tests performed to prove compliance with the specified performance criteria, upon completion and testing of the installed system. Each test report shall indicate the final position of controls.

## 2.12 INTERIOR LIGHTING SYSTEM

Lighting and lighting controls shall comply with the recommendations of the Illumination Engineering Society of North America (IESNA) and the requirements of ASHRAE 90.1 - IP.

- (a) Reflective Surfaces: Coordinate daylighting requirements and interior architectural spacesurfaces and colors with the lighting systems to provide the most energy-efficient workable combinations.
- (b) Lighting Systems and Controls: Lighting systems (including lighting controls, daylighting controls, and lighting power density limits) shall comply with the requirements of Section 7.4.6 of ASHRAE Standard 189.1 and Section 9 of ANSI/ASHRAE/IES 90.1-2013. Lighting designs shall follow the recommended practices of the IES and shall target the recommended illumination levels of the IES.
- (c) Occupancy or Vacancy Sensors: Use occupancy or vacancy sensors to automatically turn off lighting a specified time after all occupants leave the space. The off time shall be user adjustable to 5, 15, or 30 minutes. Selection of the sensor type (single or dual technology, wired or wireless) shall be based on the space configuration, user functionality and life-cycle costbenefit analysis. Single technology solutions shall incorporate signal processing technology that distinguishes between background noise and actual motion without automatically changing their sensitivity.

### 2.12.1 LED Luminaires

Provide luminaires complete with power supplies (drivers) and light sources. Provide design information including lumen output and design life in luminaire schedule on project plans for LED luminaires. LED luminaires must meet the minimum requirements in the following table:

<u>LUMINAIRE TYPE</u>	<u>MINIMUM LUMINAIRE EFFICACY (LE)</u>	<u>MINIMUM COLOR RENDERING INDEX (CRI)</u>
LED TROFFER - 1 x 4 2 x 2 2 x 4	90 LPW	80
LED Downlight	50 LPW	90
LED Track or Accent	40 LPW	80
LED Low Bay/High Bay	80 LPW	70
LED Linear Ambient	80 LPW	80

LED luminaires must also meet the following minimum requirements:

- a. Luminaires must have a minimum 10 year manufacturer's warranty.

- b. Luminaires must have a minimum L70 lumen maintenance value of 50,000 hours as calculated by IES TM-21, with data obtained per IES LM-80 requirements.
- c. Luminaires must have white finish typical at exposed fixture housing and trims per USAFA DS.

#### 2.12.2 LED Light Sources

- a. Correlated Color Temperature (CCT) of 3500 degrees K.
- b. High power, white light output utilizing phosphor conversion (PC) process.

#### 2.12.3 Egress and Exit Lights

Egress and exit lights shall be designed and installed in accordance with NFPA 101. Egress lighting shall be equipped with individual self-contained battery packs (Type 200). Exit light fixtures shall be LED type with self-contained battery packs.

#### 2.13 FIRE DETECTION AND MASS NOTIFICATION

- 1. A fire alarm and detection system shall be provided for this facility. It shall comply with the requirements of UFC 3-600-01 and NFPA 72. The system shall be addressable and fully compatible with and integrated with the local Installation wide Fire Alarm System. Provide in compliance with UFC 4-021-01.
- 2. All initiating devices shall be connected, Class B, to signal line circuits (SLC). All alarm appliances shall be connected to notification appliance circuits (NAC), Class B.
- 3. Breakglass manual fire alarm stations shall not be used.
- 4. The fire alarm system shall communicate to the Air Force Academy central fire system which is a radio based Notifier system. Place the Local Operator Control (LOC) near the building entrance, the entrance to each floor, and the Fire Alarm Panel. Provide a LCD and graphic map showing the zone of coverage for the fire alarm system. Coordinate location of exterior horn and light within 20 feet of the Fire Department Connection. Provide an exterior horn/strobe at the main entrance to the facility. Provide a fire alarm and mass notification system in compliance with UFC 4-021-01, Design and O & M: Mass Notification Systems to meet UFC 4-021-01
- 5. Fire alarm and detection systems shall be the addressable type. Fire alarm initiating devices, such as smoke detectors, heat detectors and manual pull stations shall be addressable. When the system is in alarm condition, the system shall annunciate the type and location of each alarm initiating device. Sprinkler water flow alarms shall be zoned by building and by floor. Supervisory alarm initiating devices, such as valve supervisory switches, fire pump running alarm, low-air pressure on dry sprinkler system, etc. shall be zoned by type and by room location. Provide mass notification and fire alarm systems in compliance with UFC 4-021-01.
- 6. Provide all software; database with complete identification of

programmable portions of system equipment and devices, and all other system programming data on all modes of the system; connecting cables; and proprietary equipment necessary for the operation, maintenance, testing, repair and programming, etc. of the system and that may be required for implementation of future changes to the fire system (additional and/or relocated initiating devices, notification devices, etc.

7. Provide all system and equipment technical data and computer software with the requisite rights to Government use, in accordance with the applicable contract clauses.
8. Electromagnetic door hold open features will require additional smoke detection.

#### 2.14 SECURITY SYSTEM

Contractor's base design shall include a rough-in for a CCTV system and a keyless access system to be installed as a Bid Option. Raceways shall be rigid steel conduit with a pull string. Design shall be in accordance with UFC 4-021-02 and the requirements of this section.

Closed Circuit Television (CCTV). Contractor shall install the necessary conduit, electrical power, and wiring to support the installation of a CCTV system. Contact the Physical Security Office for guidance. Cameras and CCTV equipment from the existing buildings shall be removed by the government prior to building demolition. The CCTV system will include 100% coverage of all hallways, entrances/exits, day rooms, study rooms, stairwells, laundry rooms and storage rooms. It will include a 360-degree view of the exterior of the building. The cameras will be high-resolution, digital cameras and will have a minimum of 1080- picture quality for the interior and 4k quality for the exterior. Two monitoring stations will be installed at each CQ desk. USAFA's CCTV specifications will be provided to the Contractor upon Contract Award.

Keyless Access. Contractor shall install the necessary conduit, electrical power, and wiring to support installation of a keyless system as indicated in the drawings and the Room Data Sheets. Contact the Physical Security Office for guidance.

As a project Option, the contractor shall procure and install all equipment and wiring necessary for a fully functioning CCTV system. The design and selection of the CCTV system and equipment shall comply with all requirements of UFC 4-021-02. Installation of CCTV equipment shall require Certification to be obtained, refer to section 01 86 29 COMMUNICATIONS REQUIREMENTS for additional information. The CCTV equipment selected shall be approved for use on Air Force installations. The CCTV equipment selected shall be fully compatible with the existing equipment to be relocated. The actual installer shall be required to be a "certified value-added reseller (VAR) in good standing" with the selected vendor from the AF approved products list (APL) systems to be installed.

For information only, the Air Force Non-Nuclear Configuration Management Database (CMD) Equipment Approval list is included with this RFP as an attachment.

#### 2.15 WIRING METHODS

Wiring shall conform to NFPA 70 and UFC 3-520-01.

## 2.16 POWER CONDUCTIORS

Minimum power wiring shall consist of #12 AWG conductors, meeting UL 83, installed in 3/4-inch conduits. Conductors shall be copper only. Aluminum conductors are not allowed. Conductors shall be installed in conduits and wireways UL 870. Power and lighting conductors shall be 600 volt, Type THNN, THHN, or THW or RHW, except that grounding wires may be type TW. Remote-control and signal circuits shall be Type TW, THW or TF. Cabling systems such as Mineral-Insulated cables, metallic armored cables and nonmetallic-sheathed cables shall not be allowed nor used on this project per BASE requirements.

## 2.17 CONDUITS

Wiring shall consist of insulated conductors installed in steel rigid metallic conduit (RMC), electrical metallic tubing (EMT), or intermediate metal conduit (IMC). Conduit meeting ANSI C80.1, ANSI C80.3, NEMA FB 1, and UL 360, shall be sized and based on use of single conductor cable with THW or RHW insulation for sizes #1 AWG and smaller. Flexible metal conduit (FMC) is permitted only where equipment vibration is a consideration. Plastic conduit is allowed only underground or under the floor slab. Raceways shall be concealed within finished walls, ceilings, and floors. Conduit that is exposed along walls in areas that are subject to damage shall be RMC.

## 2.18 NEUTRAL SIZING

Use of full size neutrals shall be standard practice. For applications involving discharge type lighting (fluorescent or other harmonics generating equipment (inverter, variable frequency drives, other solid state apparatus), the neutral must be treated as a current carrying conductor. Design shall follow IEEE 519 standard. Multi-wire branch circuits with common neutrals shall not be permitted to serve data processing applications, including personal computers, but branch circuits shall have an individual neutral for each phase conductor.

## 2.19 GROUNDING SYSTEM

The grounding system shall be designed in accordance with NFPA 70, IEEE 142 and the following criteria. In general, all metallic building components including reinforcing steel and miscellaneous metals shall be part of an electrically continuous ground system. Steel studs used in interior wall construction, T bars of the ceiling grid, diffusers of the air distribution system, and door hardware are exempt from this bonding requirement. Bonding shall be by exothermic welding or the brazing of a copper wire between components. The Lightning Protection System (LPS) shall be connected to the EES via multiple down conductors. The EES shall be bonded to the duct bank guard wires and to the ground ring around the facility transformer. The EES shall be extended into the main electrical room to the MSBs. The telecommunications grounding system shall be interconnected in accordance with UFC 3-580-01. See Paragraph "Separation of Systems" for additional grounding requirements.

## 2.20 GROUNDING CONDUCTORS

A green equipment grounding conductor, sized in accordance with NFPA 70 shall be provided, regardless of the type of conduit. The equipment grounding conductors shall be carried back to the service entrance grounding



connection or separately derived grounding connection. Grounding conductors shall be provided in all branch (including lighting circuits) and feeders circuits.

## 2.21 TESTING

Contractor shall provide all testing meeting NETA ATS. Testing shall include low voltage conductors, high voltage conductors, and all other mandatory testing required by the specifications provided with this section.

## 2.22 CYBERSECURITY SCOPE OF WORK

All control systems (including systems separate from an energy management control system) shall be planned, designed, acquired, executed, and maintained in accordance with DoDi 8500.01, AFGM 2017-32-01, UFC 4-010-06, and as required by individual Service Implementation Policy. The Contractor is responsible for all deliverables per Chapter 5 of UFC 4-010-06.

Facility Related Control Systems requiring cybersecurity include, but are not limited to, the following:

Electronic Security Systems (ESS) which include: Intrusion Detection Systems (IDS), Access Control Systems (ACS), and Video Monitoring Systems/Closed Circuit TV (CCVT)

Fire Protection Life-safety Systems which include: Fire Alarm Reporting System (FA), Fire Suppression System, Mass Notification System (MN) Building (Level) Automation System (BAS), Energy Monitoring and Control System (EMCS), and Utility Monitoring and Control System (UMCS), Heating, Ventilation, Air Conditioning Systems (HVAC), Utility Metering System (Advanced Meters, AMI, etc.)

Building Lighting System (UFC 3-530-01), and Receptacle Control System Elevators

Variable Frequency Drives

Automated Rollup Doors

Automated Window Shades

Electrical Distribution System (Exterior, and Interior) with micrologic processors

LED Marquee Systems when connected to process controllers

Audio/Visual Systems (A/V)

Gate Controllers

Irrigation Controllers

Other Facility Related Control Systems as defined by Project Requirements, and not specifically identified. Any system, or component of a system which has wireless, radio frequency (rf), blue tooth, network communication capabilities, or a port for connecting a laptop/computer, or digital/analog connection to or through which connection to another electronic device may occur shall be identified and inventoried.

Except as indicated, wireless and plug-and-play controls shall not be used.

### 2.22.1 Cybersecurity Subject Matter Expert (SME)

Cybersecurity Subject Matter Expert (Qualifications): Provide the services of a cybersecurity SME. All certifications must be in effect and current at the time of the resume submission. The individual shall oversee all work within this section and the 25 05 11 specifications. The Cybersecurity Subject Matter Expert must meet Information Assurance

Manager Level II Certification requirements in accordance with DoD 8570.01-M Information Workforce Improvement Program. The individual shall have experience with the Risk Management Framework (RMF) process. Facility related control system (frcs) and industrial control system (ics) knowledge is required through demonstrated control system design, testing, and commissioning experience.

#### 2.22.2 CYBERSECURITY DESIGN REVIEW

At minimum, UFC 4-010-06 Paragraph 3-1.1 Steps 1 through 4 shall be completed for the interim design review for review and further input from the System Owner (SO) and the Authorizing Official (AO). Steps 1 through 5 shall be completed for the 100 percent design review. The following systems will be included as a minimum:

Energy Monitoring and Control System (EMCS) - L-L-L  
POC - Derrick Gomes, CISSP

Fire Alarm / Mass Notification - L-M-M  
POC - Derrick Gomes, CISSP

The SO for each system is identified above. All communications with the SO and AO shall be through the Contracting Officer Representative.

#### 2.22.3 CYBERSECURITY DESIGN REQUIREMENTS

Identify and inventory each control system and component, and provide an edited UFGS 25 05 11 specification section variant applicable to each system. For independent systems, or components which have limited, or read only user interface with minimal user account support (or greater), provide an edited "Configurable Systems" 25 05 11 specification section. Provide the edited 25 05 11 specification sections with sufficient detail and information pertinent to the interconnection of systems as indicated in the UFGS for review by the SO and AO for cybersecurity hygiene. The network mappings and network architecture tabular data shall consist of all connectable devices, modules, and equipment, including devices whose outputs are binary (open/close contacts or similar) and standalone connectable devices/modules/equipment not connected to other devices/modules/equipment. Utilize the UFGS Section 25 05 11 supplemental materials for the submittal process.

#### 2.22.4 C-I-A IMPACT LEVEL RATINGS

Confidentiality-Integrity-Availability (C-I-A) Impact Level Ratings may be taken from the "Distribution of the FRCS Master List Memo-signed 7-16-21" and "Addendum- FRCS Master List Update 7-16-21" in accordance with UFC 04-010-06 as preliminary until the respective System Owner (SO) is identified, and able to provide the respective C-I-A impact level ratings.

The "Confidentiality, Integrity, and Availability" (C-I-A) impact levels systems with life safety implications shall be LOW-LOW-MODERATE and other systems shall have a C-I-A impact level of LOW-LOW-LOW, except as described below.

Life safety systems shall include emergency power and fire protection systems, and systems which connect to emergency power and fire protection systems to initiate or or carry out actions of said systems (such as lighting control systems which receive a signal from the fire alarm system to turn on lighting controlled by automatic means along egress paths).

Where interconnections of systems of differing C-I-A impact levels are created, each system shall utilize the C-I-A impact level of the more-secure system (ie, if a system is typically a C-I-A impact level of "L-L-L" but connected to a system with a C-I-A impact level of "L-L-M", the former system shall be designed with a C-I-A impact level of "L-L-M").

#### 2.22.5 COMMISSIONING OF FRCS

Commissioning Agent and Controls Venders shall include cybersecurity in commissioning documents and commissioning plans. Commissioning Agent and Controls Venders shall coordinate commissioning process with, and provide support for, the implementation of cybersecurity controls to ensure that controls are implemented to the maximum extent without rendering components, and systems non-functional. Preliminary cybersecurity construction documents shall be submitted for cybersecurity hygiene review in conjunction with the Commissioning Plan to ensure that cybersecurity controls are implemented to the maximum extent while providing a fully functional system as design and manufacturer intent. Information in the final cybersecurity documentation shall be representative of the systems and devices/modules/equipment in their final states after completion of all commissioning. No alterations shall be made to systems or devices/modules/equipment after submission of final cybersecurity documentation without the written permission of the Cybersecurity SO. Documentation shall be updated for such alteration.

-- End of Section --

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**DEPARTMENT OF THE AIR FORCE**  
AIR FORCE LIFE CYCLE MANAGEMENT CENTER (AFMC)  
HANSCOM AIR FORCE BASE, MASSACHUSETTS

15 Oct 2020

MEMORANDUM FOR DISTRIBUTION

FROM: Force Protection Division, AFLCMC/HBU

SUBJECT: Non-Nuclear Configuration Management Database (CMD) Equipment Approval

1. The CMD equipment listed below is approved for use when employed in the tested PL-1 Non- Nuclear through PL-4 applications and configurations (information can be obtained from AFLCMC/HBU). This letter consists of nine pages.

**\* Indicates correction, change, and/or addition.**

- + Indicates item is no longer procurable and/or supported by Original Equipment Manufacturer (OEM).  
NOTE: Items marked with a (+) are no longer authorized for purchase; however, previously installed systems will remain on this list as legacy systems and for fixed site sustainment support IAW with AFI 31-101, Chapter 9. Contact AFSFC/S5G at [afsfc.ibdss@us.af.mil](mailto:afsfc.ibdss@us.af.mil) with any questions concerning these items.

**PL-1 Non-Nuclear and Below**

**Command, Control Display Equipment (CCDE)**

**Will-Burt Annunciator:**

Will-Burt Annunciator Predator Elite, with integrated access control  
Annunciator Version 3.2.274p, subpatch p32274.1.13  
LINXSNMP version 3.3.274P, subpatch 3.3.274P.1.13.30  
Annunciator Version 3.3.274p, subpatch p33274.1.13.33  
+ Annunciator Version 3.2.274p  
+ Annunciator Version 3.0.252  
+ Annunciator Version 3.0.246  
Annunciator Version 8.1(Win 10)  
+LINX Predator Enrollment System Version 4.1.220  
+LINX Predator Enrollment System Version 4.0.203  
+LINX Versatile Interface Panel (VIP) Version 1.172  
+LINX Versatile Interface Panel (VIP) Version 1.148  
+LINX Versatile Interface Panel (VIP) Version 1.64  
+LINX Versatile Interface Panel, Expandable (VIP-E) Version 7.284  
+LINX Versatile Interface Panel, Expandable (VIP-E) Version 7.145  
+WSD 2000 Card Reader version 1.8V  
WSD-E Card Reader version 3.110

**Advantor Annunciator:**

- + Advantor Advantage Suite for Networks (ASN) Version 4.0
- +Advantor Advantage Suite for Networks (ASN) Version 5.0
- +Advantor Integrated Command, Control, and Access Control System Version 5.0

CUI

+Advantor Integrated Command, Control, and Access Control System Version 5.0 Service Pack 6  
 Advantor Integrated Command, Control, and Access Control System Version 6.0  
 Advantor Advantage Suite for Networks (ASN) Version 6.2 (Win 10)

### **Vindicator Annunciator:**

Vindicator Security Management and Reporting Terminal (SMART) Annunciator with Graphics Display

- + Version 2.40 with Administrative Browser 4.0
- + Version 2.43, Build 11
- + Vindicator Command and Control (VCC) Version 1.0.1.5
- + Vindicator Access Control System (ACS) Version 2.3, Build 21
- + Transponder Firmware Version 2.28
- + TS 4000 Radio Frequency (R/F) Modem Interface
- + Vindicator SMART with Graphics Display Version 2.39 and SAW Version 3.9
- + Vindicator Command and Control Platform (VCCP) v5- Version 5.0
- + Vindicator Command and Control Platform (VCCP) v5- Version 6.0
- + Vindicator Command and Control Platform (VCCP) v5- Version 6.5 (Win 7, 32 bit only)
- + Vindicator Command & Control (VCC) GUI Version 5.1.1.4
- + Vindicator Badge Manager 2 (VBM 2) Version 2.0.7.0
- + Vindicator Badge Manager 2 (VBM 2) Version 2.0.7.1 (Win 7, 32 bit only)
- Vindicator Security Archive Workstation (SAW 5) Version 5.1.0.6
- + Honeywell Vindicator Site Commander Version 1.2.0.1
- + V5 IDS Network Security Appliance – Intrusion Detection, Revision 3.2, Release 20:
  - UHS-8270
  - DES-8270T
  - AES-8270T
- + V5 ACS Network Security Appliance – Access Control Revision 3.2 Release 20:
  - UHS-1401
  - DES-1401T
  - AES-1401T
- + Vindicator UHS-Net Gateways:
  - UHS-8101 Version 2.33, Build 7
  - UHS-8102 Version 2.33, Build 6
  - UHS-8301 Version 2.33, Build 13
  - UHS-8400 Version 2.33, Build 13
- + Vindicator UHS-Net Transponder/Gateway Revision 3.3, Release 5:
  - UHS-1500
  - DES-1500T
  - AES-1500T
- + Vindicator UHS-Net Transponders Version 2.33, Build 13:
  - UHS-6842
  - UHS-6842F
  - DES-6842
  - DES-6842F
- + PC SMART PAC Software Package Version 5.1
- + Proteus 5 & SmartSave 5 Software Programs Version 5.2
- Vindicator Command and Control Platform (VCCP) Windows 7 (64-bit):
  - Vindicator Command & Control 2-Version 1.2.1.4
  - V5 Network Security Application for IDS & ACS-Version 3.2, Release 23
  - UHS-1500 UHS-Net Field Panel-Version 3.3, Release 7
  - Security Archive Workstation 2-Version 1.4.2.9
  - Vindicator Badge Manager 3-Version 2.0.26.7
  - Vindicator Site Commander-Version 1.3.0.7
  - Vindicator Area Commander-Version 1.1.0.6

Vindicator Premise Controller-Version 3.3, Release 7  
 Vindicator PC SMART PAK-Version 6.0.0.1  
 Vindicator Security Server-Version 1.0  
 Vindicator 10 Annunciator Workstation (Win 10 LTSP)  
 Vindicator Command and Control 2-Version 1.3.0.2 SP4  
 Vindicator Security Server-Version 1.0  
 V3 Head-End Server (IDS & ACS)-Version 4.3.2 SP VR11  
 V5 Network Security Appliance-Version 4.5.2 SP VR11  
 AES-1500Network Field Device-Version 4.3.2 SP VR11  
 Security Archive Workstation 2-Version 1.4.3.0  
 Vindicator Badge Manager 3-Version 2.0.26.7  
 Vindicator Site Commander-Version 1.3.0.7  
 Vindicator Area Commander-Version 1.1.0.7  
 Vindicator Premise Controller-Version 4.3.2  
 Vindicator PC Smart PAC (PCSP)-Version 6.0.0.1  
 Vindicator System Terminal-Version Win 10 LTSP

### **LENEL Annunciator:**

LENEL OnGuard Version 7.5 with Milestone Version 12.3

**NOTE: Not approved with any Ground Based Radars**

### **Assessment Subsystems:**

### **Video Servers:**

Advantor Video Management System (VMS) Software (For use only with Advantor ASN 6.0):  
     Advantor VMS Version #va-advantovms-3.3.22-1 (1/e15)  
     Advantor VMS Wall Version ds-vmx-3.3.1-3  
 +Bosch Allegiant Matrix/Control System LTC 8600 and 8800  
 + Broadware 4.80 / Cisco 5.1.1. Video Storage System (NOTE: Cisco renamed the 4.80 after purchasing Broadware.)  
 +Video Image Control and Display System (VICADS) Version 4.0 Video Management System  
 +Prometheus Security Group Global Inc. (PSSGI) (Formerly Open Roads Consulting, Inc.) Video Image Control and Display System (VICADS) Version 4.1 Video Management system using Vindicator V5, Version 6 as the annunciator  
 +PSSGI Video Image Control and Display System (VICADS) Version 4.1 Service Pack 1.6 Video Management system using Vindicator V5, Version 6.5 as the annunciator  
 +PSSGI Video Image Control and Display System (VICADS) Version 4.1 Service Pack 1.6 Video Management system using Lynx Predator Elite Version 3.2.274p, subpatch p32274.1.13 as the annunciator  
 +PSSGI Video Image Control and Display System (VICADS) Version 4.2.7 build 134 using Lynx Predator Elite Version 3.3.274p, subpatch p33274.1.13.33  
 PSSGI Video Image Control and Display System (VICADS) Version 4.2.7 build 134 using Vindicator 7 as the annunciator  
 +PSSGI Video Image Control and Display System (VICADS) Version 4.1 Service Pack 2.0 Video Management system using Vindicator VCCP Windows 7 as the annunciator. Note: *DefendIR Thermal imager protocol support, RadarWall, and Geoserver are not approved for use*  
 +PSSGI Video Image Control and Display System (VICADS) Version 4.1 Service Pack 2.4 Video Management system using Vindicator VCCP Windows 7 as the annunciator. Note: *DefendIR Thermal imager protocol support, RadarWall, and Geoserver are not approved for use.*  
 PSSG Video Image Control and Display System (VICADS) Version 4.3 using LPE v8.1 (Win 10)  
 PSSG Video Image Control and Display System (VICADS) Version 4.3.2 using Vindicator (Win 10)

### Assessment Cameras:

- \* Axis Q1645 Fixed Camera
- \* Bosch 8001 Fixed Thermal Camera (Model:NHT-8001-F35VF)
- \* Bosch MIC IP Starlight 7100i (Model:MIC-7522-Z30W)
- + Bosch NWC-04-95-20P Internet Protocol (IP) Camera
- + Bosch NWC-04-95-20P (1/3 Format)
- + Bosch NBN-498-21P Internet Protocol (IP) Camera
- \* Bosch Auto Dome IP Starlight 7000i Camera (Model:NDP-7512-Z30)
- + Bosch Auto Dome VG 4-322-ECE1M
- + Bosch Auto Dome VG5-623-ECS
- + Bosch Auto Dome VG5-624-ECS
- + Bosch Auto Dome VG5-724-ECE2
- + Bosch Auto Dome 7000 Internet Protocol (IP) Camera with environmental housing
- + Bosch Dinion Internet Protocol (IP) 7000 Camera with environmental housing
- Bosch DINION Internet Protocol (IP) Starlight 7000 HD (NBN-73013-BA)
- Bosch NBN-63013-B
- Bosch NBN-63023-B
- + Bosch NBN-71013-B
- + Bosch NBN-71022-B
- + Burle 300H Camera
- + Burle TC 351 Camera (1/2 inch format)
- + Cohu 4865 Camera (WS3) (2/3 inch format)
- + Cohu 48x Camera (KUMMSC) (2/3 inch format)
- + Cohu 4915/4912-3000 Camera (1/2 inch format)
- + Cohu 3930HD
- + Indigo Vision 512147 (PTZ)
- + Indigo Vision 11650-Audio-HD
- + IQ Eye 752 Internet Protocol (IP) Camera
- + Lumenera Le 165M-DN Internet Protocol (IP) Camera
- + Lumenera Le 165ME-DN Internet Protocol (IP) Camera with environmental housing
- + Lumenera Le 165MP-DN Internet Protocol (IP) Camera with environmental housing
- + Pelco ES31CBW35-2N Pan Tilt Zoom (PTZ) System
- + Pelco ES30C/ES31C Pan Tilt Zoom (PTZ) System (1/4 inch format) with/ without optional Wiper
- + Pelco ES4136-2N Esprit ES system Pan Tilt Zoom (PTZ) System (1/4 inch format) with/ without optional Wiper
- + Pelco MC3651H-2 Interior Camera (1/3 inch format)
- + Pelco IXE20 IP Camera
- + Pelco ES4036-5W Esprit Series, with and without wiper, standard and pressurized
- + Pelco ES40E36-5W Esprit Series, with and without wiper, standard and pressurized
- + Pelco ES40/41 Series Positioning System, Analog, PTZ, w/wo wiper Esprit SE Standard & pressurized, model ES4036-5W
- + Pelco ES40E/41E Series Positioning System, IP, PTZ, w/wo wiper Esprit SE Standard & Pressurized, Model ES40E36-5W
- + Pelco IXE21 Internet Protocol (IP)
- Pelco P1220-ESR1 (PTZ)
- Pelco Sarix IXE Series Box Cameras w/ SureVision 3.0
- VICON SN680D-B-WNIR (PTZ)
- + VICON IQ762WI-V6 Internet Protocol (IP)
- + Vivotek IP 7151
- + Vivotek SD8364E (PTZ)
- + Vivotek IP816A-HP (interior only)
- \* Vivotek IP9165 HP Fixed Camera



### Interior Sensors:

**NOTE:** Balanced Magnetic Switch (BMS) will not be used as a line of detection.

- + AN/GSS-20 Volumetric
- + AN/GSS-9(V) SA 1955 BMS
- + AN/GPS-15(V) Closed-Shelter Aircraft Sensor (C-SAS) (Volumetric)
- + AN/GSS-36(V) Open-Shelter Aircraft Sensor (O-SAS) (Volumetric)
- Banner Engineering Series Active Infrared (AIR), intrinsically safe, Model SMI30 (*Must be installed as an array of individually reporting sensor points, for use across openings in areas where explosive fumes may be present*)
- + Bosch DS 9370 PIR/MW (Volumetric)
- + Bosch DS 939 PIR (Volumetric)
- BEA LZR-s600
- BEA LZR-i30
- Dortronics 1110 x D x CT, Magnetic Lock/BMS
- Dortronics 1120 Series Electromagnetic Lock and BMS
- Eltec 862 Passive Infrared (PIR) Sensor (Wall)
- Fiber Sensys EX-35T Passive Infrared (PIR)
- Fiber Sensys AP2-20N Passive Infrared (PIR)
- Fiber Sensys LD308SH
- Fiber Sensys LD204S
- + General Electric (Sentrol) Model 2700 Series BMS
- + General Electric (Sentrol) Model 2807T Explosion Proof Balanced Magnetic Switch (BMS)
- + General Electric (Sentrol) Model 2507AH-L Wide Gap BMS
- + General Electric (Sentrol) Model 2800 Series BMS
- + General Electric AP669 PIR (Volumetric)
- Magnasphere, High Security Sensor (HSS) Door Contact Switch, BMS, Version HSSL2S000
- Magnasphere L2C-101 (Concealed switch)/L2C 101A (Recessed Switch) Magnetic Contact Switch
- Magnasphere Interior Barrier Sensor Model MSK-101-MM
- Magnasphere Interior Motion Sensor Model MSK-101-MM
- + PL&E Communications AVT 234 (VMD) using Dinion analog infrared imagers, for interior applications only
- Securitron Group MSS-1 High Security Balanced Magnetic Switch
- East Coast Security Products Inc. ESM-6T Tandem Balanced Magnetic Switch
- Protech Passive Infrared and Microwave Intruder Detectors (PIRAMID) SDI-76-G (Volumetric)
- Protech Passive Infrared and Microwave Intruder Detectors (PIRAMID) SDI-77-D (Volumetric)
- Protech SDI-76M-HS1-H Volumetric (Coverage 60'x 40', Two Sensors in Combination)
- Protech SDI-76MW Volumetric (Coverage 60'x 40', Two Sensors in Combination)
- Protech SDI-77XL2-EX, Explosion Proof Volumetric
- Redscan RLS-3060SH Laser Scan Detector (*Approved for wall and ceiling configurations*)
- + SightLogix SightSensor Video Motion Detection (VMD) using NS-90A Thermal Imager, for interior applications only.
- + United Technologies Interlogix AP669 Mirror Optic PIR (Volumetric)
- + Visonic CH-1000 (Wall)
- + Visonic CH-1000/Xtalis ADPRO 18 WH PIR Combination (Ceiling) (Coverage 30'x 30')
- Tyco Visonic Disc 360 Passive Infrared Sensor (Ceiling) (Coverage 360 Degree)
- Maxiris 3000/3100 Active IR Interior Sensor
- + AN/GSS-39(V) Interior Intrusion Detection System. Components include:
  - DR-301      -- DR-558      -- DR-851      -- HT-50B
  - HT-50DC    -- HT-100B    -- HT-100BC    -- SDI-76A
  - SDI-77C    -- SD-80B     -- SD-80EHB    -- SD-150B
  - SD-150EHB -- SRN-2000H

## Exterior Sensors:

The following sensors are approved for use as a standalone line of detection:

BEA LZR-s600 (ECP Configuration)

BEA LZR-i30 (ECP Configuration)

EAG of Americas Infrared Intrusion Detection System 4/2/2 (IIDS4/2/2) Active Infrared Sensor

EAG of Americas Infrared Intrusion Detection System 4/4/2/2/2 w/ PSTC

EAG of Americas Intrusion Detection System 4/2 (IDS 4/2) Active Infrared Sensor

IR Global Infrared Intrusion Detection System 4/4/2

IR Global IRG-509-15M

+ Microtrack buried line sensor (*NOTE: Not approved for use in Northern tier, or areas where snow and ice accumulations are normal, pending further testing*)

Senstar Omnitrac buried line sensor firmware version MSP v2.81 w/Field Programmable Gate Array (FPGA) v13.05

Senstar Omnitrac buried line sensor w/Firmware Version MSP v2.90 w/FPGA v13.93

Senstar Ultrawave Detection Sensor TE (W/Whiteman AFB tamper protection modification)

+ Perimitrac, Buried Cable Intrusion Detection Sensor

Protech (PIRAMID) / SDI-76-XL-MIL, PIR and Monostatic Microwave Sensor

Protech (PIRAMID) / SDI-76-XL-MIL LT (Ladder and Tower) Only

Protech Sorhea Technology G-Fence 600 Zoning (600Z) System

Protech Sorhea Technology G-Fence 600 Zoning (600Z) System **culvert configuration**

Protech Maxiris 3100 Active Infrared Barrier (100 meter)

+ Racon Single Stack; Barksdale Configuration - single stack, basket weave configuration with double stacked sensors at the corners

+ Racon Double Stack

+ Racon 16000-4 (Microwave) Sensor

+ Racon 14000-32 Microwave Sensor

+ Racon MPS-4100 (Microwave)

+ Racon MPS-14000-1 (Microwave)

Senstar UltraWave Microwave Detection Sensor

Senstar UltraWave Microwave Detection Sensor (Firmware 3.05)

+ Senstar Sentrax Short Ported Coaxial Cable Sensor (SPCS), large and small diameter cable, in the straight-line configuration

+ Birdeye Model IX Infrared Perimeter Detection System, up to 120m

DeTekion Defensor 100 Fence Sensor

DeTekion Defensor 100 sensor system with the GD-5000 Eliminator signal analyzer

DeTekion Vertical Taut Wire Sensor 400 (VTW-400), full fence or out-rigger configuration

ECSI Infrared Pulsed Intrusion Detection System (IPIDS), up to 80m with spring loaded mount bases and 100m with solid concrete bases

Fiber SenSys Fiber Defender +FD200/300 series. The following models have been tested:

331, 332, 341, and 342. *Note: The 331 and 332 series is with "Sensitive" Lead-in cables whereas the 341 and 342 series is with the "Insensitive" Lead-in cables. Also, the last digit (1 or 2) indicates a single channel processor or dual channel processor. Additional note: The 33x series is normally utilized for TASS applications with the 34x series being utilized for all hardwired configurations.*

Fiber Sensys Fiber Defender FD-342, v4.47

Fiber Sensys Fiber Defender FD-343, v4.47 (Culvert Configuration)

+ Fence Protection System 2-2R (FPS-2-2R)

FlexZone Fence Sensor (*NOTE: Not approved for use in Northern tier, or areas where snow and ice accumulations are normal, pending further testing*)

RBtec Ironclad Fence Sensor Double Run Configuration

+ Southwest Microwave Intrepid Micropoint. (*NOTE: Not approved for use in Northern tier, or areas where snow and ice accumulations are normal, pending further testing*)

*tier, or areas where snow and ice accumulations are normal, pending further testing)*

Southwest Microwave Intrepid Micropoint II.

Southwest (SW) Microwave 385 Monostatic Sensor, up to 100m

SW Microwave 310 Bi-static Sensor, up to 100m

Southwest Microwave 460B Active Infrared Exterior Sensor

Southwest Microwave 330 Digital Microwave System

+ Fiber Optics Intrusion Detection System (FO-IDS), Fiber Optic Sensor System (FOSS) Models 100 and 200

Fiber SenSys Fiber Defender 525 *(Note: Not approved for use in Northern tier, or areas where snow and ice accumulations are normal, pending further testing)*

**The following sensors in combination are approved for use as a line of detection with fence climber enhancement detection:**

+ Enhanced DTR-90 Vertical Taut Wire (VTW) Sensor, the DTR 90 “Y” VTW Sensor, or the VTW 400 Sensor installed at the top of the fence with any one of the following sensors installed on the fence: Fiber SenSys Fiber Defender FD300 series. The following models have been tested: 331, 332, 341, and 342.

+ Fence Protection System 2 (FPS-2)

+ Fence Protection System 2-2R (FPS-2-2R)

#### **Wide Area Detection/Approach Zone Sensors:**

+ PSRS STS-350 (FLIR/ICx) Ground Based Radar used as an approach sensor out to 125 meters (crawlers) as described below: ICX application software version 2.4.41.12 Firmware version 3.4.30 dated November 2, 2007.

+ PSRS STS-350 (FLIR/ICx) with control station application software version 2.4.41.12 or when integrated with Will Burt Annunciator Version 3.2.274p, subpatch p32274.1.13.

FLIR Ranger 1 Perimeter Surveillance Radar (700 meters)

FLIR Ranger 2 Perimeter Surveillance Radar (1400 meters)

FLIR Ranger 3 Perimeter Surveillance Radar (2800 meters)

Magos SR-500 perimeter surveillance system when integrated with the Advantior Systems ASN, Version 6.2. MASS Version 2.24.10053, SR-500 Radar Version 3.64 and Radar Manager Version 1.5

SpotterRF C40D Integrated with Advantior Version 6.2 *(Note: Not approved for use in Northern tier, or areas where snow and ice accumulations are normal, pending further testing)*

#### **PL-3 and Below**

In addition to all of the above components, the following equipment is approved for use in the protection of PL-3 and below assets:

#### **Command, Control Display Equipment (CCDE):**

TASS 7.0 Annunciator (At deployed locations only)

TASS 6.0.1.A Annunciator (At deployed locations only)

#### **Assessment Subsystems:**

Clear Align VZ-250 LRTI 23164-600

+ Clear Align VZ-250 LRTI 23164Z1-600 (Improved Cooling)

Clear Align LRTI-w/CCTV

C907891 Complete Kit

TICC/PTH only C907892

+FLIR ThermoVision Multi-Sensor System (a.k.a. SLRTI)

CUI

T-2000 LRTI w/CCTV Complete Kit IBDSS1000-085  
 T-2000 LRTI w/CCTV TICC/PTH only IBDSS1000-086  
 T-3000 LRTI w/CCTV Complete Kit FDTA-199  
 T-3000 LRTI w/CCTV TICC/PTH only  
 + Surveillance Thermal Imager (WSTI) Sentry I and Sentry II  
 FLIR DEFENDIR MS-UC 640 30/90MM CZ  
 + Short Range Thermal Imager; Fixed/Mounted (SRTI F/M)  
 + DiOP Thermal Imager 180/60mm Thermal Upgrade Kit (TUK)

**Interior Sensors:** No Additional

**Exterior Sensors:** No Additional

**Certified Air Force Test Sites:**

Test Area C-3, Eglin AFB FL, and Cold Weather Test Site, Grand Forks AFB, ND are approved for conducting operational tests and evaluations on all IDS equipment.

2. A listing of equipment approved for use in PL-1 Nuclear applications is available in a separate letter maintained by the POC listed below.
3. This memorandum supersedes the 6 Aug 20 IDS approval memorandum. The POC is 1<sup>st</sup> Lt Joshua Scollo, AFLCMC/HBUA, joshua.scollo@us.af.mil, DSN 845-5275.

HAINES.LINDA  
 .W.1015303413

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 Date: 2020.10.15 15:25:33 -04'00'

LINDA W. HAINES, NH-IV, DAF  
 Chief, Force Protection Division

## DISTRIBUTION:

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HQ USAF/A4SO  
HQ AFLCMC/HNC (CCSD)

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DEPARTMENT OF THE AIR FORCE  
10TH COMMUNICATIONS SQUADRON  
USAF ACADEMY COLORADO

DATE: 25 Oct 19

MEMORANDUM FOR USACE - Omaha District

Attn: John Jaskowiak

FROM: 10CS/SCX

1. APPLICABLE EXCEPTION

☐ Sole Source      ☒ Brand Name Only      ☐ Unusual and Compelling Urgency

2. COMPANY or BRAND NAME REQUESTED:

CISCO

3. DESCRIPTION OF THE SUPPLIES AND/OR SERVICES REQUIRED TO MEET THE AGENCY'S NEEDS:

10CS requires the purchase of Cisco switches for the mission critical .EDU & .MIL network in support the Prep School Dormitory Project, XQPZ 104002. Network equipment provides end users the connectivity to securely access E-mail, Internet, shared-drives, and SharePoint services. The procurement of new switches will allow us to remain in compliance with AF cyber security mandates. Warranty and technical support allows technicians the options to have a faulty switch replaced expeditiously without cost. End-of-life switches without warranty or technical support requires the unit to replace the switch at cost in the event of failure. This increases the risk of prolonged network outages and potential academic mission failure.

This request is to purchase items peculiar to one manufacturer for USAFA Cisco .EDU and .MIL network. Brand names include Cisco. In a memo issued by SAF/CIO A6, dated 15 September 2014, it states that the NETCENTS-2 contracts are the mandatory source for all USAF units purchasing netcentric, IT products and solutions that fall under the scope of the contracts. In addition, AFMAN 33-153 also states that the NETCENTS-2 contracts are mandatory for the purchase or lease of netcentric products for USAF customers. The CLIN structure of the United States Air Force Academy's (USAFA) delivery order will match the CLIN structure of the NETCENTS-2 Product contracts. A Form 9 has been supplied to the Contracting office and an USAFA Form O-333 has been approved. This requirement will be synopsisized through the AFWAY portal IAW FAR 16.505(a)(4)(iii) and the justification for a Brand Name acquisition will also be posted along with the solicitation.

4. FACTS SUPPORTING THE USE OF OTHER-THAN-FULL-AND-OPEN-COMPETITION:

6.302-1 Cisco is the only brand name technically capable of providing USAFA's network components. Only one brand has the level of quality required because the supplies are unique or highly specialized. In order to maintain the current security package and ensure compatibility with existing systems, the same-brand virtualization equipment must be used. Any potential change to a different brand would require replacement of a substantial fraction of the current hardware with an estimated doubling of the upfront cost for the requested capability. Additionally, use of other vendor equipment and

parts void warranties on servers, switches and other electronic components. However, the security requirement cost implications mentioned above are the more costly of mixing brand name items. This is a delivery order placed against the existing AF NETCENTS-2 Products contract vehicle. Twenty-four vendors competed for a position/portion of this contract and constitute competition when RFQ's are placed against this vehicle. In addition, Cisco equipment is covered under the Joint Enterprise License Agreement where maintenance support/replacement is covered under an existing contract with the government.

In accordance with the Technology Acquisition - Mandatory Use of Network Centric Solutions-2 (NETCENTS-2) The existing CISCO/NetApp hardware platform cost the government approximately \$453K over the past three to six years to cover the equipment and parts as they reached end of service life. All government and contractor support staff are specifically trained on the use of the existing CISCO equipment. Manufacturer licensing and support is for this equipment only.

TECHNICAL REQUIREMENTS PERSONNEL CERTIFICATION.

I certify that the data supporting the recommended use of other than full and open competition is accurate and complete to the best of my knowledge and belief.

---

DAVID A. WEST, GS-12, DAF  
Chief, Plans and Programs Flight  
10th Communications Squadron





**DEPARTMENT OF THE AIR FORCE**  
AIR FORCE LIFE CYCLE MANAGEMENT CENTER (AFMC)  
HANSCOM AIR FORCE BASE, MASSACHUSETTS

28 January 2021

MEMORANDUM FOR DISTRIBUTION

FROM: Force Protection Division, AFLCMC/HBU

SUBJECT: Non-Nuclear Configuration Management Database (CMD) Equipment Approval

1. The CMD equipment listed below is approved for use when employed in the tested PL-1 Non- Nuclear through PL-4 applications and configurations (information can be obtained from AFLCMC/HBU). This letter consists of nine pages.

**\* Indicates correction, change, and/or addition.**

- + Indicates item is no longer procurable and/or supported by Original Equipment Manufacturer (OEM).  
NOTE: Items marked with a (+) are no longer authorized for purchase; however, previously installed systems will remain on this list as legacy systems and for fixed site sustainment support IAW with AFI 31-101, Chapter 9. Contact AFSFC/S5G at [afsfc.ibdss@us.af.mil](mailto:afsfc.ibdss@us.af.mil) with any questions concerning these items.

**PL-1 Non-Nuclear and Below**

**Command, Control Display Equipment (CCDE)**

**\* LINX Annunciator (formerly known as Will-Burt Annunciator):**

**\*LINX** Annunciator Predator Elite, with integrated access control

Annunciator Version 3.2.274p, subpatch p32274.1.13

LINXSNMP version 3.3.274P, subpatch 3.3.274P.1.13.30

Annunciator Version 3.3.274p, subpatch p33274.1.13.33

+ Annunciator Version 3.2.274p

+ Annunciator Version 3.0.252

+ Annunciator Version 3.0.246

Annunciator Version 8.1(Win 10)

+LINX Predator Enrollment System Version 4.1.220

+LINX Predator Enrollment System Version 4.0.203

LINX Versatile Interface Panel (VIP) Version 1.172

LINX Versatile Interface Panel (VIP) Version 1.148

+LINX Versatile Interface Panel (VIP) Version 1.64

LINX Versatile Interface Panel, Expandable (VIP-E) Version 7.284

LINX Versatile Interface Panel, Expandable (VIP-E) Version 7.145

+WSD 2000 Card Reader version 1.8V

WSD-E Card Reader version 3.110

**Advantor Annunciator:**

+ Advantor Advantage Suite for Networks (ASN) Version 4.0

+Advantor Advantage Suite for Networks (ASN) Version 5.0

+Advantor Integrated Command, Control, and Access Control System Version 5.0

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Page 1 of 9

+Advantor Integrated Command, Control, and Access Control System Version 5.0 Service Pack 6  
 Advantor Integrated Command, Control, and Access Control System Version 6.0  
 Advantor Advantage Suite for Networks (ASN) Version 6.2 (Win 10)

### **Vindicator Annunciator:**

Vindicator Security Management and Reporting Terminal (SMART) Annunciator with Graphics Display

- + Version 2.40 with Administrative Browser 4.0
- + Version 2.43, Build 11
- + Vindicator Command and Control (VCC) Version 1.0.1.5
- + Vindicator Access Control System (ACS) Version 2.3, Build 21
- + Transponder Firmware Version 2.28
- + TS 4000 Radio Frequency (R/F) Modem Interface
- + Vindicator SMART with Graphics Display Version 2.39 and SAW Version 3.9
- + Vindicator Command and Control Platform (VCCP) v5- Version 5.0
- + Vindicator Command and Control Platform (VCCP) v5- Version 6.0
- + Vindicator Command and Control Platform (VCCP) v5- Version 6.5 (Win 7, 32 bit only)
- + Vindicator Command & Control (VCC) GUI Version 5.1.1.4
- + Vindicator Badge Manager 2 (VBM 2) Version 2.0.7.0
- + Vindicator Badge Manager 2 (VBM 2) Version 2.0.7.1 (Win 7, 32 bit only)
- Vindicator Security Archive Workstation (SAW 5) Version 5.1.0.6
- + Honeywell Vindicator Site Commander Version 1.2.0.1
- + V5 IDS Network Security Appliance – Intrusion Detection, Revision 3.2, Release 20:
  - UHS-8270
  - DES-8270T
  - AES-8270T
- + V5 ACS Network Security Appliance – Access Control Revision 3.2 Release 20:
  - UHS-1401
  - DES-1401T
  - AES-1401T
- + Vindicator UHS-Net Gateways:
  - UHS-8101 Version 2.33, Build 7
  - UHS-8102 Version 2.33, Build 6
  - UHS-8301 Version 2.33, Build 13
  - UHS-8400 Version 2.33, Build 13
- + Vindicator UHS-Net Transponder/Gateway Revision 3.3, Release 5:
  - UHS-1500
  - DES-1500T
  - AES-1500T
- + Vindicator UHS-Net Transponders Version 2.33, Build 13:
  - UHS-6842
  - UHS-6842F
  - DES-6842
  - DES-6842F
- + PC SMART PAC Software Package Version 5.1
- + Proteus 5 & SmartSave 5 Software Programs Version 5.2
- Vindicator Command and Control Platform (VCCP) Windows 7 (64-bit):
  - Vindicator Command & Control 2-Version 1.2.1.4
  - V5 Network Security Application for IDS & ACS-Version 3.2, Release 23
  - UHS-1500 UHS-Net Field Panel-Version 3.3, Release 7
  - Security Archive Workstation 2-Version 1.4.2.9
  - Vindicator Badge Manager 3-Version 2.0.26.7
  - Vindicator Site Commander-Version 1.3.0.7
  - Vindicator Area Commander-Version 1.1.0.6

Vindicator Premise Controller-Version 3.3, Release 7  
 Vindicator PC SMART PAK-Version 6.0.0.1  
 Vindicator Security Server-Version 1.0  
 Vindicator 10 Annunciator Workstation (Win 10 LTSP)  
 Vindicator Command and Control 2-Version 1.3.0.2 SP4  
 Vindicator Security Server-Version 1.0  
 V3 Head-End Server (IDS & ACS)-Version 4.3.2 SP VR11  
 V5 Network Security Appliance-Version 4.5.2 SP VR11  
 AES-1500Network Field Device-Version 4.3.2 SP VR11  
 Security Archive Workstation 2-Version 1.4.3.0  
 Vindicator Badge Manager 3-Version 2.0.26.7  
 Vindicator Site Commander-Version 1.3.0.7  
 Vindicator Area Commander-Version 1.1.0.7  
 Vindicator Premise Controller-Version 4.3.2  
 Vindicator PC Smart PAC (PCSP)-Version 6.0.0.1  
 Vindicator System Terminal-Version Win 10 LTSP

### **LENEL Annunciator:**

LENEL OnGuard Version 7.5 with Milestone Version 12.3

**NOTE: Not approved with any Ground Based Radars**

### **Assessment Subsystems:**

### **Video Servers:**

Advantor Video Management System (VMS) Software (For use only with Advantor ASN 6.0):  
     Advantor VMS Version #va-advantovms-3.3.22-1 (1/e15)  
     Advantor VMS Wall Version ds-vmx-3.3.1-3  
 +Bosch Allegiant Matrix/Control System LTC 8600 and 8800  
 + Broadware 4.80 / Cisco 5.1.1. Video Storage System (NOTE: Cisco renamed the 4.80 after purchasing Broadware.)  
 +Video Image Control and Display System (VICADS) Version 4.0 Video Management System  
 +Prometheus Security Group Global Inc. (PSSGI) (Formerly Open Roads Consulting, Inc.) Video Image Control and Display System (VICADS) Version 4.1 Video Management system using Vindicator V5, Version 6 as the annunciator  
 +PSSGI Video Image Control and Display System (VICADS) Version 4.1 Service Pack 1.6 Video Management system using Vindicator V5, Version 6.5 as the annunciator  
 +PSSGI Video Image Control and Display System (VICADS) Version 4.1 Service Pack 1.6 Video Management system using Lynx Predator Elite Version 3.2.274p, subpatch p32274.1.13 as the annunciator  
 +PSSGI Video Image Control and Display System (VICADS) Version 4.2.7 build 134 using Lynx Predator Elite Version 3.3.274p, subpatch p33274.1.13.33  
 PSSGI Video Image Control and Display System (VICADS) Version 4.2.7 build 134 using Vindicator 7 as the annunciator  
 +PSSGI Video Image Control and Display System (VICADS) Version 4.1 Service Pack 2.0 Video Management system using Vindicator VCCP Windows 7 as the annunciator. Note: *DefendIR Thermal imager protocol support, RadarWall, and Geoserver are not approved for use*  
 +PSSGI Video Image Control and Display System (VICADS) Version 4.1 Service Pack 2.4 Video Management system using Vindicator VCCP Windows 7 as the annunciator. Note: *DefendIR Thermal imager protocol support, RadarWall, and Geoserver are not approved for use.*  
 PSSG Video Image Control and Display System (VICADS) Version 4.3 using LPE v8.1 (Win 10)  
 PSSG Video Image Control and Display System (VICADS) Version 4.3.2 using Vindicator (Win 10)

### Assessment Cameras:

Axis Q1645 Fixed Camera

\* Axis P3245-LVE

\* Axis Q3527-LVE

\* Axis Q6075 Indoor PTZ

\* Axis Q6075-E Outdoor PTZ

\* Axis Q6215-LE PTZ

Bosch 8001 Fixed Thermal Camera (Model:NHT-8001-F35VF)

Bosch MIC IP Starlight 7100i (Model:MIC-7522-Z30W)

+ Bosch NWC-04-95-20P Internet Protocol (IP) Camera

+ Bosch NWC-04-95-20P (1/3 Format)

+ Bosch NBN-498-21P Internet Protocol (IP) Camera

Bosch Auto Dome IP Starlight 7000i Camera (Model:NDP-7512-Z30)

+ Bosch Auto Dome VG 4-322-ECE1M

+ Bosch Auto Dome VG5-623-ECS

+ Bosch Auto Dome VG5-624-ECS

+ Bosch Auto Dome VG5-724-ECE2

+ Bosch Auto Dome 7000 Internet Protocol (IP) Camera with environmental housing

+ Bosch Dinion Internet Protocol (IP) 7000 Camera with environmental housing

Bosch DINION Internet Protocol (IP) Starlight 7000 HD (NBN-73013-BA)

Bosch NBN-63013-B

Bosch NBN-63023-B

\* Bosch Flexidome Starlight 8000

+ Bosch NBN-71013-B

+ Bosch NBN-71022-B

+ Burle 300H Camera

+ Burle TC 351 Camera (1/2 inch format)

+ Cohu 4865 Camera (WS3) (2/3 inch format)

+ Cohu 48x Camera (KUMMSC) (2/3 inch format)

+ Cohu 4915/4912-3000 Camera (1/2 inch format)

+ Cohu 3930HD

+ Indigo Vision 512147 (PTZ)

+ Indigo Vision 11650-Audio-HD

+ IQ Eye 752 Internet Protocol (IP) Camera

+ Lumenera Le 165M-DN Internet Protocol (IP) Camera

+ Lumenera Le 165ME-DN Internet Protocol (IP) Camera with environmental housing

+ Lumenera Le 165MP-DN Internet Protocol (IP) Camera with environmental housing

+ Pelco ES31CBW35-2N Pan Tilt Zoom (PTZ) System

+ Pelco ES30C/ES31C Pan Tilt Zoom (PTZ) System (1/4 inch format) with/ without optional Wiper

+ Pelco ES4136-2N Esprit ES system Pan Tilt Zoom (PTZ) System (1/4 inch format) with/ without optional Wiper

+ Pelco MC3651H-2 Interior Camera (1/3 inch format)

+ Pelco IXE20 IP Camera

+ Pelco ES4036-5W Esprit Series, with and without wiper, standard and pressurized

+ Pelco ES40E36-5W Esprit Series, with and without wiper, standard and pressurized

+ Pelco ES40/41 Series Positioning System, Analog, PTZ, w/wo wiper Esprit SE Standard & pressurized, model ES4036-5W

+ Pelco ES40E/41E Series Positioning System, IP, PTZ, w/wo wiper Esprit SE Standard & Pressurized, Model ES40E36-5W

+ Pelco IXE21 Internet Protocol (IP)

Pelco P1220-ESR1 (PTZ)

Pelco Sarix IXE Series Box Cameras w/ SureVision 3.0

VICON SN680D-B-WNIR (PTZ)  
 + VICON IQ762WI-V6 Internet Protocol (IP)  
 + Vivotek IP 7151  
 + Vivotek SD8364E (PTZ)  
 + Vivotek IP816A-HP (interior only)  
 Vivotek IP9165 HP Fixed Camera

### **Interior Sensors:**

**NOTE:** Balanced Magnetic Switch (BMS) will not be used as a line of detection.

+ AN/GSS-20 Volumetric  
 + AN/GSS-9(V) SA 1955 BMS  
 + AN/GPS-15(V) Closed-Shelter Aircraft Sensor (C-SAS) (Volumetric)  
 + AN/GSS-36(V) Open-Shelter Aircraft Sensor (O-SAS) (Volumetric)  
 Banner Engineering Series Active Infrared (AIR), intrinsically safe, Model SMI30 (*Must be installed as an array of individually reporting sensor points, for use across openings in areas where explosive fumes may be present*)  
 + Bosch DS 9370 PIR/MW (Volumetric)  
 + Bosch DS 939 PIR (Volumetric)  
 BEA LZR-s600  
 BEA LZR-i30  
 Dortronics 1110 xD xCT, Magnetic Lock/BMS  
**Dortronics 1120 x2D xCT, Series Electromagnetic Lock and BMS**  
 Eltec 862 Passive Infrared (PIR) Sensor (Wall)  
 Fiber Sensys EX-35T Passive Infrared (PIR)  
 Fiber Sensys AP2-20N Passive Infrared (PIR)  
 Fiber Sensys LD308SH  
 Fiber Sensys LD204S  
 + General Electric (Sentrol) Model 2700 Series BMS  
 + General Electric (Sentrol) Model 2807T Explosion Proof Balanced Magnetic Switch (BMS)  
 + General Electric (Sentrol) Model 2507AH-L Wide Gap BMS  
 + General Electric (Sentrol) Model 2800 Series BMS  
 + General Electric AP669 PIR (Volumetric)  
 Magnasphere, High Security Sensor (HSS) Door Contact Switch, BMS, Version HSSL2S000  
 Magnasphere L2C-101 (Concealed switch)/L2C 101A (Recessed Switch) Magnetic Contact Switch  
 Magnasphere Interior Barrier Sensor Model MSK-101-MM  
 Magnasphere Interior Motion Sensor Model MSK-101-MM  
 + PL&E Communications AVT 234 (VMD) using Dinion analog infrared imagers, for interior applications only  
**ASSA ABLOY (Securitron Group) MSS-1 High Security Balanced Magnetic Switch**  
 East Coast Security Products Inc. ESM-6T Tandem Balanced Magnetic Switch  
 Protech Passive Infrared and Microwave Intruder Detectors (PIRAMID) SDI-76-G (Volumetric)  
 Protech Passive Infrared and Microwave Intruder Detectors (PIRAMID) SDI-77-D (Volumetric)  
 Protech SDI-76M-HS1-H Volumetric (Coverage 60'x 40', Two Sensors in Combination)  
 Protech SDI-76MW Volumetric (Coverage 60'x 40', Two Sensors in Combination)  
 Protech SDI-77XL2-EX, Explosion Proof Volumetric  
 Redscan RLS-3060SH Laser Scan Detector (*Approved for wall and ceiling configurations*)  
 + SightLogix SightSensor Video Motion Detection (VMD) using NS-90A Thermal Imager, for interior applications only.  
 + United Technologies Interlogix AP669 Mirror Optic PIR (Volumetric)  
 + Visonic CH-1000 (Wall)  
 + Visonic CH-1000/Xtalis ADPRO 18 WH PIR Combination (Ceiling) (Coverage 30'x 30')  
 Tyco Visonic Disc 360 Passive Infrared Sensor (Ceiling) (Coverage 360 Degree)



Maxiris 3000/3100 Active IR Interior Sensor

+ AN/GSS-39(V) Interior Intrusion Detection System. Components include:

-- DR-301      -- DR-558      -- DR-851      -- HT-50B  
 -- HT-50DC    -- HT-100B    -- HT-100BC    -- SDI-76A  
 -- SDI-77C    -- SD-80B    -- SD-80EHB    -- SD-150B  
 -- SD-150EHB    -- SRN-2000H

### **Exterior Sensors:**

The following sensors are approved for use as a standalone line of detection:

BEA LZR-s600 (ECP Configuration)

BEA LZR-i30 (ECP Configuration)

EAG of Americas Infrared Intrusion Detection System 4/2/2 (IIDS4/2/2) Active Infrared Sensor

EAG of Americas Infrared Intrusion Detection System 4/4/2/2/2 w/ PSTC

EAG of Americas Intrusion Detection System 4/2 (IDS 4/2) Active Infrared Sensor

IR Global Infrared Intrusion Detection System 4/4/2

IR Global IRG-509-15M

+ Microtrack buried line sensor (*NOTE: Not approved for use in Northern tier, or areas where snow and ice accumulations are normal, pending further testing*)

Senstar Omnitrix buried line sensor firmware version MSP v2.81 w/Field Programmable Gate Array (FPGA) v13.05

Senstar Omnitrix buried line sensor w/Firmware Version MSP v2.90 w/FPGA v13.93

Senstar Ultrawave Detection Sensor TE (W/Whiteman AFB tamper protection modification)

+ Perimitrix, Buried Cable Intrusion Detection Sensor

Protech (PIRAMID) / SDI-76-XL-MIL, PIR and Monostatic Microwave Sensor

Protech (PIRAMID) / SDI-76-XL-MIL LT (Ladder and Tower) Only

Protech Sorhea Technology G-Fence 600 Zoning (600Z) System

Protech Sorhea Technology G-Fence 600 Zoning (600Z) System culvert configuration

Protech Maxiris 3100 Active Infrared Barrier (100 meter)

+ Racon Single Stack; Barksdale Configuration - single stack, basket weave configuration with double stacked sensors at the corners

+ Racon Double Stack

+ Racon 16000-4 (Microwave) Sensor

+ Racon 14000-32 Microwave Sensor

+ Racon MPS-4100 (Microwave)

+ Racon MPS-14000-1 (Microwave)

Senstar UltraWave Microwave Detection Sensor

Senstar UltraWave Microwave Detection Sensor (Firmware 3.05)

+ Senstar Sentrax Short Ported Coaxial Cable Sensor (SPCS), large and small diameter cable, in the straight-line configuration

+ Birdeye Model IX Infrared Perimeter Detection System, up to 120m

DeTekion Defensor 100 Fence Sensor

DeTekion Defensor 100 sensor system with the GD-5000 Eliminator signal analyzer

DeTekion Vertical Taut Wire Sensor 400 (VTW-400), full fence or out-rigger configuration

ECSI Infrared Pulsed Intrusion Detection System (IPIDS), up to 80m with spring loaded mount bases and 100m with solid concrete bases

Fiber SenSys Fiber Defender +FD200/300 series. The following models have been tested:

331, 332, 341, and 342. *Note: The 331 and 332 series is with "Sensitive" Lead-in cables whereas the 341 and 342 series is with the "Insensitive" Lead-in cables. Also, the last digit (1 or 2) indicates a single channel processor or dual channel processor. Additional note: The 33x series is normally utilized for TASS applications with the 34x series being utilized for all hardwired configurations.*

Fiber SenSys Fiber Defender FD-342, v4.47

Fiber SenSys Fiber Defender FD-343, v4.47 (Culvert Configuration)

- + Fence Protection System 2-2R (FPS-2-2R)
- FlexZone Fence Sensor (*NOTE: Not approved for use in Northern tier, or areas where snow and ice accumulations are normal, pending further testing*)
- RBtec Ironclad Fence Sensor Double Run Configuration
- + Southwest Microwave Intrepid Micropoint. (*NOTE: Not approved for use in Northern tier, or areas where snow and ice accumulations are normal, pending further testing*)
- Southwest Microwave Intrepid Micropoint II.
- Southwest (SW) Microwave 385 Monostatic Sensor, up to 100m
- SW Microwave 310 Bi-static Sensor, up to 100m
- Southwest Microwave 460B Active Infrared Exterior Sensor
- Southwest Microwave 330 Digital Microwave System
- + Fiber Optics Intrusion Detection System (FO-IDS), Fiber Optic Sensor System (FOSS) Models 100 and 200
- Fiber SenSys Fiber Defender 525 (*Note: Not approved for use in Northern tier, or areas where snow and ice accumulations are normal, pending further testing*)

**The following sensors in combination are approved for use as a line of detection with fence climber enhancement detection:**

- + Enhanced DTR-90 Vertical Taut Wire (VTW) Sensor, the DTR 90 “Y” VTW Sensor, or the VTW 400 Sensor installed at the top of the fence with any one of the following sensors installed on the fence: Fiber SenSys Fiber Defender FD300 series. The following models have been tested: 331, 332, 341, and 342.
- + Fence Protection System 2 (FPS-2)
- + Fence Protection System 2-2R (FPS-2-2R)

**Wide Area Detection/Approach Zone Sensors:**

- + PSRS STS-350 (FLIR/ICx) Ground Based Radar used as an approach sensor out to 125 meters (crawlers) as described below: ICX application software version 2.4.41.12 Firmware version 3.4.30 dated November 2, 2007.
- + PSRS STS-350 (FLIR/ICx) with control station application software version 2.4.41.12 or when integrated with Will Burt Annunciator Version 3.2.274p, subpatch p32274.1.13.
- FLIR Ranger 1 Perimeter Surveillance Radar (700 meters)
- FLIR Ranger 2 Perimeter Surveillance Radar (1400 meters)
- FLIR Ranger 3 Perimeter Surveillance Radar (2800 meters)
- Magos SR-500 perimeter surveillance system when integrated with the Advantors Systems ASN, Version 6.2. MASS Version 2.24.10053, SR-500 Radar Version 3.64 and Radar Manager Version 1.5
- SpotterRF C40D Integrated with Advantors Version 6.2 (*Note: Not approved for use in Northern tier, or areas where snow and ice accumulations are normal, pending further testing*)

**PL-3 and Below**

In addition to all of the above components, the following equipment is approved for use in the protection of PL-3 and below assets:

**Command, Control Display Equipment (CCDE):**

- TASS 7.0 Annunciator (At deployed locations only)
- TASS 6.0.1.A Annunciator (At deployed locations only)

**Assessment Subsystems:**

Clear Align VZ-250 LRTI 23164-600  
 + Clear Align VZ-250 LRTI 23164Z1-600 (Improved Cooling)  
 Clear Align LRTI-w/CCTV  
     C907891 Complete Kit  
     TICC/PTH only C907892  
 +FLIR ThermoVision Multi-Sensor System (a.k.a. SLRTI)  
     T-2000 LRTI w/CCTV Complete Kit IBDSS1000-085  
     T-2000 LRTI w/CCTV TICC/PTH only IBDSS1000-086  
     T-3000 LRTI w/CCTV Complete Kit FDTA-199  
     T-3000 LRTI w/CCTV TICC/PTH only  
 + Surveillance Thermal Imager (WSTI) Sentry I and Sentry II  
 FLIR DEFENDIR MS-UC 640 30/90MM CZ  
 + Short Range Thermal Imager; Fixed/Mounted (SRTI F/M)  
 + DiOP Thermal Imager 180/60mm Thermal Upgrade Kit (TUK)

**Interior Sensors:** No Additional

**Exterior Sensors:** No Additional

**Certified Air Force Test Sites:**

Test Area C-3, Eglin AFB FL, and Cold Weather Test Site, Grand Forks AFB, ND are approved for conducting operational tests and evaluations on all IDS equipment.

2. All equipment was determined to meet all applicable TAA/BAA/NDAA requirements at the time of approval. Manufacturers could change place of origin over time. Installation agents should verify place of origin of all components prior to installation.
3. A listing of equipment approved for use in PL-1 Nuclear applications is available in a separate letter maintained by the POC listed below.
4. This memorandum supersedes the 15 Oct 20 IDS approval memorandum. The POC is 1st Lt Joshua Scollo, AFLCMC/HBUA, joshua.scollo@us.af.mil, DSN 845-5275.

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LINDA W. HAINES, NH-IV, DAF  
 Chief, Force Protection Division



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## SECTION 01 86 29

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## SECTION 01 86 29

## COMMUNICATIONS REQUIREMENTS

## PART 1 GENERAL

## 1.1 REFERENCES

Publications, codes, specifications and standards shall be used as the basis for the project design and shall include, but not be limited to the following. Publications and codes that imply recommendations shall be taken to be mandatory. Where there are conflicting criteria, the requirements of this RFP take precedence.

The design publications listed below shall be used as sources of criteria for the architectural design. The most current edition of the code or standard (with revisions, reprintings, changes, notices, errata, and addenda) available at the RFP proposal submission deadline shall be used as criteria for the design, unless noted otherwise. The criteria from these sources may be supplemented but not supplanted, by applicable criteria contained in nationally recognized codes and standards.

## 38 ES/ENCE

## 38 ES/ENCE EMNS

Emergency Mass Notification System ESS

## U.S. AIR FORCE (USAF)

## AF 91-501

Air Force Consolidated Occupational Safety Standard

## AFGM 2017-32-01

Air Force Guidance Memorandum, Civil Engineer Control Systems Cybersecurity

## AFI 10-2501

Air Force Emergency Management Program Planning and Operations

## AFI 32-1065

Grounding Systems

## AFI 33-210

Certification and Accreditation (C&amp;A) Program

## AFI 64-101

Cable Television on Air Force Bases

## AFMAN 32-1084

Facility Requirements

## AMERICAN CONCRETE INSTITUTE INTERNATIONAL (ACI)

## ACI 304R

Guide for Measuring, Mixing, Transporting, and Placing Concrete

## ACI 318M

Building Code Requirements for Structural Concrete (ACI 318M-14) and Commentary (ACI 318RM-14)

## AMERICAN SOCIETY FOR TESTING AND MATERIALS INTERNATIONAL (ASTM)

ASTM B1	Standard Specification for Hard-Drawn Copper Wire
ASTM B8	Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
ASTM C139	Standard Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes
ASTM C309	Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C478	Standard Specification for Precast Reinforced Concrete Manhole Sections
ASTM C857	Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures
ASTM C990	Standard Specification for Joints for Concrete Pipe, Manholes and Precast Box Sections Using Preformed Flexible Joint Sealants
ASTM D709	Laminated Thermosetting Materials
ASTM D1557	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft <sup>3</sup> ) (2700 kN-m/m <sup>3</sup> )
ASTM F512	Smooth-Wall Poly (Vinyl Chloride) (PVC) Conduit and Fittings for Underground Installation
ASTM F2160	Standard Specification for Solid Wall High Density Polyethylene (HDPE) Conduit Based on Controlled Outside Diameter (OD)

## U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	Safety and Health Requirements Manual
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## U.S. AIR FORCE ACADEMY (USAFA)

USAFA DS	(Latest Approved Version) USAFA Design Standards
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## BUILDING INDUSTRY CONSULTING SERVICE INTERNATIONAL (BICSI)

ANSI/NECA/BICSI 568-2006	(2006) Standard for Installing Commercial Building Telecommunication Cabling
--------------------------	--

OSPDRM	(2011) Outside Plant Engineering Reference Manual, 5th Edition
TDMM	(2014) Telecommunications Distribution Methods Manual, 13th Edition, Volumes I & II

## U.S. DEPARTMENT OF AGRICULTURE (USDA)

RUS Bull 345-65	(1985) Shield Bonding Connectors (PE-65)
RUS Bull 345-83	(1979; Rev Oct 1982) Gas Tube Surge Arrestors (PE-80)
RUS Bull 1751F-640	Design of Buried Plant - Physical Considerations
RUS Bull 1751F-641	Construction of Buried Plant
RUS Bull 1751F-642	Construction Route Planning of Buried Plant
RUS Bull 1751F-643	Underground Plant Design
RUS Bull 1751F-644	Underground Plant Construction
RUS Bull 1753F-201	(1997) Acceptance Tests of Telecommunications Plant (PC-4)

## U.S. DEPARTMENT OF DEFENSE (DOD)

DoDi 8500.01	(2014) Cybersecurity
DoDi 8510.01	(2014; Change 1-2016; Change 2-2017) Risk Management Framework (RMF) for DoD Information Technology (IT)
DoD Manual 5200.1-R	Information Security Program
FED-STD 795	Uniform Federal Accessibility Standards
MIL-HDBK-411B	Power and the Environment for Sensitive DOD Electronic Equipment
UFC 1-200-01	DoD Building Code
UFC 1-200-02	High Performance and Sustainable Building Requirements
UFC 3-501-01	Electrical Engineering
UFC 3-520-01	Interior Electrical Systems
UFC 3-550-01	Exterior Electrical Power Distribution
UFC 3-560-01	Electrical Safety, O&M
UFC 3-580-01	Telecommunications Interior Infrastructure Planning and Design

UFC 3-600-01	Fire Protection Engineering for Facilities
UFC 4-021-01	Design and O&M: Mass Notification Systems
UFC 4-021-02	Electronic Security Systems

## ELECTRONIC INDUSTRIES ALLIANCE (EIA)

EIA/CIA-310-E	Cabinets, Racks, Panels, and Associated Equipment
TIA J-STD-607-A	Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications (ANSI-J-STD-607-A)

## INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE 100	(2000; Archived) The Authoritative Dictionary of IEEE Standards Terms
IEEE 1100	(2005) Emerald Book IEEE Recommended Practice for Powering and Grounding Electronic Equipment
IEEE C2	(2017; Errata 1-2 2017; INT 1 2017) National Electrical Safety Code(2017)

## INSULATED CABLE ENGINEERS ASSOCIATION (ICEA)

ICEA S-87-640	(2011) Optical Fiber Outside Plant Communications Cable; 4th Edition
ICEA S-98-688	(2012) Broadband Twisted Pair Telecommunication Cable, Aircore, Polyolefin Insulated, Copper Conductors Technical Requirements
ICEA S-99-689	(2012) Broadband Twisted Pair Telecommunication Cable Filled, Polyolefin Insulated, Copper Conductors Technical Requirements

## INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC	(2021) International Building Code
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## U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

36 CFR 1191	Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines
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## NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

ANSI C62.61	(1993) American National Standard for Gas Tube Surge Arresters on Wire Line Telephone Circuits
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ANSI C80.1	(2020) American National Standard for Electrical Rigid Steel Conduit (ERSC)
ANSI C80.3	(2020) American National Standard for Electrical Metallic Tubing (EMT)
ANSI/NEMA OS 1	(2013; R 2020) Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports
ANSI/NEMA OS 2	Nonmetallic Outlet Boxes, Device Boxes, Covers, and Box Supports
ANSI/NEMA WC 66	(2013) Performance Standard for Category 6 and Category 7 100 Ohm Shielded and Unshielded Twisted Pairs
NEMA FB 1	(2014) Standard for Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable
NEMA TC 2	(2013) Standard for Electrical Polyvinyl Chloride (PVC) Conduit
NEMA TC 3	(2013) Standard for Polyvinyl Chloride (PVC) Fittings for Use With Rigid PVC Conduit and Tubing
NEMA TC 6 & 8	(2013) Standard for Polyvinyl Chloride (PVC) Plastic Utilities Duct for Underground Installations
NEMA TC 9	(2004) Standard for Fittings for Polyvinyl Chloride (PVC) Plastic Utilities Duct for Underground Installation
NEMA VE 1	(2017) Standard for Metal Cable Tray Systems
NEMA VE 2	(2018) Cable Tray Installation Guidelines
NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)	
NFPA 70	(2020) National Electrical Code
NFPA 75	Standard for the Protection of Information Technology Equipment
OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA)	
OSHA CFR 29 Part 1910.268	Telecommunications
SOCIETY OF CABLE TELECOMMUNICATIONS ENGINEERS (SCTE)	
ANSI/SCTE 77	Specification for Underground Enclosure Integrity
TELECOMMUNICATIONS INDUSTRY ASSOCIATION (TIA)	
TIA/EIA-455	Standard Test Procedure for Fiber Optic

	Fibers, Cables, Transducers, Sensors, Connecting and Terminating Devices, and Other Fiber Optic Components
TIA/EIA-455-C	General requirements for standard test procedures for optical fibers, cables, transducers, sensors, connecting and terminating devices, and other fiber optic components
TIA-455-46A	FOTP-46 Spectral Attenuation Measurement for Long-Length, Graded-Index Optical Fibers
TIA-455-78B	FOTP-78 Optical Fibres - Part 1-40: Measurement Methods and Test Procedures - Attenuation
TIA-455-107-A	FOTP-107 Determination of Component Reflectance or Link/System Return Loss using a Loss Test Set
TIA-472D000	Sectional Specification (Adopted ANSI/ICEA S-87-640-2006) Standard for Optical Fiber Outside Plant Communications Cable
TIA/EIA-492AAAA-B	Detail Specification for 62.5- $\mu$ m Core Diameter/125- $\mu$ m Cladding Diameter Class Ia Graded-Index Multimode Optical Fibers
TIA/EIA-492-CAAA	Detail Specification for Class IVa Dispersion-Unshifted Single-Mode Optical Fibers
TIA-526-14	OFSTP-14A Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant
TIA-526-14-B	Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant; IEC 61280-4-1 edition 2, Fibre-Optic Communications Subsystem Test Procedure-Part 4-1: Installed cable plant-Multimode attenuation measurement
TIA-526-14-C	Optical Power Loss Measurement of Installed Multimode Fiber Cable Plant; Modification of IEC 61280-4-1 edition 2, Fiber-Optic Communications Subsystem Test Procedures- Part 4-1: Installed Cable Plant-Multimode Attenuation Measurement
TIA-568-C.2	Balanced Twisted-Pair Telecommunications Cabling and Components Standards
TIA-568-C.4	Broadband Coaxial Cabling and Components Standard
TIA-568.0-D	Generic Telecommunications Cabling for Customer Premises

TIA-568.1-D	Commercial Building Telecommunications Infrastructure Standard
TIA-568.3-D	Optical Fiber Cabling and Components Standard
TIA-569-D	Telecommunications Pathways and Spaces
TIA-570-C	Residential Telecommunications Infrastructure Standard
TIA-590-A	Standard for Physical Location and Protection of Below Ground Fiber Optic Cable Plant
TIA/EIA-598-D	Optical Fiber Cable Color Coding
TIA-606-B	Administration Standard for the Telecommunications Infrastructure
TIA-607-C	Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises
TIA-758-B	Customer-Owned Outside Plant Telecommunications Infrastructure Standard
TIA-1152	Requirements for Field Test Instruments and Measurements for Balanced Twisted-Pair Cabling
TIA-1152-A	Requirements for Field Test Instruments and Measurements for Balanced Twisted-Pair Cabling

## UNDERWRITERS LABORATORIES (UL)

UL 5	Surface Metal Raceways and Fittings
UL 5A	Nonmetallic Surface Raceways and Fittings
UL 5B	Standard for Strut-Type Channel Raceways and Fittings
UL 5C	Standard for Surface Raceways and Fittings for Use with Data, Signal, and Control Circuits
UL 6	Electrical Rigid Metal Conduit-Steel
UL 83	(2017; Reprint Apr 2020) UL Standard for Safety Thermoplastic-Insulated Wires and Cables
UL 444	Communications Cables
UL 497	Protectors for Paired-Conductor Communication Circuits

UL 497A	Secondary Protectors for Communication Circuits
UL 497B	Standard for Protectors for Data Communications and Fire-Alarm Circuits
UL 497C	Standard for Protectors for Coaxial Communications Circuits
UL 510	Polyvinyl Chloride, Polyethylene and Rubber Insulating Tape
UL 514A	Metallic Outlet Boxes
UL 514B	Conduit, Tubing and Cable Fittings
UL 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
UL 514D	Cover Plates for Flush-Mounted Wiring Devices
UL 651	Standard for Schedule 40 and 80 Rigid PVC Conduit and Fittings
UL 651A	Type EB and A Rigid PVC Conduit and HDPE Conduit
UL 797	Electric Metallic Tubing - Steel
UL 870	(2016; Reprint Mar 2019) UL Standard for Safety Wireways, Auxiliary Gutters, and Associated Fittings
UL 884	Standard for Underfloor Raceways and Fittings
UL 969	Standard for Marking and Labeling Systems
UL 1242	Standard for Electrical Intermediate Metal Conduit - Steel
UL 1655	Standard for Community-Antenna Television Cables
UL 1660	Liquid-Tight Flexible Nonmetallic Conduit
UL 1666	Test for Flame Propagation Height of Electrical and Optical-Fiber Cables Installed Vertically in Shafts
UL 1681	Standard for Wiring Device Configurations
UL 2017	General-Purpose Signaling Devices and Systems
UL 2239	Hardware for the Support of Conduit, Tubing, and Cable

UL 2416	Standard for Audio/Video, Information and Communication Technology Equipment Cabinet, Enclosure and Rack Systems
UL 2556	Safety Wire and Cable Test Methods

## 1.2 DEFINITIONS

Unless otherwise specified or indicated, electrical and electronics terms used in this specification shall be as defined in TIA-568-C.2, TIA-568.3-D, TIA-606-B, and IEEE 100 and herein.

## 1.3 COORDINATION OF COMMUNICATIONS CRITERIA

All communications criteria provided in this section shall be coordinated with all other sections of the RFP. The locations of all equipment indicated in the communications requirements are approximate. Contractor shall coordinate the final number/locations of all equipment with the Contracting Officer. Contractor shall meet the requirements of Architectural Barriers Act (ABA), 36 CFR 1191.

## 1.4 DESIGNER AND INSTALLER REQUIREMENTS

All voice and data communications design shall be performed by a BICSI Registered Communications Distribution Designer (RCDD). The communications media (Telephone cables, LAN cables, and fiber optic cables) shall be installed by BICSI certified technicians and installers. The structured cabling system shall be certified by the manufacturer with the longest warranty available.

The installers assigned to the installation of the telecommunications system or any of its components shall be regularly and professionally engaged in the business of the application, installation, and testing of the specified telecommunications systems and equipment. Key personnel; i.e., supervisors and lead installers assigned to the installation of this system or any of its components shall be BICSI Registered Cabling Installers, meeting the requirements of USAFA DS. Submit documentation of current BICSI certification for each of the key personnel.

## 1.5 SCOPE AND STANDARDS

Building telecommunications cabling systems (BCS) and outside plant (OSP) telecommunications cabling system shall conform to applicable criteria. This project includes both inside and outside plant telecommunications scope for the Consolidated Prep School Dormitory, demolition of Buildings 5210, 5212, and 5214 and interface and coordination with other building systems.

Contractor shall contact 10CS at 719-333-4421, before removing/cutting any communications cabling.

Design and construction shall meet or exceed the requirements set forth in the following standards, as applicable.

In addition to this specification, refer to the Room Data Sheets for requirements specific to individual spaces and space types.

All equipment shall be rated for an elevation of 5555 feet above sea level or derated for such elevation.

A survey of existing conditions, including location of underground utilities shall be provided, and incorporated prior to submitting the 100% design.

Contractor shall repair any cuts made to existing road, sidewalk, and parking lot surfaces that are to remain in place after construction. Repair shall match existing road, sidewalk, and parking lot cross section, respectively.

#### 1.6 BUILDING COMMUNICATION REQUIREMENTS

Comply with requirements of this specification, USAFA DS and UFC 3-580-01. The hierarchy for BCS shall be as listed in the previous sentence, with the first standard given the highest priority.

##### 1.6.1 Communications Cabling Systems

An acceptable BCS encompasses, but is not limited to, copper and fiber optic (FO) entrance cable, termination equipment, copper and fiber backbone cable, copper and fiber horizontal distribution cable, workstation outlets racks, cabinets, cable management, patch panels, cable tray, cable ladder, conduits, grounding, and labeling. Items included under OSP infrastructure encompass, but are not limited to, manhole and duct infrastructure, copper cable, fiber optic cable, cross connects, terminations, cable manholes/vaults, and copper and FO entrance cable.

The design shall form a complete voice and data communications system, including, but not limited to: wires, terminations, raceway, cable tray, cabinets/racks, outlets, etc. All wiring shall be tested; sample testing shall not be permitted. Design and installation shall be provided by BICSI (Building Industry Consulting Services International) certified personnel. Proof of certification must be provided. The installed structured cable system shall be certified by the manufacturer and installer to perform at EIA/TIA standards for Category 6 performance for a period of not less than 15 years. The contractor shall provide the required warranty to support the system certification. An RCDD shall be on site at all times during the installation.

All termination equipment, devices, and cabling shall be category 6A and/or fiber, shielded as required. All voice and data drops are to be terminated to rack mounted CAT6A patch panel as a structured cabling system.

##### 1.6.2 Testing

Design, install, label, and test all telecommunications systems in accordance with the requirements of this specification, USAFA DS, UFC 3-580-01, ANSI/TIA/EIA 568, 569, and 606 standards, and Building Industry Consulting Services International (BICSI) standards. A BICSI Registered Communications Distribution Designer (RCDD) with at least 2 yrs related experience shall develop and stamp telecommunications design, and prepare the test plan.

##### 1.6.3 End to End Test

Perform a comprehensive end to end test of all circuits to include all copper and fiber optic cables upon completion of the BCS and prior to

acceptance of the facility. Provide adequate advanced notification to the COR to allow COR and Installation personnel attendance. The BCS circuits include but are not limited to all copper and fiber optic (FO) entrance cables, termination equipment, copper and fiber backbone cable, copper and fiber horizontal distribution cable, and workstation outlets. Test in accordance with ANSI/EIA/TIA 568 standards. Use test instrumentation that meets or exceeds the standard. Submit the official test report to include test procedures, parameters tested, values, discrepancies, and corrective actions in electronic format. Test and accomplish all necessary corrective actions to ensure that the government receives a fully-operational, standards-based, code-compliant telecommunications system.

#### 1.6.4 Cable TV (CATV)

Wiring for CATV shall be provided for this building. It shall include the installation of outlets, coax cable, and the CATV rack in accordance with UFC 3-580-01 and USAFA DS. The CATV shall also include the requirements for testing.

CATV may utilize the same cable tray as NIPR cables. Provide separate conduits for drops for these systems if sharing a common outlet box.

Locate cable TV equipment in the telecommunications rooms. Space shall be made available within the telecommunications rooms for the future installation of equipment by commercial cable providers.

#### 1.6.5 Cable Types

This facility shall be pre-wired for voice, data, and CATV communication systems.

Horizontal cabling shall be Category-6A unshielded twisted pair (UTP) copper cable, Category 6A-shielded twisted pair (STP) copper cable, single-mode fiber optic (SMFO) cable, and multi-mode fiber optic (MMFO) cable. All cables shall be Plenum rated. All cables shall be new and meet or exceed the fire prevention requirements of NFPA 70, and NFPA 75 as applicable to telecommunication wire and cable.

#### 1.6.6 Riser/Backbone Cable

A new minimum 200-pair, 24 AWG, UTP copper cable shall be routed to the new main Telecommunications Room (TR) from the Core Node. The copper shall be terminated on wall mount 110 Type blocks. A wall tie to rack cable shall be provided to connect voice circuits from copper riser 110 block to rack and terminated on CAT6A patch panel, allowing 2 pair / port for analog / digital voice circuits.

For data, minimum 48-stand SMFO backbone cable shall also be routed to the new main TR from the Core Node. All fiber optic cables shall be installed in 3" x 3", 3-cell maxcell. All fiber optic cables in the new main TR terminate in rack-mount patch panels. All single-mode fiber cables shall be OS2 rated, 9-micron and meet the specifications of ANSI TIA/568-C. All multi-mode fiber cable shall be laser-optimized Optical Multimode 3 (OM3), 50/125-micron cables and meet the specifications of TIA/EIA-568-C. Fiber Optic cables shall utilize non-mechanical LC style connectors.

Reference USAFA DS and UFC 3-580-01 for additional riser/backbone cable and sizing requirements.

### 1.6.7 Networks

The networks within this facility are as follows (network: jack/jacket color, cable type):

(a) Classification: MISSION

MISSION Data: Blue, CAT6A UTP.

CATV: Black, RG-6/U quad shield for less than or equal to 250-foot lengths, RG-11/U quad shield for lengths between 250 feet and 400 feet, 625 Series for lengths greater than 400 feet.

(b) Classification: NIPR

NIPR Data: Blue, CAT6A UTP.

NIPR Voice: Blue, CAT6A UTP.

CCTV: Black, CAT6A UTP.

Where fiber is indicated, duplex outlets shall be provided (one TX, one RX).

Communications distribution systems (conduit, cable tray, outlet boxes) and racks/cabinets may be shared within the same network classification.

### 1.6.8 Telephone/Data Cables

Copper cables for voice and data serving administrative areas shall be 24 AWG, 4 pair, TIA-568-C.2 Category-6A, unshielded twisted pair (UTP) or shielded twisted pair (STP) as required, plenum rated, solid copper station cable. Fiber cables for data connections to racks from source(s) shall be SMFO and shall be terminated in accordance with TIA-568.3-D. Fiber optic cabling shall have no metallic members. All cables including patch cords shall be tested meeting TIA-1152, for Category 6A performance. Extrapolation from a lower frequency is not allowed. The installation acceptance test shall be a "channel test" and includes all patch connections and cables. Testing shall be accomplished with a Cat 6A, Level III compliant tester. One cable shall be dedicated to one jack. Daisy chaining is not be permitted.

### 1.6.9 Coaxial Cables

Coaxial cables shall be the type as identified for the routing distance in paragraph "Networks" for cables routed between outlets and the CATV enclosure. Cable shall be label-verified. Cable jacket shall be factory marked at regular intervals identifying cable type. Cable shall be rated CMP in accordance with NFPA 70. Interconnecting cables shall be cable assemblies consisting of coaxial cable with male connectors at each end. Reference USAFA DS and UFC 3-580-01 for additional requirements.

### 1.6.10 Wireless Access Points

Provide wireless access points (WAP) throughout the dormitory building. Provide complete coverage for all common areas. Provide WAP coverage for all dormitory rooms by placing points in hallways, to minimize potential damage.

### 1.6.11 Components

All passive components of the communications distribution system, such as patch panels, interconnection cabling, patch cords, wire manager,



termination backboards, communication racks/cabinets, outlet boxes and raceway systems, jacks, and connectors shall be included. Provide one horizontal wire manager for each patch panel installed and minimum one vertical wire manager for each equipment cabinet and 2-post equipment rack installed.

The racks and cabinets shall be provided with standard 19-inch rails. The equipment depth for all racks and cabinets shall be assumed to be 3 feet to accommodate GFGI equipment. Use this depth to account for UFC 3-580-01 clearance requirements. Cabinets shall be minimum 24 inches wide and provided with cooling fans per UFC 3-580-01.

All riser cabling and horizontal cabling in walls, modules, patch panels, conduit, and cable tray to complete this facility shall be Contractor furnished and installed. The Contractor shall install all copper cable, fiber-optic cable, and the associated hardware from telecommunications rooms to the data/communications faceplates to meet the specifications found in ANSI TIA/568-C and as defined in this document. All cabling infrastructure shall be installed and terminated to Government-approved patch panels with strain relief bars. All CAT6A patch panels shall be able to support 10 Gbps signaling. For audio visual cabling, all horizontal fiber-optic patch panels shall support LC connectors.

Active electronic components such as computers, hubs, routers, telephone instruments, and other electronic LAN and communications equipment will be provided by government unless otherwise stated.

This project shall also install conduit and pull string to accommodate the bid option of the following systems:

- a. CCTV camera system, refer to section 01 86 26 Electrical Requirements for additional information.
- b. Keyless access system, refer to sections 01 82 00 Architectural Building Requirements and 01 86 26 Electrical Requirements for additional information.

Wiring requirements for the above listed items shall be coordinated through the COR.

#### 1.7 TELECOMMUNICATIONS OUTLETS (TO)

All administrative spaces within the building shall be provided with the number of outlets as indicated in the Room Data Sheets. Number of outlets identified on the room data sheets are minimum quantities; provide one faceplate (three CAT6A outlets) for each 48 square feet of net office space, and private offices shall have a communication faceplate for each electrical outlet.

The standard telecommunications outlet for administrative spaces consists of four 8-pin/8-position CAT 6A modular USOC RJ-45 terminated as T568B jacks mounted in a single faceplate co-located with 120-VAC, 60-Hz general-purpose electrical receptacles. Refer to Section 01 86 26 Electrical Requirements, UFC 3-580-01, and USAFA DS for additional information.

Wall phone drops shall be singular port/connector. For electrical, mechanical, and telecommunications rooms provide a single phone outlet located on the wall for phones that can be mounted on lugs. Mount wall

phone TO at 48" above finished floor to outlet. Wire all telephone voice and data jacks from jack locations on floor plan back to floor mounted voice and data racks in telecommunications room. Provide a wall phone TO in each entrance vestibule.

The TO shall be provided with a cover plate over the entire face plate. Label all jacks on the face plate. Provide double gang box and minimum 1" conduit from the box to the required location. The conduit shall terminate at the cable tray, PDS, telecommunications room, or rack/cabinet as appropriate. The end of the conduit shall be equipped with an insulated bushing.

Each wall mounted TO shall be mounted 18" above finished floor to the top of the box, unless indicated otherwise. All telephone/data outlet locations shall be coordinated with the interior design package to include the furniture layout.

TOs shall be sized per UFC 3-580-01.

All voice and data cables shall be routed to the appropriate communications room.

All communications outlets located on STC 45 and 50 rated walls shall be surface mounted unless noted otherwise. All other outlets mounted on non-STC rated walls shall be flush mounted.

Data outlets shall be provided to accommodate GF/GI equipment such as copiers, fax machines, printers, etc. in locations identified on the Room Data Sheets. Separate printers shall be accounted for for each network; printers shall not be shared between networks, even networks within the same classification. The Contractor shall coordinate with the user to determine which network the GF/GI equipment shall be connected to.

The IST network shall be provided with dedicated outlet boxes and plates.

Final communications requirements shall be coordinated with 10CS.

Reference USAFA DS and UFC 3-580-01 for additional requirements.

## 1.8 INTERIOR PATHWAYS AND SPACES

New pathways shall be designed, furnished, and installed in accordance with ANSI TIA/568-C.1, ANSI TIA/569-B, UFC 3-580-01, and USAFA DS, and they shall be labeled in accordance with TIA-606-B, UFC 3-580-01, and USAFA DS. Unless otherwise specified, all information system pathways must be metallic and bonded to the SRGS. All pathways shall allow for the installation of cables without violating the minimum bend radius required by ANSI TIA/568-C.3. New pathways shall accommodate the size and quantity of cables to be used while not exceeding the maximum, 40-percent fill rate allowed by ANSI TIA/569-B and while allowing for a 50 percent size increase for future expansion. See UFC 3-580-01 for additional fill requirements. The stricter criteria shall govern. In the case of conduits or sealed ducts, additional empty pathways may be installed to satisfy this expansion requirement.

Cable runs and outlet location for modular furniture shall be coordinated with the requirements located in section 01 84 00 Interior Design Requirements.

Electrically bond all pathway sections (conduit and cable tray) together to provide a continuous metallic path. Where applicable, all information system spaces and pathways shall comply with the requirements of USAFA DS.

All conduits located at STC 45 and 50 rated walls shall be surface mounted unless noted otherwise. All other non-STC rated walls shall have concealed conduits.

Entrances for all telecom rooms shall be from the interior of the building.

Cables routed through underground conduits (typically serving floor boxes) shall be wet rated. If the cables to be installed are not also plenum rated, the underground conduits shall be routed all the way to the telecom rooms and shall not utilize plenum-located cable tray pull strings shall be provided for such applications in addition to cable media. For any underground conduits installed, a detailed map MUST be provided that shows the path taken as well as any pull points included in the run.

Reference USAFA DS and UFC 3-580-01 for additional requirements.

#### 1.8.1 Black (Unclassified/Confidential) Pathways

Black communications pathways are for cables that carry unclassified or classified data that has been encrypted. Use of the Black cable tray system for any non-communications system (e.g., access control, alarms, etc.) shall be coordinated with 10CS. All unarmored plenum or armored riser rated fiber placed in cable pathways shall be protected inside a split, plenum rated inner duct tube.

#### 1.8.2 Cable Tray

All distribution of cable throughout the building shall be via conduit and cable tray. The cable tray shall be a welded wire type tray a minimum of 12" (w) x 4" (d). Cable tray within the communications rooms shall be ladder type. Cable tray that passes through mechanical spaces or that transitions between floors shall be totally enclosed type with removable covers.

Provide 12 inches of clearance above cable trays for future access. Contractor must coordinate with other disciplines to insure clearances can be achieved.

All cable tray in communications rooms shall be ladder type. Cable tray for outside communications rooms shall be solid bottom when located below the ceiling or in exposed spaces; cable tray for outside communications rooms may be basket type when located above the ceiling. Size cable trays per UFC 3-580-01.

All cables shall be in minimum 1" conduit between the cable tray and outlet locations.

Reference USAFA DS and UFC 3-580-01 for additional requirements.

#### 1.8.3 Labeling

Terminations shall be labeled and color-coded in accordance with UFC 3-580-01, USAFA DS, and TIA-606-B. All interior communication wiring systems shall have the cabling labeled with a unique alphanumeric number at beginning and end termination points of the cable. The alphanumeric

number shall also be placed by the jack on the device plate.

#### 1.8.4 Communication Terminal Backboard

Provide a 3/4" (19mm), 4 by 8 feet, grade AC, fire-rated plywood backboards must be placed on all walls in Core Node and telecommunications rooms to be used for communications equipment. Backboards shall be fire rated by manufacturing process. Fire stamp shall be clearly visible. The backboards cannot be any greater than 1'-0" above finished floor level and no less than 7 feet above the finished floor. The plywood telephone backboard shall be painted with 2 coats of white fire retardant paint. Contractor/Designer shall coordinate location of incoming telephone service with the location of the surge arrestors and cross connect blocks on the telephone backboard. All underground conduits (if any) entering telecommunications rooms shall be stubbed up 6" above finished floor adjacent to the telephone backboard. The equipment layout in telecommunications rooms shall be approved by 10CS. Reference USAFA DS and UFC 3-580-01 for additional requirements.

#### 1.8.5 Cross-Connect Blocks

Cross-connect blocks shall be the Category 6A, insulation displacement connector (IDC) 110 type. The telephone cross-connect blocks shall have standoff brackets and shall be wall mounted. Provide the necessary quantity of blocks to accomplish this plus provide the greater of one additional 100 pair block or 25 percent spare for future connections at each communications room. Reference USAFA DS and UFC 3-580-01 for additional requirements.

#### 1.8.6 Equipment/Enclosure Racks

For rack-mounted installations in a telecommunications room/closet, provide standard 19-inch, equipment enclosures with 36" usable depth and 89" (48U) of vertical rack space.

- (a) The enclosures shall be floor mounted.
- (b) The rack shall have standard ANSI/EIA-310-C mounting holes having a full 48U on front and back of rails.
- (c) The rack shall be steel with a black finish and utilize black grommets for unused cable openings. Each rack shall have vertical cable management. Retainers which can be hinged left or right and be located in any position along the channel. The rack shall have mounting holes and a ground lug for #6-gauge ground cable provided.
- (d) The rack shall have 10 outlet (4 ft) power strip, lockable vented front door, lockable vented rear door, solid sides, tops and bottoms, equipment shelves (provide 3 per rack ), ventilation openings, ventilation fan at the top of the unit, and vertical and horizontal wire management and blank plates. Insulated bushings for present and future cabling shall be provided at the cable entry points. Remove any side panels between racks installed together.
- (e) At a minimum, provide the quantity of racks that are indicated on the drawing.

Reference USAFA DS and UFC 3-580-01 for additional requirements.

### 1.8.7 Racks

Provide rack with vertical and horizontal cable management channels, top and bottom cable troughs, grounding lug. Rack shall be compatible with 19 inches panel mounting. Contractor shall coordinate with the 10CS for all equipment, including racks, etc., and with the most recent edition of the USAFA DS.

Reference USAFA DS and UFC 3-580-01 for additional requirements.

### 1.8.8 Installation and Terminations

Terminate twisted pair cable in accordance with TIA-568.1-D, TIA-568-C.2 and wiring configuration as specified. Terminate fiber optic cables in accordance with TIA-568.3-D.

- (a) Per instruction from USAFA, no horizontal copper cable length shall exceed 250 feet. Telecom rooms shall be appropriately spaced to accommodate this request. Use this maximum length, not the length identified in USAFA DS and UFC 3-580-01, for locations and quantities of telecom rooms and routing pathways.
- (b) Install signal wire to projectors from the ceiling down the wall into a dedicated outlet for use by a computer and/or run into a cable tray and back to the telecommunications room.
- (c) The wiring configuration shall be T568B per USAFA DS.
- (d) All data drops at desktop locations will consist of four Blue RJ45 jacks.
- (e) Floor mounted communications and power boxes shall be the "in-use" type, allowing for the cover to be closed after a plug has been inserted.
- (f) Power and communications shall be routed through the wall to systems furniture, where possible. If wall connections to power and communications are not possible, power and communications shall be routed through the power poles to the systems furniture.

## 1.9 CERTIFICATION

Any information system that is installed shall be DIACAP/RMF certified by the designated approving authority as determined by the installation.

All control systems must be planned, designed, acquired, and executed in accordance with DoDi 8500.01, DoDi 8510.01, AFGM 2017-32-01, and as required by individual Service Implementation Policy.

### 1.10 Telecommunications Entrance Facility

#### 1.10.1 TER

##### 1.10.1.1 Telecommunications Room

Communication closet sizes must be no smaller than identified in UFC 3-580-01 and USAFA DS unless written permission is obtained from the 10CS for a deviation.

#### 1.10.1.2 Building Protector Assemblies

Provide self-contained units supplied with a field cable stub factory connected to protector socket blocks to terminate and accept protector modules for outside cable. Building protector assembly shall have interconnecting hardware for connection to interior cabling at full capacity. Provide manufacturers instructions for building protector assembly installation.

#### 1.10.1.3 Protector Modules

Provide in accordance with UL 497 electrode gas tube or solid state type rated for the application. Provide gas tube protection modules in accordance with RUS Bull 345-83 and shall be heavy duty,  $A > 10\text{kA}$ ,  $B > 400$ ,  $C > 65\text{A}$  where A is the maximum single impulse discharge current, B is the impulse life and C is the AC discharge current in accordance with ANSI C62.61. The gas modules shall shunt high voltage to ground, fail short, and be equipped with an external spark gap and heat coils in accordance with UL 497. Provide the number of surge protection modules equal to the number of pairs of exterior cable of the building protector assembly.

#### 1.11 Outside Plant (OSP) Telecommunications

Outside plant includes all cable pathways, splicing, trenching, plowing, mounting hardware, duct banks, cable vaults/manholes, main distribution frames, and building entrance conduits. Comply with requirements of this specification, USAFA DS and UFC 3-580-01. The hierarchy for OSP shall be as listed in the previous sentence, with the first standard given the highest priority.

Ensure existing telecommunications equipment/cabling is protected in all affected areas of this project. Contractor is responsible to repair or replace communication cable and/or equipment that is damaged as a result of renovation. Exercise care when crossing exiting communication lines. Pothole all communication lines prior to digging and maintain USAFA requirements of 36" either side of marked areas. Maintaining the integrity of the communications plant should be priority for the entire project. Primary OSP work is as follows:

- (a) Remove 12-strand fiber optic cable (FO209:1-12) from Building 5210 to splice 0192 in MH-CC-4D1. In MH-CC-4C, at splice 0194, cut and remove 25 pair copper cable (Cu05: 576-600) to Building 5210 and re-splice onto 600 pair trunk to MH-CC-4D.
- (b) Remove 12-strand fiber optic cable (FO209:13-24) from Building 5212 to splice 0192 in MH-CC-4D1. In MH-CC-4D, at splice 0092, cut and remove 25 pair copper cable (Cu05: 551-575) to Building 5212 and re-splice onto 600 pair trunk to MH-CC-4D1.
- (c) Remove 12-strand fiber optic cable (FO209:25-36) from Building 5214 to splice 0192 in MH-CC-4D1. In MH-CC-4C, at splice 0127, cut and remove 25 pair copper cable (Cu05: 276-300) to Building 5214 and re-splice onto 600 pair trunk to MH-CC-4D1.
- (d) In MH-CC-4D1, at splice 0191, re-splice and reduce count of copper cable to Building 5216 from Cu05:301-450 to Cu05:401-450.

Contractor to field verify and verify with 10CS exact locations of existing manholes. Locations shown on bridging documents are approximate. Contractor shall contact 10CS at 719-333-4421 before removing/cutting any communications cabling.

Reference Section 01 86 26 Paragraph "Facility Entrance Plate(s)" for cable entrance requirements, which shall be coordinated with other disciplines.

#### 1.11.1 Exterior Construction Standards

New facilities are required to bring communication lines back to the information transfer node indicated, there is no spare infrastructure in manholes on the Air Force Academy for facilities to connect too.

##### (a) Underground Duct

1. Duct bank shall consist of minimum six (4 with maxcell plus 2 spare) 4 inch inside diameter (ID) concrete encased ducts. Top of conduit shall be no less than 30 inches below grade. Provide schedule 40 PVC or 80 PVC conduits.

2. The innerduct system shall consist of 3"x3" 3-cell/maxcell cloth innerduct. Use the 3"x3" 3-cell/maxcell for FO cable runs. Install pre-lubricated measuring pulling tape with a minimum breaking strength of 1,200 lbs (i.e. Mule Tape) secured at each end. When performing duct placement, sweep new ducts and install in the lowest available duct position within the lowest available duct window in the MH.

3. Install tracer wire directly above ductbanks. Terminate tracer wire at MH in a test well to allow for base locators not to have to enter the MH. In the Core Node, terminate tracer wire on test lug on backboard. After installation, test the tracer wire to verify continuity of the tracer wire system and provide a continuity report.

4. A color-coded plastic warning tape at least 4-inches wide shall be placed 12 to 18 inches below grade. ORANGE shall be supplied for the buried communication lines.

5. All spare conduit and innerduct shall be sealed with a reusable mechanical type screw or plug.

(b) Underground Cable. Label underground cable, including maintenance loop, where it enters and exits a maintenance hole or Telecommunication Room and on each service loop. Direct Buried Cable is not permitted on this contract. All cables shall be installed in conduit systems. See USAFA DS for maintenance loop requirements. Labeling shall be done in accordance with USAFA DS and TIA-606-B. Provide tags for each telecommunications cable or wire located in manholes, handholes, and vaults. Handwritten labeling is unacceptable. Consult 10CS for proper cable ID's for labeling cable in duct system.

(c) Fiber Optic Cable. Fiber Optic Cable shall be manufactured by major well-recognized manufacturers with experience in the manufacturing, assembly, and factory testing of cable and components which comply with, EIA TIA/EIA-568, and with optical and mechanical performance requirements in accordance with ICEA S-87-640.

(d) Splices and Splice Cases. When existing copper splice cases are

re-entered to place an additional cable, replace the entry end cap and all sealing tape on the cable going through that end cap followed by the closing of the case. All splice cases are to be filled with re-enterable encapsulant after splicing and testing, pressurized splice cases are not permitted.

USAFA DS is mandatory and will detail industry standards, references, and installation practices that must be adhered too on USAFA.

#### 1.11.2 Cable Pulling

Test duct lines with a mandrel and swab out to remove foreign material before the pulling of cables. Avoid damage to cables in setting up pulling apparatus or in placing tools or hardware. Do not step on cables when entering or leaving the manhole. Do not place cables in ducts other than those shown without prior written approval of the Contracting Officer. Roll cable reels in the direction indicated by the arrows painted on the reel flanges. Set up cable reels on the same side of the manhole as the conduit section in which the cable is to be placed. Level the reel and bring into proper alignment with the conduit section so that the cable pays off from the top of the reel in a long smooth bend into the duct without twisting. Under no circumstances shall the cable be paid off from the bottom of a reel. Check the equipment set up prior to beginning the cable pulling to avoid an interruption once pulling has started. Use a cable feeder guide of suitable dimensions between cable reel and face of duct to protect cable and guide cable into the duct as it is paid off the reel. As cable is paid off the reel, lubricate and inspect cable for sheath defects. When defects are noticed, stop pulling operations and notify the Contracting Officer to determine required corrective action. Cable pulling shall also be stopped when reel binds or does not pay off freely. Rectify cause of binding before resuming pulling operations. Provide cable lubricants recommended by the cable manufacturer. Avoid bends in cables of small radii and twists that might cause damage. Do not bend cable and wire in a radius less than 10 times the outside diameter of the cable or wire.

##### 1.11.2.1 Pulling Eyes

Equip cables 1.25 inches in diameter and larger with cable manufacturer's factory installed pulling-in eyes. Provide cables with diameter smaller than 1.25 inches with heat shrinkable type end caps or seals on cable ends when using cable pulling grips. Rings to prevent grip from slipping shall not be beaten into the cable sheath. Use a swivel of 3/4 inch links between pulling-in eyes or grips and pulling strand.

#### 1.11.3 Maintenance Holes (MH) and Hand Holes (HH)

The standard communication manhole is an 8'x8'x8' octagonal manhole with built in ladder. A locking mechanism inside the lid matching the existing system on the Air Force Academy. The lid must be cast to say "COMMUNICATIONS" and all materials installed in the manhole will be resistant to corrosion or rust.

- a. MH/HH placement and specifications shall be in accordance with UFC 3-580-01 and USAFA DS guidelines.
- b. All newly constructed MH/HH and duct banks shall have a tracer wire. Reference paragraph "Exterior Construction Standards".



- c. MH/HH shall have a locking lid. The contractor shall provide a padlock per the specifications of the 10CS.
- d. Schedule MH/HH placement to allow a Quality Assurance Representative from 10CS to observe.
- e. MH/HH shall be stenciled in accordance with Air Force Academy guidelines and shall use 10CS numbers (Contact 10CS POC for MH/HH numbering scheme).
- f. HHs shall be precast with the preferred size of 4 feet W by 4 feet L by 4 feet H standard type with hatch style lids.
- g. Horizontal Unistrut channels are the preferred method of anchoring the vertical cable racks in the MH.
- h. Conduit systems shall not exceed 500' between pull points and shall not exceed a total of 180 degrees in bends between pull points. Pull points are manholes unless handholds are specifically authorized by the 10CS.
- i. Manholes shall be no smaller than 8' x 8' octagonal with a built-in ladder.
- j. Every newly-installed standard MH shall include an approved galvanized ladder, support bar, and C-Steps placed 18" apart.
- k. Install a ground rod of copper-clad steel at least 3/4 inch (19 mm) in diameter and at least 10 feet (2.75 mm) long installed in the floor of each MH, connected to the internal bonding system.

#### 1.11.4 Copper Conductor Cable

Solid copper conductors, covered with an extruded solid insulating compound. Insulated conductors shall be twisted into pairs which are then stranded or oscillated to form a cylindrical core. For special high frequency applications, the cable core shall be separated into compartments. Cable shall be completed by the application of a suitable core wrapping material, a corrugated copper or plastic coated aluminum shield, and an overall extruded jacket. Telecommunications contractor shall verify distances between splice points prior to ordering cable in specific cut lengths. Gauge of conductor shall determine the range of numbers of pairs specified; 19 gauge (6 to 400 pairs), 22 gauge (6 to 1200 pairs), 24 gauge (6 to 2100 pairs), and 26 gauge (6 to 3000 pairs).

For installation underground provide filled cable meeting the requirements of ICEA S-99-689.

#### 1.11.5 Fiber Optic Cable Specifications

Provide single-mode fiber optic cable. Provide optical fibers as indicated. Fiber optic cable shall be specifically designed for outside use with loose buffer construction. Provide fiber optic color code in accordance with TIA/EIA-598-D

Provide strength members with sufficient tensile strength for installation and residual rated loads to meet the applicable performance requirements in accordance with ICEA S-87-640. The strength member is included to serve as a cable core foundation to reduce strain on the fibers, and shall

not serve as a pulling strength member.

- a. The type of protective covering required for fiber optic cables installed in a variety of methods and differing environments situations are identified in Air Force Academy 10CS guidelines and as noted in Table below.

Table 1.15.7: Protective of Fiber Optic Cable		
	JACKET LAYERS	ARMOR
DIRECT BURIAL	Double	Double
DUCT BANK	Single	Single
CONCRETE ENCASED DUCT BANK	Single	Dielectric

- b. All new terminating connectors for fiber optic cable shall be LC connector.

Provide multimode 62.5/125-um, 0.275 aperture fiber optic cable in accordance with TIA/EIA-492AAAA-B, TIA-472D000, and ICEA S-87-640 including any special requirements made necessary by a specialized design. Fiber optic cable shall be specifically designed for outside use with loose buffer construction. Provide fiber optic color code in accordance with TIA/EIA-598-D.

## 1.12 Splices Cases and Splicing Standards

### 1.12.1 General

When existing copper splice cases are re-entered to place an additional cable, the entry end cap and all sealing tape on the cable going through that end cap shall be replaced followed by the closing of the case. Depending on the type of case and manufacturers recommendations, a sustainment test shall be performed by pressurizing the splice case. Filled splice cases are not the preferred method of installation. Do not place re-enterable compound in a splice case. Preferred splice case type is a "PLP" or equivalent. All end plates will be "Field Drilled" to ensure proper cable sizing and proper tape layering.

### 1.12.2 In Vault or Manhole

Provide underground closure suitable to house splice organizer in a protective housing into which can be poured an encapsulating compound. Closure shall be of thermoplastic, thermoset, or stainless steel material supplying structural strength necessary to pass the mechanical and electrical requirements in a vault or manhole environment. Encapsulating compound shall be reenterable and shall not alter the chemical stability of the closure.

### 1.12.3 Copper Splicing Standards

- a. All splices shall be done in a high quality workmanship and neatness. Provide 710 style modular splice connectors. Connector shall accommodate 22 to 26 AWG solid wire with a maximum insulation diameter

of 0.065 inch. Fill connector with sealant grease to make a moisture resistant connection. Final product shall be inspected and approved by the 10CS.

- b. Cable identification integrity shall be maintained through all super binder and binder groups by using Mylar binder wraps crimped in the splice module.
- c. Cables greater than 25 pairs shall be spliced using multipair splicing connectors, which accommodate 25 pairs of conductors at a time. Provide correct connector size to accommodate the cable gauge of the supplied cable.
  - 1. "Pair Protectors" shall be used on all splices.
- d. Sizing of bonding bullets; sizing will be appropriate to cable size, i.e.: #2- 25-200 pair, #3 200-400 pair, #4 400-900 pair, #5 900-1800 pair.
- e. Cables sized 600 pairs or less use a two bank splice feeding equally from each directions.

#### 1.12.4 Shield Connectors

Provide connectors with a stable, low-impedance electrical connection between the cable shield and the bonding conductor in accordance with RUS Bull 345-65.

#### 1.12.5 Grounding and Bonding Conductors

Provide grounding and bonding conductors in accordance with RUS 1755.200, TIA-607-C, IEEE C2, and NFPA 70. Solid bare copper wire meeting the requirements of ASTM B1 for sizes No. 8 AWG and smaller and stranded bare copper wire meeting the requirements of ASTM B8, for sizes No. 6 AWG and larger. Insulated conductors shall have 600-volt, Type TW insulation meeting the requirements of UL 83.

The Contractor shall provide a grounding system for the new raised floor system. Coordinate with requirements of Section 01 86 26 ELECTRICAL REQUIREMENTS.

#### 1.13 Conduit

Provide conduit as specified in Section 01 86 26 ELECTRICAL REQUIREMENTS.

#### 1.14 Pedestals

Pedestals shall not be provided in this project.

#### 1.15 Audio/Visual Systems

Provide conduit and power for an AV system for the base bid. See Room Data Sheets for required locations.

As a Contract Option, design and install an AV system. System design shall be performed by a professional AV system designer. An itemized equipment list shall be provided for each A/V system.

AV equipment may be relocated from the existing dormitory. Coordinate

with the user and 10 CS for removal and reinstallation.

## PART 2 TESTS, INSPECTIONS, AND VERIFICATIONS

### 2.1 Testing

For interior cabling provide documentation of the testing and verification actions taken by manufacturer to confirm compliance with TIA-568.1-D, TIA-568-C.2, TIA-568.3-D, and TIA-526-14 for single mode optical fiber cables.

Test 100 percent OTDR test of FO media at the factory in accordance with TIA-568.1-D and TIA-568.3-D. Use TIA-526-14 Method B for multi mode fiber measurements. Calibrate OTDR to show anomalies of 0.2 dB minimum. Enhanced performance filled OSP copper cables, referred to as Broadband Outside Plant (BBOSP), shall meet the requirements of ICEA S-99-689. Enhanced performance air core OSP copper cables shall meet the requirements of ICEA S-98-688. Submit test reports, including manufacture date for each cable reel and receive approval before delivery of cable to the project site.

#### 2.1.1 OSP Pre-Installation Tests

a. Pre-Installation Tests: Perform the following tests on cable at the job site before it is removed from the cable reel. For cables with factory installed pulling eyes, these tests shall be performed at the factory and certified test results shall accompany the cable.

b. Cable Capacitance: Perform capacitance tests on at least 10 percent of the pairs within a cable to determine if cable capacitance is within the limits specified.

c. Loop Resistance: Perform DC-loop resistance on at least 10 percent of the pairs within a cable to determine if DC-loop resistance is within the manufacturer's calculated resistance.

#### 2.1.2 Quality Control and Acceptance Testing

Perform acceptance testing in accordance with RUS Bull 1753F-201 and as further specified in this section. Provide personnel, equipment, instrumentation, and supplies necessary to perform required testing. Notification of any planned testing shall be given to the Contracting Officer at least 14 days prior to any test unless specified otherwise. Testing shall not proceed until after the Contractor has received written Contracting Officer's approval of the test plans as specified. Test plans shall define the tests required to ensure that the system meets technical, operational, and performance specifications. The test plans shall define milestones for the tests, equipment, personnel, facilities, and supplies required. The test plans shall identify the capabilities and functions to be tested. Provide test reports in booklet form showing all field tests performed, upon completion and testing of the installed system. Measurements shall be tabulated on a pair by pair or strand by strand basis.

a. Contractor shall submit a detailed test plan for all the cable plant installation for government review and concurrence. Include information on the test equipment and its calibration documentation

b. All testing shall be conducted using TIA/EIA standards and with all

equipment within current manufacture's recommended time frame for calibration. A copy of the calibration certification shall be carried with all equipment and be presented upon request by 10CS designated representative (PM or QA). If equipment is not within current manufacture's recommended time frame, test results shall be rejected by the 10CS and no telecommunication services will be activated in the tested facility until corrected and retested.

c. OSP Cable Testing

Perform acceptance testing in accordance with RUS Bull 1753F-201 and as further specified in this section. Provide personnel, equipment, instrumentation, and supplies necessary to perform required testing.

1. OSP Copper Cable

Every OSP copper cable pair installed/repaired shall be tested per the TIA-568-C.2 specifications using a cable tester that meets TIA-1152.

d. Wire map (pin to pin continuity)

e. Continuity to remote end

f. Crossed pairs

g. Reversed pairs

h. Split pairs

i. Shorts between two or more conductors

1. OSP Fiber Optic Cable

All OSP fiber strands shall be tested with OTDR and power meter / light source. OTDR shall be dual frequency, launch and receive cable. Power meter/light source shall be dual frequency/bi-directional.

j. OTDR Test: The OTDR test shall be used to determine the adequacy of the cable installations by showing any irregularities, such as discontinuities, micro-bendings or improper splices for the cable span under test. Hard copy fiber signature records shall be obtained from the OTDR for each fiber in each span and shall be included in the test results. The OTDR test shall be measured in both directions. A reference length of fiber, 66 feet minimum, used as the delay line shall be placed before the new end connector and after the far end patch panel connectors for inspection of connector signature. Conduct OTDR test and provide calculation or interpretation of results in accordance with TIA-526-14 for multimode fiber. Splice losses shall not exceed 0.3 db.

k. Attenuation Test: End-to-end attenuation measurements shall be made on all fibers, in both directions, using a 1550 nanometer light source at one end and the optical power meter on the other end to verify that the cable system attenuation requirements are met in accordance with TIA-526-14 for multi-mode fiber optic cables. The measurement method shall be in accordance with TIA-455-78B. Attenuation losses shall not exceed 5.0 db/km at 850 nm and 1.5 db/km at 1300 nm for

multimode fiber.

1. Bandwidth Test: The end-to-end bandwidth of all multimode fiber span links shall be measured by the frequency domain method. The bandwidth shall be measured in both directions on all fibers.

m. Test Result Formatting

1. All test results can be submitted in softcopy format in original form and PDF.
2. All failed readings found require a description of corrective actions taken and a retest.
3. Test plans, test results, test equipment calibration certification and test documentation shall be included in the record drawing set. A copy of the test document shall be received in the NEC at a minimum of 10 days prior to pre-final inspection of facility or building complex (2 or more buildings sharing infrastructure resources).

2.1.2.1 Telecommunications Cabling Testing

Perform telecommunications cabling inspection, verification, and performance tests in accordance with TIA-568.1-D, TIA-568-C.2, and TIA-568.3-D. Test equipment shall conform to TIA-1152. Perform optical fiber field inspection tests via attenuation measurements on factory reels and provide results along with manufacturer certification for factory reel tests. Remove failed cable reels from project site upon attenuation test failure.

2.1.3 Verification Tests

UTP backbone copper cabling shall be tested for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors, and between conductors and shield, if cable has overall shield. Test operation of shorting bars in connection blocks. Test cables after termination but prior to being cross-connected.

2.1.4 Performance Tests

Perform testing for each outlet as follows:

- a. Perform Category 6A link tests in accordance with TIA-568.1-D and TIA-568-C.2. Tests shall include wire map, length, insertion loss, NEXT, PSNEXT, ELFEXT, PSELFEXT, return loss, propagation delay, and delay skew.
- b. Optical Fiber Links. Perform optical fiber end-to-end link tests in accordance with TIA-568.3-D.

2.1.5 Final Verification Tests

Perform verification tests for UTP and optical fiber systems after the complete telecommunications cabling and workstation outlet/connectors are installed.

2.2 Cable Inspection

Promptly repair indicated utility lines or systems damaged during site

preparation and construction. Damages to lines or systems not indicated, which are caused by Contractor operations, shall be treated as "Changes" under the terms of the Contract Clauses. When Contractor is advised in writing of the location of a nonindicated line or system, such notice shall provide that portion of the line or system with "indicated" status in determining liability for damages. In every event, immediately notify the Contracting Officer of damage.

Visually inspect UTP and optical fiber jacket materials for UL or third party certification markings. Inspect cabling terminations in telecommunications rooms and at workstations to confirm color code for T568A or T568B pin assignments (verify pin assignment requirements with COR), and inspect cabling connections to confirm compliance with TIA-568.1-D, TIA-568-C.2, and TIA-568.3-D. Visually confirm Category 6A, marking of outlets, cover plates, outlet/connectors, and patch panels.

Handle cable and wire provided in the construction of this project with care. Inspect cable reels for cuts, nicks or other damage. Damaged cable shall be replaced or repaired to the satisfaction of the Contracting Officer. Reel wraps shall remain intact on the reel until the cable is ready for placement.

## 2.3 Soil Density Tests

- a. Determine soil-density relationships for compaction of backfill material in accordance with ASTM D1557, Method D.

See Section 01 86 26 ELECTRICAL REQUIREMENTS for further requirements.

## 2.4 As-Built Drawings

- (a) Record Drawings of as-built conditions for exterior communications shall include the following: a table of contents, a legend of all symbols, line-types and abbreviations, shopdrawings, bore logs, (T0) site plan, outside plant route drawing, (T3) equipment elevations, logical diagrams (T4) details, (T5) schedules and test results. Reference TIA-606-B, annex C for explanations of the T-series drawings and for drawing symbols.
- (b) Accurately reflect the actual installation, specific as to type, size and placements. Show all items installed as a part of the infrastructure and call out.
- (c) Supply one electronic copy of all record drawings to 10CS at the completion of the contracted performance of work. The preferred electronic format is a geospatial sub-meter accurate drawing supplied in AutoCAD .dwg format.
- (d) Show measurements on all drawings.
- (e) Show all numbers assigned, applied, stenciled, or labeled during design, construction or installation.
- (f) Indicate references to details and other drawings.
- (g) T0 Campus or Site Plans
  - 1. Cable route drawings shall show measurements to all placements, changes of path direction and transitions in path types. Reference:

RUS Bull 1751F-643, figure 11 and figure 13.

2. Identify all conduits and ducts on the OSP routing as to the type, size and length to include burial type and depth of cover. Show duct assignment for each section of duct/conduit. Include bore logs.
  3. Identify all tracer wire and grounding.
  4. Identify all maintenance holes, hand holes, pedestals and splices.
  5. Identify all cable using the 10CS labeling scheme. Call out cable type, cable sheathing, length of cable between splices. If re-labeling is required then show all re-labeling.
  6. Show the Building Entrance Facilities on the Outside Plant route drawings. Include measurements of where the cable goes under or through the foundation of the building.
  7. A maintenance hole detail is required for all maintenance holes, handholes and vaults installed or where a change in the existing infrastructure occurred. Maintenance hole/handhole/vault details shall be of the butterfly configuration. The BICSI Outside Plant Design reference manual 4th edition chapter 10 Figure 10.16 and 10.17 provide examples of butterfly details. Show splices on the MH details.
  8. Include shop drawings of new MHs/HHs.
- (h) T4 Details. Typical details allow one to present a lot of information that otherwise would be redundantly called out many times on the drawings. IE; duct bank sections including tracer wires and typical duct assignments. But do show out all non-typical variations.
- (i) Schedules. A splice schedule is required for every splice that is not a 1 to 1 splice. Use schedules for the elimination of redundant information I.E. maintenance hole schedules stating size, type, locking covers etc, pedestal schedule stating size, type, etc., and conduit schedule, stating cables, duct assignments, etc.
- (j) Test results. Include test plans, test results, test equipment calibration certification and test documentation.
- (k) Additional requirements as stated in USAFA DS.

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SECTION 01 89 00

SITE WORK REQUIREMENTS  
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PART 1 SITE WORK

Attachment:

Fire Hydrant Flow Test Results  
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1.1 REFERENCES

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS  
(AASHTO)

AASHTO GDHS (2018) A Policy on Geometric Design of  
Highways and Streets

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C651 (2014) Standard for Disinfecting Water  
Mains

AWWA M17 (2016) Installation, Field Testing, and  
Maintenance of Fire Hydrants

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

36 CFR 1191 Americans with Disabilities Act (ADA)  
Accessibility Guidelines for Buildings and  
Facilities; Architectural Barriers Act  
(ABA) Accessibility Guidelines

CITY OF COLORADO SPRINGS

City of Colorado Springs Drainage Criteria: Volume 1 and 2 & Policy  
Clarifications

EL PASO COUNTY

El Paso County Drainage Criteria Manual: Volume 1 and 2

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1 (2014) Safety and Health Requirements  
Manual

EM 1110-1-1002 (2012) Survey Markers and Monumentations

EM 1110-1-1005 01 January 2007, Control and Topographic  
Surveying

## NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 1	(2021) Fire Code
NFPA 24	(2022) Standard for the Installation of Private Fire Service Mains and Their Appurtenances
NFPA 291	(2022) Recommended Practice for Fire Flow Testing and Marking of Hydrants

MILITARY SURFACE DEPLOYMENT AND DISTRIBUTION COMMAND  
TRANSPORTATION ENGINEERING AGENCY (SDDCTEA)

Better Military Traffic Engineering SDDCTEA Pamphlet 55-17

## STATE OF COLORADO DEPARTMENT OF TRANSPORTATION (CDOT)

CDOT	Standard Specifications for Road and Bridge Construction, 2019 Edition (including applicable Standard Special Provisions)
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## U.S. AIR FORCE ACADEMY (USAFA)

USAFA DS	(Latest Approved Version) USAFA Design Standards
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## U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 1-200-01	DoD Building Code
UFC 1-200-02	High Performance and Sustainable Building Requirements
UFC 3-201-01	Civil Engineering
UFC 3-201-02	Landscape Architecture, with Change 1
UFC 3-210-10	Low Impact Development
UFC 3-230-03	Water Treatment, with Change 2
UFC 3-240-01	Wastewater Collection and Treatment
UFC 3-240-02	Domestic Wastewater Treatment, with Change 1
UFC 3-230-01	Water Storage and Distribution
UFC 3-250-01	Pavement Design for Roads and Parking Areas
UFC 3-120-01	Sign Standards
UFC 3-250-03	Standard Practice Manual for Flexible Pavements
UFC 3-260-01	Airfield and Heliport Planning and Design

UFC 3-600-01	Fire Protection Engineering for Facilities
UFC 4-010-01	DoD Minimum Antiterrorism Standards for Buildings
UFC 4-022-01	Security Engineering: Entry Control Facilities / Access Control Points

U.S. FEDERAL HIGHWAY ADMINISTRATION (FHWA)

MUTCD	(2009; Rev 2012) Manual on Uniform Traffic Control Devices
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## 1.2 GOVERNMENT-SUPPLIED ENGINEERING SURVEY

The Contractor shall use Government supplied survey data in the preparation of their proposal and design. An engineering field survey has been performed and data will be provided to the Contractor upon award. The survey CADD files are in units of U.S. Survey Feet (1 foot equals 0.304801 meters) and Civil 3D 2009 format. A Digital Terrain Model (dtm) of the survey is also included with the CADD files. The field survey data information was gathered by a topographical survey performed in October, 2019. Contours were gathered at 1-foot intervals. Below grade utility data was obtained from "best-available" record drawings. Government provided survey drawings are provided to assist the Contractor in preparing their proposal. Any errors identified shall be brought to the attention of the Contracting Officer immediately for resolution and direction. The Contractor shall take all professionally prudent and reasonable actions to verify the accuracy of the data provided. During design and construction, the Contractor shall be responsible for obtaining any additional data necessary for the execution of this project.

### 1.2.1 Survey Monuments

The Contractor shall use existing government-supplied permanent surveying monuments for construction staking. Locations and descriptions of survey monuments can be found on the drawings.

The Contractor shall provide copies of field notes for differential level loops from four horizontal control points within second order surveying tolerances. The Contractor shall immediately notify the Contracting Officer of any discrepancies found in either the horizontal or vertical control elevations/coordinates.

Government-supplied monuments shall be protected by the Contractor throughout the life of the project. Government-supplied monument disturbed by the Contractor shall be reset to second order surveying tolerances and subject to the Contracting Officer's approval at the Contractor's expense. Resetting of these monuments shall be in accordance with EM 1110-1-1005 and EM 1110-1-1002.

## 1.3 CONTRACTOR-SUPPLIED ENGINEERING SURVEY UPDATE

The Contractor shall update the Government-supplied engineering survey to include any changes that have occurred since the Government-supplied survey was completed (see paragraph titled GOVERNMENT-SUPPLIED ENGINEERING SURVEY). The update shall include any changes within the site or project-related, off-site utility corridors. This survey update work shall be in accordance with EM 1110-1-1005. The updated survey shall be

submitted to and approved by the Contracting Officer prior to commencement of grading and/or trenching activities.

#### 1.3.1 Setting of Surveying Monuments

The Contractor shall set/provide Secondary Control as necessary to accomplish construction staking and as-built drawings for the project site and all project related, off-site utilities. Secondary Control shall be accomplished within second order surveying tolerances and shall be in accordance with EM 1110-1-1005 and EM 1110-1-1002. Locations shall be coordinated with the Contracting Officer and protected for the life of project.

#### 1.3.2 Surveying of Underground Utilities

Within the project site and all project-related off-site utility corridors the Contractor shall expose all existing underground electrical, data, telecommunication, natural gas pipelines, conduits and duct-banks. This is required in all areas of proposed excavation as well as utility crossings. Once exposed, the utilities shall be surveyed horizontally and vertically in accordance with EM 1110-1-1005 a minimum 100 ft intervals and all changes in direction. All utility systems including but not limited to storm drainage, sanitary sewer, water, etc. shall be exposed and surveyed where clearances are critical for new construction. The updated survey shall be submitted to and approved by the Contracting Officer prior to commencement of grading and/or trenching activities. Additional requirements are noted within the paragraph titled Utility Interference.

#### 1.3.3 As-Built Conditions

All new underground utility lines (including electrical power and communications, gas, water, sanitary sewer, storm drains, and culverts) shall be located by the Contractor during installation using surveying equipment. The Contractor shall survey pipe invert of water, sanitary sewer, storm drains, and culverts and top of duct bank and/or pipe of electrical power, communications lines and gas lines. Storm drains and sanitary sewer lines shall be surveyed where pipes enter manholes and inlets and at 100-foot maximum intervals along the line. The inverts of all cleanouts and tees shall be surveyed. Inverts at each end of culverts shall be surveyed. Electrical power, communications, gas and water lines shall be surveyed at all manholes, tees, valves, corners, changes in direction and at intervals along the line which will accurately depict the location of the line in both horizontal and vertical directions (50-foot maximum interval). Survey accuracy shall be in accordance with the EM 1110-1-1005. Survey shall be in the same coordinate system as government supplied survey.

### 1.4 CONTRACTOR'S STAGING AREA AND ACCESS ROUTE

#### 1.4.1 Staging Area

The Contractor's staging area location is shown on the Drawings. The staging area shall be graded with a 4 percent maximum cross slope. The area shall have a 4 inch aggregate base material placed and compacted. Any trees not identified for removal shall be protected to the maximum extent practicable. Upon completion the staging area shall be cleared of all debris and restored to previously existing conditions. The base material shall be removed from government property. The staging area



shall be graded to drain, covered with 4 inches of topsoil and seeded. Construction and vehicle traffic as well as material storage shall be kept outside the existing trees' dripline. Tree driplines shall be delineated with construction fencing or similar material.

#### 1.4.2 Contractor's Access Route

The Contractor's access route to the project location is shown on the Drawings. Contractor's parking areas shall be located near the staging areas and coordinate with the Contracting Officer. The Contractor shall coordinate with Base Security if access to the site is modified based on FPCON level at the installation.

#### 1.4.3 Contractor's Stockpile Area

Stockpile and borrow sites are not available on the Installation. All stockpile and borrow areas must be acquired off Government property.

#### 1.4.4 Project Sign

Contractor shall provide and maintain a project sign in accordance with Section 01 30 00.24.

### 1.5 DEMOLITION AND REMOVAL

The Contractor shall remove all pavements, utilities and other appurtenances necessary to construct the new facility. Service lines of all utilities shall be removed (not abandoned) to the nearest main connection and capped as necessary. This project will include demolition of three existing dormitories and appurtenant site features as indicated in the Drawings. Additional tree removals not identified on the drawings may be required to maintain compliance with the International-Wildland Urban Interface Code as referenced within UFC 3-600-01 and approval of the AHJ. Unless otherwise specified, disposal of all removed materials shall be outside the limits of Government-controlled lands in accordance with federal, state, and local regulations. The Contractor shall immediately notify the Contracting Officer if any material to be disposed of is found to contain hazardous, toxic, biological or radiological substances not already identified within this document. Rubbish and debris shall be removed from Government property daily to avoid accumulation at the project site. Trees infeasible for transplanting shall be cut, limbed and delivered to the 10th CES compost yard for firewood per the attached document titled USAFA Site Restoration and Revegetation. Refer to this document for additional information regarding tree removals.

#### 1.5.1 Pavement Removals/Utility Protection

The Contractor shall avoid installing utilities underneath existing streets, sidewalks, and parking areas. The Contractor shall not install any utilities underneath buildings. In cases where it is necessary for the utilities to cross existing undisturbed streets, sidewalks, and parking lots, the Contractor shall install the lines using trenchless methods. No open trenching will be allowed unless written permission is obtained and approved by the Contracting Officer. Open trenching may be used beneath existing roads that are scheduled for removal, relocation or reconstruction. When open trench methods are approved, streets, sidewalks, and parking lots shall be sawcut, removed and replaced. Portions of walks and concrete pavements requiring removal shall be removed to the nearest joint.

### 1.5.2 Utility Interference

All existing utilities, including but not limited to storm drain, electrical power, sewer, gas, water, and communication lines that are impacted during the construction of this project shall remain in service. If this is not feasible, all outages shall be coordinated with the Contracting Officer. All underground utilities from field data and surveys, site investigations, and digging permit locates, shall be marked within and adjacent to areas of the work. All work areas shall be investigated with detection devices for cables and pipelines, to confirm locations, identify unknown utilities, and establish depths. All underground utilities potentially disturbed by the work and not specifically addressed in Surveying of Underground Utilities shall be located by hand digging or vacuum excavation prior to mechanical trenching or excavating in the vicinity. The Contracting Officer shall be notified of detection activities 48 hours in advance. Detection devices shall be on site at all times.

## 1.6 NEW CONSTRUCTION

All new construction is located entirely within the limits of Government-controlled lands. The design drawings shall be developed using the same vertical and horizontal datum's as noted in the paragraph titled Survey Monuments.

### 1.6.1 Buildings

The location of the new dormitory, associated site features, roads, utilities and landscaping shall be as indicated on the drawings. The exact building location may be revised slightly to accommodate the final project layout pending approval of the Contracting Officer. All site layout changes shall be subject to approval by the Government. The new building and access to parking and nearby sidewalks shall be handicap accessible. Government supplied site plans are provided to assist the Contractor in the preparation of their proposal and design. The site plans are available to the Contractor with this solicitation. Any errors identified shall be brought to the attention of the Contracting Officer immediately for resolution and direction. The Contractor shall take all professionally prudent and reasonable actions to verify the accuracy of the data provided. The Contractor shall be responsible for final site plans.

### 1.6.2 Parking

Parking for the new dormitory will be provided by existing adjacent parking lots. No additional parking lot construction is included in the project. The existing parking lot shall be redesigned as necessary to provide parking which may include removal of existing islands and sidewalks as well as significant grading based upon the finished floor elevation of the new Dorm. Pavement shall be restriped where necessary.

### 1.6.3 Access Roads

The existing access road on Cedar Drive shall be removed as necessary to allow construction of the Dorm. Cedar Drive shall be realigned to provide a 21 ft wide access drive north of the Dorm. Access shall be restricted by a CAC-enabled traffic arm as per the paragraph titled Access Control. Regrading and earth reinforcement may be required for construction of the

access drive adjacent to the softball field. The design vehicle used for the emergency access drive shall be a Type 1 Fire Engine.

#### 1.6.3.1 Access to Athletic Fields

Aggregate surfacing improvements and minor grading will be required between the softball field and tennis courts as shown on the drawings.

#### 1.6.4 Planting

##### 1.6.4.1 Landscape Plan

Provide the final Landscape Plan as part of the design package. Comply with UFC 4-010-01 and "Cadet Area" landscape design requirements of the USAFA DS, and as described below. Design the Landscape plan to visually enhance the new facility and outdoor amenities with color, form and texture, while screening unsightly elements and visually framing views to the new facility. Cluster tree plantings for a naturalistic design in lieu of providing single specimen plants with exception to the emergency access lane. Trees, shrubs, and ground covers indicated on the conceptual drawings provided are considered minimum requirements. Coordinate with local nurseries when developing the planting plan to ensure that chosen plants are readily available in the project area. Top dress all planting beds and individual tree pits with a 2 inch to 3 inch layer of shredded hardwood mulch. Extend all planting beds a minimum of 12 inches beyond the backfilled pit. Provide commercial-quality black metal edging for plant beds not edged by pavements. Weed barrier fabric is required below all planting beds; weed barrier is not required for individual tree plantings. Show extent of seeding proposed on final landscape plan. Tree stakes are required for tree establishment due to high winds. Provide complete planting and staking details and specifications as part of the Final Landscape Plan. Additional tree care requirements can be found within the attached document titled USAFA Site Restoration and Revegetation.

All plantings must be guaranteed for one year beginning on the date of inspection by the Contracting Officer to commence the plant establishment period against defects including death and unsatisfactory growth during the warranty period. The Contractor shall water and maintain all planted trees and vegetation during the one year establishment period.

Remove and replace dead planting materials immediately unless required to plant in succeeding planting season. At the end of the warranty period, replace planting materials that die or have 25 percent or more of their branches that die during the construction operations or the guarantee period.

##### 1.6.4.2 Minimum Sizes

Minimum tree and shrub sizes shall comply the USAFA DS.

##### 1.6.4.3 Planting Soil and Fertilizer

Specify suitable planting soil or amend existing topsoil based upon local conditions. Specify slow-release fertilizer as necessary based upon soil condition and plant selection.

### 1.6.5 Seeding

#### 1.6.5.1 General

Provide an established stand of turf for all disturbed areas outside building and site feature limits. Established turf area is defined as having a growing, healthy stand of turf with 95% coverage. Specify seed mix, methods, and rates. Show extent of seeding proposed on final landscape plan and complete seeding specifications. Specify erosion control blankets for slopes greater than 4 horizontal to 1 vertical.

All seeding mixtures and methods of placement shall meet the requirements of the attached document titled USAFA Site Restoration and Revegetation.

a. Weed within the seed shall not exceed 1 percent by weight of the total mixture. Wet, moldy, expired, or otherwise damaged seed shall be rejected. Seed mixing shall be performed by the seed supplier prior to delivery to the site. Bulk quantities of seed shall be labeled.

b. All areas that are disturbed, excluding the landscape mulched areas, or sodded turf area will receive the applicable seed mixture.

c. All seeded areas shall be watered with temporary lawn sprinklers for a period of 60 days or until well established. Areas shall be watered as required for the ground to remain moist during the first three weeks of sprinkling. Beginning with the fourth week of sprinkling, the areas shall be watered every other day, delivering 1/2 inch of water to the ground for each watering day, for the remainder of the 60 day period unless natural precipitation is heavy.

#### 1.6.5.2 Soil Preparation

Prior to seeding operations, loosen subsurface soils to a minimum depth of 4 inches and break up to a fine, workable texture suitable for seeding. Work an additional 2 inches of topsoil into the prepared subgrade. Apply fertilizer at rates determined by seed mix selection and local extension services.

#### 1.6.5.3 Seasons

Spring: March 15 - April 30

Fall: August 15 - September 30

#### 1.6.5.4 Turf Establishment

Contractor is responsible for establishing and maintaining a healthy stand of turf for a period of 90 days after establishment has taken place and does not require further watering or until all work under this entire Contract has been completed and accepted, whichever period is longer. In addition, the Storm Water Pollution Prevention Plan (SWPPP) must be terminated.

Provide temporary irrigation for all seeded areas as required during the establishment period. Adjust locations of temporary irrigation equipment as required during establishment period so that no bare areas exist after establishment period. Reseed all areas where turf has not been established according to the requirements and begin establishment period for those areas after reseeding operations are complete. Remove all temporary irrigation equipment after the seeding has been accepted.

#### 1.6.6 Construction Area / Safety Fencing

The Contractor shall install an approved construction area fence adjacent to the building footprint and applicable site features that shall be maintained throughout the duration of the contract. Fence shall be in accordance with OSHA, EM 385-1-1 and USAFA DS. Upon complete of construction, all fence materials shall be disposed of outside the limits of Government-controlled lands.

#### 1.6.7 Access Control

Access via Cedar Drive and the adjacent parking lot of the new Dorm shall meet UFC 4-010-01. Provide Common Access Card (CAC) controlled electric traffic arms meeting UFGS 34 41 26.00 10 and where indicated on the drawings.

#### 1.6.8 Trash Enclosure

Provide concrete pad and trash enclosure where noted on the Drawings. Design enclosure to completely screen three sides of the dumpster pad and swing gates on the fourth side. Allow adequate space for two 8 CY refuse containers. Allow additional space within the enclosure to facilitate pedestrian circulation and for pickup of refuse containers with a standard trash vehicle. Provide wheel stops on sides and rear of refuse containers to avoid damage to enclosure materials as well adequate overhead clearance. Enclosures shall be buff brick matching the architectural finishes of the building. Reference the USAFA DS and UFC 3-201-01 for additional requirements. Minimum separation of dumpsters and adjacent facilities shall meet UFC 4-010-01.

### 1.7 PAVEMENTS

#### 1.7.1 Pavement Sections

Roads and parking lots in this project shall be constructed of flexible (asphalt) pavement over an appropriate base course. The shared pedestrian and emergency access drive identified on the Drawing shall be rigid (concrete) pavement over an appropriate base course. Provide a drainage layer that outlets to the road foreslope or via sub drain to a storm drain system as appropriate. Typical pavements sections are attached to UFC 3-250-01 and layer thicknesses shall be designed by the Contractor as described below.

The Contractor shall be responsible for design of all pavements using the traffic information provided below. Design of pavement structures for roads and parking areas shall be determined by the Contractor using the methods described within UFC 3-250-01. Pavement design calculation sheets for the procedures may be found in UFC 3-250-01. The thickness of pavement layers shall be designed using the Pavement-Transportation Computer Assisted Structural Engineering (PCASE) as described within UFC 3-250-01.

Pavements for permanent installations shall be designed for a life of 25 years and local seasonal frost conditions. A drainage layer shall be incorporated into flexible and rigid pavement sections. Soil data for pavement design shall be obtained from the attached PRELIMINARY GEOTECHNICAL EVALUATION. The Contractor shall design the final pavement section. The Contractor is responsible for providing the Final Geotechnical Evaluation for the Project.

### 1.7.2 Design Traffic

Pavement for the roadway and drive shall be asphalt cement pavement and shall be designed for an Average Daily Traffic (ADT) of 1200 vehicles (total vehicles for all lanes in both directions). The traffic composition consists of: 90 percent passenger cars, panel trucks and pickup trucks, 9 percent two-axle trucks, and 1 percent three-, four-, and five-axle trucks.

### 1.7.3 Sidewalks & Stairs

Portland cement concrete sidewalks shall be a minimum of 4 inches thick over 4 inches of rigid pavement base course. The minimum width of sidewalks shall be 7 feet and 14 feet where troop formations occur. Transverse contraction joint spacing shall be equally spaced based upon width and meet USAFA DS. Longitudinal contraction joints shall be constructed in sidewalk widths 8 feet and greater. Expansion joint spacing shall not exceed 42 feet. All sawcuts shall mimic the terrazzo within the Cadet Area where applicable both under and around the building. Walks accessing the handicap entrances shall meet the requirements of the American Disability Act with respect to width and grade. All ABA sidewalk ramps and treads shall match the existing at the adjacent intersection of Cedar Drive and Aspen Drive. Handrails shall meet the Type I: Academic Buildings Handrail Profile per the USAFA DS.

### 1.7.4 Pavement Removal and Replacement for Utilities

Where new utilities will be installed across existing pavements using open trench method, existing pavement shall be removed and replaced to original thickness(unless otherwise noted). New bituminous and p.c. concrete pavement shall overlap at least 12 inches over existing base course.

### 1.7.5 Pavement Base Course

The gradation shall meet the requirements within UFC 3-250-01 for pavement design for frost conditions.

### 1.7.6 Curbs and Gutters

Curb and gutter cross section shall match existing curb and gutter adjacent to the site. Typical curb details are attached.

## 1.8 GRADING

### 1.8.1 General

Positive drainage shall be provided for all areas and existing drainage ways shall be utilized to the extent possible and meet the requirements of Table 2-2 within UFC 3-201-01. It is desirable to direct drainage away from buildings to curb and gutter or road ditches. Swales between buildings and parking areas shall be avoided, if possible. Parking areas shall be graded such that storm water is directed off to the sides, with curbs and gutters to control drainage, and not down the center of the parking area, where possible. Earthwork shall be balanced to the extent possible without compromising the design. The number of existing trees to be removed shall be kept to a minimum. The Contractor shall be responsible for editing the specifications for the project. The Contractor shall be responsible for final grading plans.

### 1.8.2 Adjustment of Existing Structures

All manholes, valve boxes, or inlets of any nature within the project that do not conform to the new finish grade in either surfaced or unsurfaced areas shall be adjusted to the new finish grade. Where inlets, manholes, or valve boxes fall within a surfaced or unpaved roadway or parking, the existing frames and cover shall be removed and replaced with a heavy-duty frame and cover. The structure shall be adjusted as needed to fit the new conditions. All structures shall be of a type suitable for the intended use and shall conform to the requirements of the applicable section of these specifications.

### 1.8.3 Borrow and Waste

Clean borrow materials, if needed, shall be obtained from sources outside the limits of Government-controlled land. The source of the borrow material shall be the Contractor's responsibility and approved by the Contracting Officer. The Contractor shall obtain from the owners the right to procure material, shall pay all royalties and other charges required, and shall bear all expenses of developing the sources, including right-of-way for hauling. Surplus excavated material not required for fill shall be disposed of at the Contractor's expense. Excess soil shall be removed from Government property.

### 1.8.4 Sidewalks

Concrete walks shall have a transverse grade of 2 percent. Maximum longitudinal walk grade shall be 5 percent in freezing climates. Walks designed to provide a handicap accessible route shall conform to 36 CFR 1191 ABA Standards for Accessible Design. Special attention shall be given to sidewalks located on the north (shaded) side of buildings. These walks shall be designed to ensure freeze / thaw cycles do not result in the formation of ice on the walk. Ice on walks should be a safety consideration during design for all areas. Dual purpose walks are a combination of a straight curb and a concrete walk. Their use shall be limited to areas where drainage flows away from from the curb line or gutter.

### 1.8.5 Stairs

Exterior stairs shall be standard grey concrete and match adjacent retaining walls. All steps within a stair shall have a uniform tread width and riser height. Risers shall have a height of 4.5 to 6 inches and treads shall have a width of 12 to 17 inches. Treads should slope 2 percent for positive drainage. The height between landings shall be kept to a maximum of 5 feet to allow a view of the next higher landing whenever possible. The height between landings shall not exceed 12 feet. Landings shall be at least 4 feet long. Recessed lighting shall be located in the stairs.

### 1.8.6 Retaining Walls

Retaining walls shall be vertical architectural concrete with chamfered edges and joints placed on the building grid. Walls should harmonize with the facility which may include cladding, fitting cap or other architectural features. Handrails shall meet the Type I: Academic Building Handrail Profile per the USAFA DS. Recessed lighting shall be located in the walls and locations to be determined by the customer during design.

### 1.8.7 Road and Street Longitudinal Grades

Desirable and absolute maximum grades shall be in accordance with Table 2-2 UFC 3-201-01 with exception to the below. Use of longitudinal road and street grades greater than 7 percent shall be subject to approval by the Contracting Officer.

### 1.8.8 Ramp Grades

- a. Desirable maximum of 7 percent.
- b. Absolute maximum of 8.33 percent for short distances only.

### 1.8.9 Building Floor Elevation

Building finished floor elevation shall be as shown on the drawings. Buildings shall not be constructed within a 100-year floodway.

### 1.8.10 Grades Away From Building

- a. Minimum of 5 percent for 10 feet in unpaved areas.
- b. Maximum of 10 percent for 10 feet.

### 1.8.11 Overlot Grades

- a. Minimum 1 percent for cohesionless sandy soils.
- b. Minimum 2 percent for cohesive soils or turfed areas.
- c. Sideslopes for ditches, roads, and other turfed areas shall be no steeper than 1V on 3H.

### 1.8.12 Ditches

Ditches shall be graded at non-erodible slopes or the ditch shall be lined with an appropriate material to prevent erosion. The 1 hour - 2 year design storm shall be used to determine erodibility of ditches and swales. The depth of ditches along pavement shoulders shall be such that the water surface from the 10 year design storm is below pavement subbase and base courses which daylight through the adjacent shoulder.

## 1.9 ROAD & PARKING LOT GEOMETRIC DESIGN

Access drives and roads shall be designed for a minimum design speed of 20 mph. Horizontal and vertical alignment shall be designed in accordance with AASHTO GDHS "A Policy on Geometric Design of Highways and Streets". Comply with the requirements of SDDCTEA Pamphlet 55-17 as referenced within UFC 3-201-01 and UFC 4-022-01.

### 1.10 STORM DRAINAGE

#### 1.10.1 Determination of Storm Runoff

Determination of peak discharges for smaller drainage areas shall be accomplished using either the Rational Method presented in UFC 3-201-01. The Rational Method may not be used for drainage areas more than 200 acres. The minimum time of concentration for turfed or paved areas shall



be 5 minutes. For larger areas or where detailed consideration of ponding is required, computation should be by unit-hydrograph and flow-routing procedures such as HEC-HMS. Reference UFC 3-210-10, the City of Colorado Springs and El Paso County drainage criteria for additional requirements including but limited to water quality, detention, low impact development, and storm event design.

#### 1.10.1.1 Design Storm Return Period

Storm drains shall be sized for a design storm with a return period of 10 years. Culverts shall be sized for a design storm with a return period of 25 years. Provisions shall be made to protect all buildings and critical structures from a major storm event with a return period of 100 years. Detention facilities shall be designed to temporarily store at minimum the 100-year peak volume in relation to all upstream watersheds.

#### 1.10.1.2 Rainfall Intensity-Duration-Frequency Data

Rainfall intensity-duration data for projects at the United States Air Force Academy shall be obtained from the City of Colorado Springs Drainage Criteria Manual. Rainfall intensity-duration data developed by nearby cities or regions may be used if available and approved by the Contracting Officer.

#### 1.10.2 Stormwater Management

Contractor shall develop a stormwater management plan in accordance with requirements detailed in UFC 3-201-01 and UFC 3-210-10 as well as all city, county and state design criteria.

The Contractor shall be responsible for design of the UFC 3-210-10 compliant storm drainage system. Storm runoff in streets and parking areas with curbing shall be collected using curb inlets or area inlets. The use of curb openings with flumes to drain water from streets and parking areas with curbing will not be permitted unless approved by the Contracting Officer.

#### 1.10.3 Storm Drainage System Design

The Contractor shall be responsible for design of the storm drainage system including but not limited to all new storm water runoff resulting from the new dorm and site features as well as re-routing and upgrades to existing infrastructure along Cedar Drive. Route exisiting and new storm water to the detention area identified on the Drawings via pipe, not overland flow. The detention volume shall be increased in capacity to support both existing and new facilities. The detention facility shall meet all local and federal design standards for water quality while draining all storm water within a period of 48 hours. The storm drainage system shall be designed so as to minimize the number of drainage structures required. Structures shall be located at all changes in direction of storm drain line, at the intersection of two or more storm drain lines, and where required to intercept rainfall runoff. The maximum distance between drainage structures shall be approximately 300 feet for conduits less than 30 inches in diameter. The maximum distance between drainage structures shall be approximately 500 feet for conduits 30 inches and greater in diameter. Storm runoff in streets with curbing shall be collected using curb inlets or area inlets. Under no circumstance shall storm drain lines be located beneath buildings. Roof drain lines shall be used to collect and convey drainage from the roof of the new dormitory.

The roof drain system shall have outlet(s) to an appropriate stormwater structure, determined by the Contractor. Roof drain connections shall have a minimum diameter of 6 inches with double cleanouts and all changes in direction shall be 45 degree bends.

#### 1.10.3.1 Hydraulic Design

New storm drain pipes shall be designed for gravity flow during the 10-year design storm unless otherwise approved by the Government. The hydraulic grade line shall be calculated for and all energy losses. Storm drain systems shall be designed to provide a minimum flow velocity of 2.5 feet per second when the drains are one-third or more full.

#### 1.10.3.2 Manholes

Diameter of manholes shall be large enough to accommodate pipes entering/exiting the manhole. Manhole cast iron frames shall have a minimum opening diameter of 30 inches. Galvanized steel ladders shall be provided in all manholes with a depth exceeding 6 feet.

#### 1.10.3.3 Area Inlets

Area inlets shall be properly sized and designed to accommodate the design flows.

#### 1.10.3.4 Headwalls and Flared End Sections

Unless otherwise approved, headwalls or flared end sections shall be provided at the ends of culverts and at storm drain outfalls. Protection from erosion and scouring at headwall and flared end section outfalls shall be provided as needed.

#### 1.10.3.5 Culverts

Culvert pipes shall have a minimum diameter of 18 inches.

#### 1.10.4 Storm Drain and Culvert Pipe

The Contractor shall select the appropriate storm drain and culvert pipe. Only pipe materials which have a minimum design service life of 50 years shall be allowed for permanent installations. As a minimum, all pipe joints shall be soiltight. The Contractor shall specify watertight pipe joints and flexible resilient pipe connectors at drainage structures when the water table is at or above the pipeline. All piping shall meet the minimum frost depth requirements as required per UFC 3-201-01.

##### 1.10.4.1 Concrete Pipe

Reinforced concrete pipe shall be a minimum Class III. Type I cement may be used only when sulfates in the soil are 0.1 percent or less and dissolved sulfates in the effluent are 150 ppm or less. Type II cement may be used only when sulfates in the soil are 0.2 percent or less and dissolved sulfates in the effluent are 1,500 ppm or less. Only Type V cement may be used if sulfates in the soil exceed 0.2 percent or dissolved sulfates in the effluent exceed 1,500 ppm. Concrete pipe shall be assumed to have a minimum design service life of 50 years unless the Contractor determines that conditions at the site will reduce the service life. Concrete culverts and storm drains shall be protected by a minimum of 3 feet of cover during construction to prevent damage before permitting

heavy construction equipment to pass over them during construction.

#### 1.10.4.2 Plastic Pipe

Stiffness of the plastic pipe and soil envelope shall be such that the predicted long-term deflection shall not exceed 7.5 percent. Plastic culverts and storm drains shall be protected by a minimum of 3 feet of cover during construction to prevent damage before permitting heavy construction equipment to pass over them during construction. Split couplers shall not be allowed for corrugated high-density polyethylene pipe. Plastic pipe shall be assumed to have a minimum design service life of 50 years unless the Contractor determines that conditions at the site will reduce the service life. The final depth of cover for plastic pipe shall be a minimum of 2 feet and a maximum of 15 feet.

#### 1.11 TRAFFIC SIGNAGE AND STRIPING

Traffic signage and striping shall be provided for all new roads. Signage and striping shall be designed in accordance with MUTCD Manual on Uniform Traffic Control Devices for Streets and Highways. Roads and streets shall be striped with reflectorized paint. Reference the SDDCTEA Pamphlet 55-17, USAFA DS and the attached document titled "USAFA Supplemental Signage Requirements" for additional signage requirements. Signing plans shall be approved by the Contracting Officer prior to ordering signs.

#### 1.12 SITE SIGNAGE

Site signage is part of this project. Exterior signage shall comply with the USAFA DS and the attached document titled "USAFA Supplemental Signage Requirements".

Signage must conform to 36 CFR 1191, Architectural Barriers Act (ABA), and UFC 3-120-01 Air Force Sign Standards (applies to Air Force and Army projects). Coordinate all signage requirements, and placement with the Contracting Officer. Before fabrication of signage, manufacturer's representative shall coordinate message content with the Contracting Officer.

Directional and warning signage shall be provided for roadways, parking areas and entry control buildings. Reference UFC 3-120-04 for additional criteria.

#### 1.13 EROSION AND SEDIMENT CONTROL

The Contractor shall be responsible for selecting and implementing Best Management Practices (BMPs) to minimize pollutants in storm water discharges associated with construction activity at the construction site. All erosion and sediment measures and other protective measures shall be maintained by the Contractor in effective operating condition. All temporary structural practices shall be removed once the corresponding disturbed drainage area has been permanently stabilized. The Contractor shall comply with the requirements in Omaha District guide specification Sections 01 57 20.00 10 ENVIRONMENTAL PROTECTION and 01 57 20.00 10 STORM WATER POLLUTION PREVENTION MEASURES, and 01 41 26.05 24 (FEDERAL FACILITIES COLORADO) NPDES PERMIT REQUIREMENTS FOR STORM WATER DISCHARGES FROM CONSTRUCTION SITES.

#### 1.13.1 Temporary Construction Entrance

Tracking of mud from the construction site onto adjacent roads and streets shall be kept to a minimum. A temporary stabilized stone pad shall be constructed at points where vehicular traffic will be leaving the construction site and moving directly onto a paved road or street. It shall extend the full width of the vehicular ingress and egress area and have a minimum length of 70 feet. The entrance shall be maintained in a condition which will prevent tracking or flow of mud onto adjacent roads or streets. If conditions on the site are such that the majority of the mud is not removed by the vehicles traveling over the stone, then the tires of the vehicles shall be washed before entering the road or street. Any mud which is tracked onto roads or streets shall be removed immediately.

#### 1.13.2 Erosion Control Blanket

Bottoms and sideslopes of ditches and any other disturbed slopes 1V on 4H or steeper shall be covered with an erosion control blanket immediately after seeding.

#### 1.13.3 Silt Fence

Silt fencing shall be installed below disturbed areas where erosion would occur in the form of sheet and rill erosion. The size of the drainage area above the silt fence shall not exceed one fourth of an acre per 100 feet of silt fence length. Silt fencing may be installed across ditches only when the maximum contributing drainage area is not greater than 1 acre. Silt fence constructed across a ditch shall have wire support and shall be of sufficient length to eliminate endflow.

#### 1.13.4 Straw Bale Barrier

Straw bale barriers may not be installed across ditches.

#### 1.13.5 Outlet Protection

Preformed riprap lined scour holes or other suitable measures shall be installed at outlets of culverts and storm drains as needed to prevent erosion.

#### 1.13.6 Storm Drain Inlet Protection

Storm drain inlet protection shall be installed around any new or existing storm drain inlets that will become operational before permanent stabilization of the corresponding disturbed drainage area has occurred. Storm inlet protection shall be designed so no reduction of flow occurs. The use of drop in BMPs are recommended.

#### 1.13.7 Rock Check Dam

Rock check dams may be installed in ditches which drain 2 to 10 acres. The allowable drainage area will be dependent on the gradation of the rock used to construct the check dam. The maximum height of the dam shall be 3 feet. The center of the dam shall be at least 6 inches lower than the outer edges. For added stability, the base of the check dam may be keyed into the soil approximately 6 inches. The maximum spacing between the dams should be such that the toe of the upstream dam is at the same elevation as the top of the downstream dam.

#### 1.13.8 Temporary Sediment Trap

Temporary sediment traps may be constructed below disturbed areas where the total drainage area is less than 3 acres.

#### 1.13.9 Temporary Sediment Basin

Temporary sediment basins may be constructed below disturbed areas where the total drainage area is equal to or greater than 3 acres.

#### 1.13.10 Other Controls

Other controls such as diversion dikes, level spreaders, temporary seeding, etc. may be used if deemed necessary by the Contractor. The Contracting Officer may require the contractor to install additional controls if the current erosion control devices are not working adequately.

### 1.14 UTILITIES

The Contractor shall avoid running utilities underneath buildings, streets, and parking lots. In cases where it is necessary for the utilities to cross existing streets, the Contractor shall install the lines by boring and jacking methods. No open trenching will be allowed through existing streets unless written permission is obtained and approved by the Contracting Officer. All utilities shall be surveyed and documented per the paragraph titled As-Built Conditions.

#### 1.14.1 CATHODIC PROTECTION

Corrosion protection shall be provided for all buried gray or ductile-iron piping, coated piping, fittings, valves, and other water line appurtenances, regardless of pipe material. Corrosion protection shall consist of an anode type cathodic protection system. See Section 01 86 26 ELECTRICAL REQUIREMENTS.

#### 1.14.2 WATERLINES

a. All waterlines shall comply with applicable Local, State and Federal standards. Local and State standards shall dictate unless the Federal standards are more stringent. Water distribution systems and service lines shall be designed and constructed in accordance with UFC 3-230-01 and applicable State criteria and applicable UFGS guide specifications. Where there is a conflict between UFC 3-230-01 and the State criteria, the State criteria shall be followed. The Contractor shall be responsible for protection of existing waterlines. If any potable waterlines are damaged during construction, the Contractor must immediately notify the Contracting Officer. The Contractor shall disinfect all new water lines and any remaining lines which do not remain fully pressurized during construction or connection. The Contractor shall notify the Contracting Officer prior to disinfection of the water lines. The disinfection shall be in accordance with the American Water Works Association Standard AWWA C651 and shall not be considered complete until two consecutive days of bacteriological samples show no contamination. All bacteriological, lead and copper tests shall be performed by Environmental Protections Agency (EPA) certified laboratories. Copies of results of the analyses shall be submitted to the Contractor immediately upon receipt.

b. The Contractor shall design and provide all facilities required to

deliver water to the project. Service connections or extensions to the existing water distribution system shall be made without interruption to service. The domestic demand for the new facility served shall be designed in accordance with the Uniform Plumbing Code Fixture Count Method. For design of the waterlines, use maximum Hazen-Williams "C" value of 130 for plastic pipe and 120 for other pipe materials. The building's domestic and fire services shall connect to the water main in the Base's high pressure zone northeast of the building.

Water lines shall be installed with a minimum of five feet of cover below finished grade. Dedicated fire service lines shall be provided with an additional six inches of cover.

#### 1.14.2.1 Water Distribution and Service Lines

##### a. Flow Requirements

Water shall be supplied by service lines of appropriate capacity to provide the flows determined to be necessary to meet all requirements of the new facility. The requirements include all domestic use, and interior and exterior fire protection water as required. Contractor shall submit all design calculations of the water design.

##### b. Service Connections

A maximum velocity of 10 feet per second shall be used for metallic piping and 5 feet per second shall be used for nonmetallic piping. If the Service connection is one pipe size or more less than the pipe being connected to, the service connection shall be made via tapping sleeves and valves. If the service connection is the same size as the pipe being connected to, the service connection shall be made by cutting a tee into the existing pipe. Coordinate connection with Contracting Officer.

##### c. Dewatering, Hydrostatic Testing, and Flushing of Lines

The Contractor shall be responsible for implementing the terms and requirements for dewatering, hydrostatic testing, and flushing of lines after disinfection.

##### d. Domestic Service Stop Valve

Building shall be provided with separate service and stop valves in areas readily accessible to maintenance and emergency personnel. Stop valves located in walks are prohibited.

#### 1.14.2.2 Dedicated Fire Water Service Lines

##### a. Fire Flow Data

For determination and documentation of fire protection, the Contractor shall conduct and provide all fire hydrant flow tests. Flow tests shall be performed in the project site within seven (7) days of the installation of the fire hydrants. Data to be included with the flow tests are static pressures, residual pressures, flowrates, date, domestic and fire pumps in operation at the pumphouse, time tests were conducted, and name of personnel conducting the fire hydrant flow tests. The static pressures, residual pressures, flowrates, test hydrant and flow hydrants shall be shown on the appropriate contract drawings. Fire hydrant flow tests required for fire protection design shall be made in accordance with the

procedures specified in NFPA 291, Recommended Practice for Fire Flow Testing and Marking of Hydrants. The Contractor shall coordinate with the Contracting Officer prior to conducting such tests. The Contractor shall submit fire hydrant flow test data with the design calculations. The Contractor shall become familiar with the existing water system prior to conducting the hydrant flow tests.

The contractor is required to perform a hydrant flow test for design purposes.

b. Fire Hydrants

The Contractor shall be required to install fire hydrants for the new facility. One fire hydrant shall be located within a minimum of 150 feet of the building fire department connection. All other hydrants shall be located in accordance with UFC 3-600-01 and NFPA 1, chapter 18. The hydrant shall have connections identical to the existing hydrants at the Base. The hydrant shall be painted to match the Base's color scheme.

c. Dedicated Fire Line

The Contractor shall be required to provide a separate fire water service line to the building for interior fire sprinkler protection in accordance with NFPA 24, 2013, and UFC 3-600-01. The fire water service line to the building shall be equipped with a Post Indicator Valve (PIV) that can be readily located by the fire department. The PIV shall not be placed closer than 60 feet to the building it is serving and shall be provided with a tamper switch connected to the building fire control panel. The PIV shall be protected by 6 inch steel pipe bollards, filled with concrete, painted to and spaced in accordance with USAFA DS. The PIV shall be painted to USAFA DS.

1.14.3 WASTEWATER

All wastewater lines shall comply with applicable Local, State, and Federal standards.

1.14.3.1 Design Criteria

Sewage system shall be designed and constructed in accordance with State and local criteria unless the Federal standards are more stringent. If the Federal standards are more stringent, the sewage system shall be designed and constructed in accordance with UFC 3-240-01, UFC 3-240-02 and applicable UFGS guide specifications. The Contractor shall field verify the sanitary sewer system capacity and invert elevations to ensure that it is adequate for the flows generated by the new facilities. No interruption of service shall be allowed on the existing sanitary sewer lines. The Contractor shall coordinate the sequencing of construction as it affects the existing sanitary sewer line with the Contracting Officer. The exterior sanitary service size shall be minimum of 6 inch diameter pipe. All design slopes will be calculated using the Manning formula. The Contractor shall provide all calculations.

1.14.3.2 Manholes

Manholes are required at all changes of direction, slope, and size for pipes 8 inches diameter or greater. Manholes shall be spaced not more than 400 feet apart. Manholes shall be located at intersections of streets when possible. Avoid placing manholes where the tops will be

submerged or subject to surface water inflow. Where the invert of the inlet pipe would be more than 1.5 feet above the manhole floor, a drop connection will be provided. The Contractor shall provide all calculations. Manholes 6 feet deep or greater shall be provided with a ladder.

#### 1.14.3.3 Cleanouts

Cleanouts are required at all changes of direction, and slopes for pipe 6 inches diameter or smaller. Cleanouts shall be spaced not more than 90 feet apart.

#### 1.14.4 Gas Distribution System

See Section 01 86 10 MECHANICAL REQUIREMENTS for instructions and engineering information relating to the design of the exterior gas distribution system.

#### 1.14.5 Electrical Distribution System

See Section 01 86 26 ELECTRICAL REQUIREMENTS for instructions and engineering information relating to the design of the exterior electrical distribution system.

#### 1.14.6 Communications Systems

Refer to Section 01 86 29 COMMUNICATIONS REQUIREMENTS for exterior communications requirements.

### 1.15 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS.

#### 1.15.1 Trenches

Jacking and boring shall be required when an underground utility line crosses any roadway. Sewer and water lines, mains or laterals, shall be placed in separate trenches. The separate trenches shall maintain a minimum horizontal separation of 10 feet and the bottom of the water line shall be at least 1.5 feet above the top of the sewer. Sewers crossing above potable water lines shall maintain a vertical separation of 1.5 feet and must be constructed of suitable pressure pipe or fully encased in concrete for a distance of 10 feet on each side of the crossing.

The trench shall be excavated as recommended by the manufacturer of the pipe to be installed. Bedding and initial backfill material shall be in accordance with the manufacturers recommendations. Where no manufacturer's installation manual is available, trench walls shall be excavated to a stable angle of repose as required to properly complete the work. Trench excavations shall adhere to requirements prescribed in EM 385-1-1, Safety and Health Requirements Manual. Special attention shall be given to slopes which may be adversely affected by weather or moisture content.

#### 1.15.2 Conductor Wire

All non-metallic utility and storm drain lines shall have #12 AWG TW (thermal-weather resistant) coated conductor installed parallel with and 6 inches above the utility for the reception of a locator transmitter signal.

-- End of Section --





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Aspen Dr

BLDG 5234

Test Hydrant  
Static Pressure 90 psi  
Residual Pressure 64 psi

Flow hydrant  
@ 1030 gpm  
discharged rate

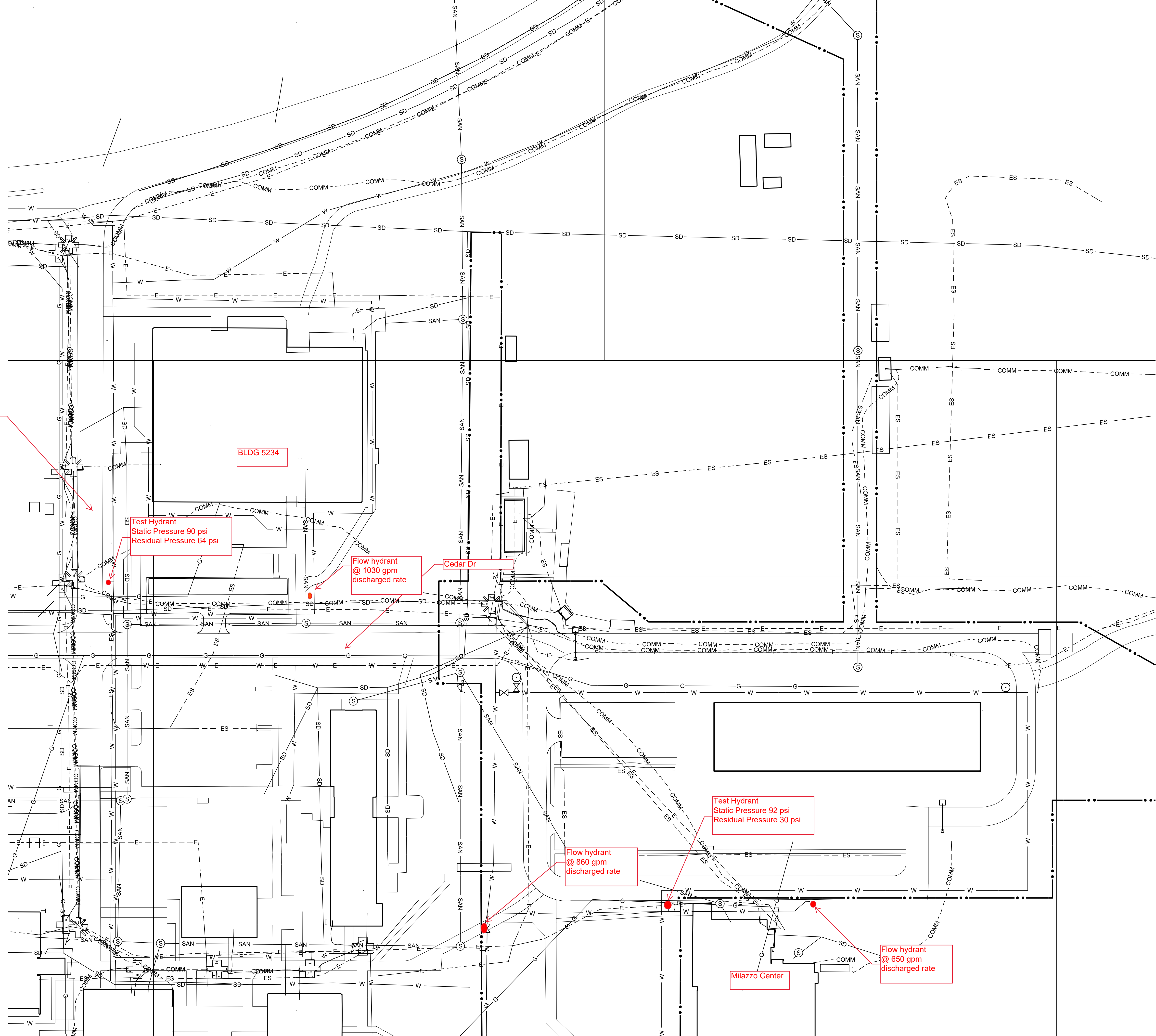
Cedar Dr

Test Hydrant  
Static Pressure 92 psi  
Residual Pressure 30 psi

Flow hydrant  
@ 860 gpm  
discharged rate

Milazzo Center

Flow hydrant  
@ 650 gpm  
discharged rate



OMAHA DISTRICT	CALCULATION SHEET	CORPS OF ENGINEERS
PROJECT: Consolidate Prep. School Dormitories	SHEET 1 OF 1	
USAF Academy, Colorado Springs, CO	BY: QVL	10/11/19
SUBJECT: Hydrant Flow Calculations		

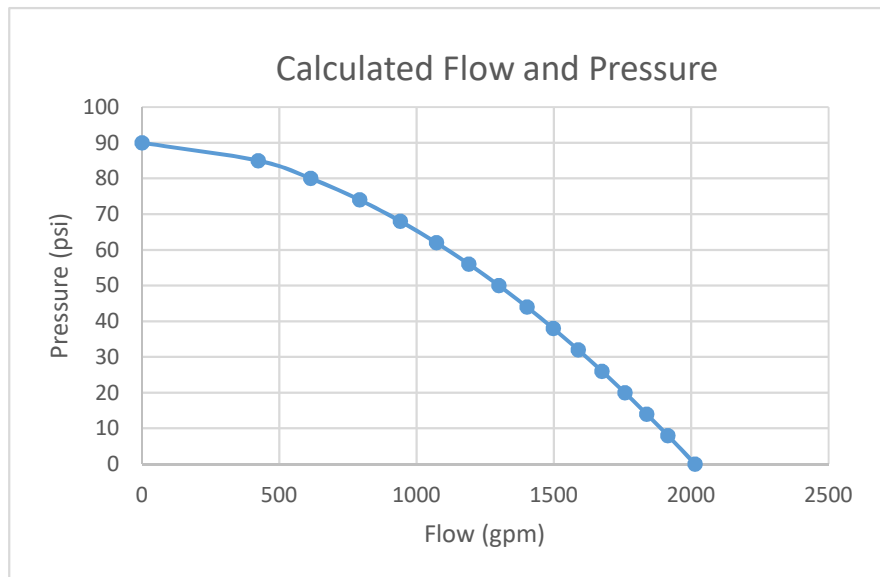
References: 1. NFPA 291: *Recommended Practice for Fire Flow Testing and Marking of Hydrants* (2016)

<b>Location:</b> Bldg 5234 locates NE corner of Aspen Dr and Cedar Dr	<b>Conducted By:</b>
<b>Date:</b> 10/9/2019	Q. Le B. Landis
<b>Time:</b> 1721-1725	

<b>Test Hydrant #1:</b>	<b>Static pressure:</b> 90 psi	<b>Pressure drop:</b> 28.9%
<b>Flow Hydrant 1a:</b>	<b>Residual pressure:</b> 64 psi	
	<b>Test time:</b> 1641-1658	

<b>Flow Hydrant 1a:</b>	Outlet diameter: 2.5 inch	<b>Flow Hydrant 1b:</b>	Outlet diameter:
	Pitot pressure:		Pitot pressure:
	Outlet coefficient:		Outlet coefficient:
	Flow: 1,030 gpm		Flow:

Pressure (psi)	Flow (gpm)
100	-----
95	-----
90	0
85	423
80	615
74	792
68	941
62	1072
56	1191
50	1300
44	1402
38	1498
32	1589
26	1675
20	1758
14	1838
8	1915
0	2014



NFPA 291 Equation 4.10.1.2:

$$Q_r = Q_t \left( \frac{P_s - P_r}{P_s - P_t} \right)^{0.54}$$

OMAHA DISTRICT	CALCULATION SHEET	CORPS OF ENGINEERS
PROJECT:	Consolidate Prep. School Dormitories	SHEET 1 OF 1
	USAF Academy, Colorado Springs, CO	BY: QVL 10/11/19
SUBJECT:	Hydrant Flow Calculations	

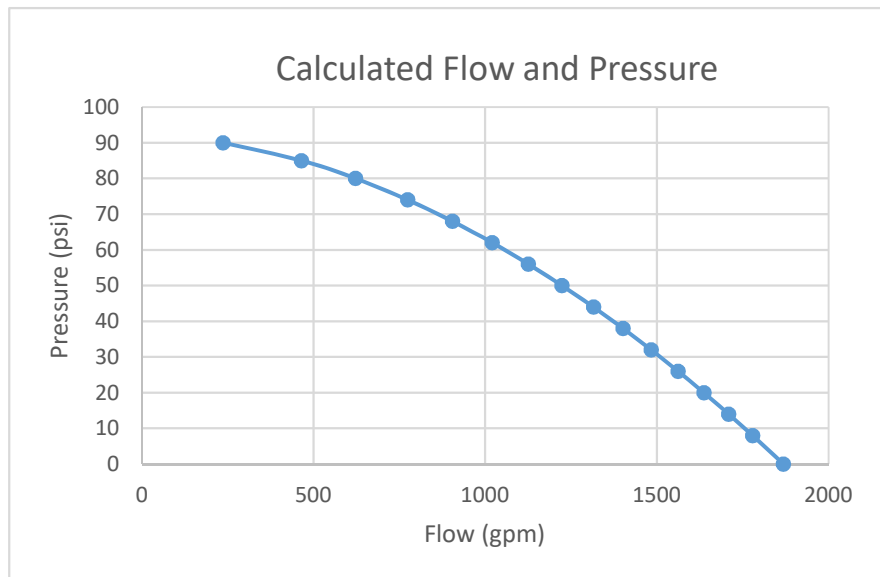
References: 1. NFPA 291: *Recommended Practice for Fire Flow Testing and Marking of Hydrants* (2016)

<b>Location:</b>	<b>Conducted By:</b>
Milazzo Center	
<b>Date:</b> 10/9/2019	Q. Le B. Landis
<b>Time:</b> 1350-1400	

<b>Test Hydrant #1:</b>	<b>Static pressure:</b> 92 psi	<b>Pressure drop:</b> 67.4%
<b>Flow Hydrant 1a:</b>	<b>Residual pressure:</b> 30 psi	
	<b>Test time:</b> 1641-1658	

<b>Flow Hydrant 1a:</b>	Outlet diameter: 2.5 inch	<b>Flow Hydrant 1b:</b>	Outlet diameter: 2.5 inch
	Pitot pressure:		Pitot pressure:
	Outlet coefficient:		Outlet coefficient:
	Flow: 650 gpm		Flow: 860 gpm

Pressure (psi)	Flow (gpm)
100	-----
95	-----
90	236
85	465
80	622
74	774
68	904
62	1020
56	1126
50	1224
44	1315
38	1401
32	1483
26	1562
20	1637
14	1709
8	1779
0	1869



NFPA 291 Equation 4.10.1.2:

$$Q_r = Q_t \left( \frac{P_s - P_r}{P_s - P_t} \right)^{0.54}$$

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**SITE RESTORATION, REVEGETATION AND TREE SPECIFICATION  
U.S. AIR FORCE ACADEMY**

**I. PLANT MATERIALS FOR REVEGETATION**

- A. NATIVE SEED. Depending on site conditions, one of the following native seed mixes shall be used for revegetating most disturbed areas. Other seed mixes may need to be developed for unique sites such as wetlands or riparian areas on a case-by-case basis. Any modification of the specified seed mix shall be coordinated with the Government and Natural Resources (10 CES/CECN, 333-3308). All seed shall be certified varieties that are free of noxious weeds and have been tested for purity and germination within six months of the planting date. If available, all seed shall originate from sources within 200 miles of the Air Force Academy and from a similar elevation (6300-8000 feet).

**The pounds of Pure Live Seed (PLS) per acre specified below are for drill seeding only. If the seed is to be broadcast by hand, spreader, or hydroseeder, the PLS/acre rate shall be doubled.**

1. Dry Upland areas, with a variety of soil and slope conditions, shall be planted with the following seed mix:

SPECIES (Variety)	PLS RATE PER ACRE
Little Bluestem (Pastura)	3.0
Blue Grama (Hachita)	2.5
Side Oats Grama (Vaughn)	3.0
Green Needlegrass (Lodorm)	1.5
Sand Dropseed	0.5
Western Wheatgrass (Barton)	3.5

2. If a rapid, temporary grass cover is required, perennial ryegrass shall be added to the above seed mix, but the PLS seeding rate of the native grasses shall be unchanged.

SPECIES (Variety)	PLS RATE PER ACRE
Perennial Ryegrass (Tetraploid)	6.0

3. Mesic (moist) areas shall be planted with the following seed mix:

SPECIES (Variety)	PLS RATE PER ACRE
Switchgrass (Trailblazer)	2.0
Western Wheatgrass (Barton)	3.5
Canada Wildrye	2.0
Little Bluestem (Pastura)	3.0
Slender Wheatgrass (San Luis)	2.5

4. Upland areas at Farish Recreation Area, with a wide variety of slope and soil conditions, shall be planted with the following seed mix:

SPECIES (Variety)	PLS RATE PER ACRE
Mountain Muhly*	2.0
Arizona fescue (Redondo)	2.5
Western wheatgrass (Barton)	4.0
Sideoats grama (Vaughn)	3.0
Thickspike wheatgrass (Critana)	3.0

\* If available. If mountain muhly is unavailable, then 0.25 pounds (PLS) shall be added to each of the other seed rates.

## II. SITE PREPARATION

- A. **SOIL PREPARATION.** All disturbed areas shall be tilled to a minimum depth of four inches, then harrowed or raked to produce a firm seed bed for planting. Large rocks (>6 inch diameter) and other debris shall be cleared from the site. Any necessary erosion control structures (e.g., water bars, berms, turnouts) shall be constructed prior to seeding. No fertilizer shall be applied to any seeded area.
- B. **TOPSOIL.** Where possible, native topsoil shall be salvaged prior to construction and stockpiled for later redistribution over the disturbed areas. Post –disturbance sites that have unsuitable surface soils (loam, sandy loam, clay loam, loamy sand) for plant growth shall be covered with 3-inches of weed-free, loamy topsoil (i.e., high organic matter content, non-compacted structure, good soil tilth) that is free of rocks, large woody debris, trash, or other non-soil materials. All topsoil shall be incorporated by disking it into the subsoil. Suitable topsoil material may be available from the Academy's compost/mulch yard. Access to this material must be coordinated with the yard manager and the material must be approved for



topsoil use by contacting the Natural Resources office. **Any proposed deviation from the topsoil requirement must be approved and coordinated with the Natural Resources office at 333-3308**

### III. SEEDING AND MULCHING

- A. SEEDING DATES. Site stabilization and seeding shall normally occur within 14 days of the completion of a project or project phase. Depending on the project schedule, seeding shall normally be conducted either during the fall (September-November) or spring (March-May) to maximize planting success. If the project completion date does not correspond with a preferred seeding period, then Best Management Practices shall be implemented to stabilize the disturbed area until the next appropriate seeding period. Seeding outside the preferred months shall require Government approval and coordination with the Natural Resources office.
- C. SEEDING METHODS. Drill seeding or broadcast seeding shall be used depending on the slope of the disturbed site and the size of the area. **Where feasible, drill seeding and crimped hay mulching or hydro-mulching is the preferred method of revegetation.**
1. **Slopes less than 3:1** – Seed shall be drilled using a rangeland drill with a small seed/legume box and an agitator box for fluffy or bulky seed. Seed rows shall be spaced 7-10 inches apart, and planted 0.5 to 0.75 inches deep. The drill shall have double-disk furrow openers with depth bands and packer wheels. Seeding shall be accomplished using bi-directional drilling and following the slope contour. The seed drill shall be calibrated each day or whenever changing seed mixes to ensure even seed distribution.
  2. **Slopes greater than 3:1 or less than 0.10 acre** – Seed shall be broadcast by hand, mechanical spreader, or hydro-seeding equipment. Broadcast seeded areas shall be raked or harrowed to incorporate the seed into the soil at a depth not exceeding 0.75 inches. **If hydro-seeding is used, the seed shall not be tank mixed with the hydro-mulch and broadcast.**
- D. MULCHING. Weed-free native hay, weed-free straw, virgin wood fiber hydro-mulch, erosion control blankets, and/or coir logs shall be used to control erosion and promote seed germination and plant establishment. **Native hay, straw, or hydro-mulch shall be applied at 3000 pounds/acre on slopes less than 3:1. On steeper slopes, a hydro-mulching rate of 4000 pounds/acre shall be used.** Native hay or straw shall be crimped into the soil to a depth of 3-4 inches, and shall protrude above the ground 3-4 inches. An organic tackifier shall be used to hold the hay or straw in place if the crimping results are insufficient. Hydro-mulch shall be applied using a color dye and the manufacturer recommended rate of an organic tackifier. Erosion control blankets, soil berms, and/or straw wattles shall be used whenever reclaiming slopes greater than 3:1 or along drainage areas where erosion is probable.

- D. **WEED CONTROL.** If weed growth becomes abundant on the seeded area, the site shall be mowed 1-2 times per year at a height just above the leaves or seedheads of the planted, native vegetation.
- E. **WATERING.** Artificial watering will normally not be required (or necessary) if the seeding is accomplished during the preferred planting periods. However, where access to potable or non-potable water is available, a sprinkler system may be desirable to enhance plant establishment. Generally, watering at 0.75-1.0 inches/week is recommended during the growing season. Using water trucks to irrigate is generally not recommended due to traffic impacts on the seeded areas and inadequate water infiltration.

#### IV. RESEEDING

A successful revegetation project shall have at least 3 planted seedlings/square foot (not including weedy species) and no bare areas exceeding one square meter after the second growing season. If a partial or total seeding failure is apparent after the second growing season, poorly vegetated areas shall be reseeded in the same manner described above. Appropriate site preparation practices shall be used to create a suitable seedbed for planting, but any established native vegetation shall be undisturbed to the extent possible. Areas that erode and lose seed before establishment can occur shall be immediately reseeded during the same season.

#### V. TREE CARE DURING CONSTRUCTION

Extreme care shall be exercised in protecting branches and root systems of existing trees. To the extent possible, moist conditions shall be maintained during construction. Roots damaged during excavation shall be pruned. Branch removal shall be minimized, with necessary removal done following standard pruning techniques (no flush cuts – as these increase tree decay in proximity to the pruning wound, etc). Contact Natural Resources (10 CES/CECN 333-3308) for technical advice on pruning techniques.

See Appendix A for additional information on proper pruning techniques.

Information on protecting trees during construction activities can be found at [www.ext.colostate.edu/PUBS/GARDEN/07420.html](http://www.ext.colostate.edu/PUBS/GARDEN/07420.html)

#### VI. TREE TRANSPLANTING FROM CONSTRUCTION AREA

Whenever possible, existing trees that need to be cleared shall be relocated or sold by Natural Resources as a forest product prior to site clearing. Transplantable trees are generally less than 25' in height. Coordinate with Natural Resources at least two months in advance to assess the feasibility of transplanting trees.

## VII. CARE OF TREES MOVED INTO CONSTRUCTION AREA

Trees moved into project area for landscaping purposes shall have irrigation needs addressed for at least two years, including winter watering. Approximately 10 gallons per inch of tree caliper (measured at 6" above ground level) shall be applied to the tree ring area upon planting. A similar amount should be applied weekly throughout the first growing season (as frequently as twice weekly for the first several weeks in dry and windy conditions), depending on natural moisture and soil conditions. Light watering applications (i.e. sprinklers) will not provide adequate water saturation, as this will tend to promote root proliferation within the top several inches of soil, rather than encouraging deeper root establishment which is vital to long-term survival. The objective of this periodic deep watering is to saturate the root ball to a depth of at least 12". Water amounts on heavy clay soils with poor drainage may need to be lessened to avoid drowning the root system. A rule of thumb would be to check the edge of the root ball for moisture at a depth of 4-6". If this area is still moist, watering can be postponed.

Winter watering from late October through March is critical, especially in dry climates with desiccating winter winds. Water should be applied monthly during dry periods, when the ground is not frozen. As the tree becomes established, the need for supplemental watering should decrease. This watering regime should be implemented for at least the first two seasons to assist in establishment, but is advisable beyond this timeframe if the transplanted tree is especially large, or is slow in adapting to its new site.

A soil berm or tree ring of at least 4" height shall be constructed around the tree (roughly under the tree dripline (outer edge of branches), or at least the size of the transplanted root ball). This will allow water to focus onto the root ball. The berm should be removed within two to three years.

Approximately 2-3" of mulch shall be placed above the root ball to preserve soil moisture, and to protect trees from lawnmower damage in mowed areas. Mulch should not be placed directly against tree stem, as this could cause rotting of wood, and could afford rodents a place to hide and potentially damage tree. A distance of at least 6" from tree stem should be left unmulched.

Transplanted trees shall be sprayed to prevent bark beetle infestation (with a persistent formulation of active ingredients Carbaryl or Permethrin) within one week of transplanting, and one additional time late in the growing season. Transplanted trees are a prime target for the Ips (Pine engraver) beetle, which are attracted to stressed trees.

In general, trees over 6' in height shall be staked, unless they are not located in a wind-prone location (i.e. sheltered from predominant west/north winds by a building), or do not have a large crown. Stakes shall be removed in one year, unless in unusually windy location, in which case they should be removed after

the second growing season. Retaining stakes for too long compromises windfirmness.

Trees should not be fertilized upon transplanting, as this encourages stem growth at the expense of root growth. Root growth is more critical at this time, so fertilization (nitrogen in particular) is best held off for several years. A root stimulant (generally high in phosphorus) may be used during or immediately after transplanting.

Coordinate with Natural Resources to advise on watering, mulching, spraying, staking, and fertilization.

Holes resulting from trees moved from elsewhere on the Academy must be filled within one week

See Appendix B for additional information and guidelines on watering guidelines.

#### VIII. FIREWOOD AND SLASH REMOVAL

Trees needing removal that are deemed infeasible for transplanting shall be cut and limbed (all limbs removed). Firewood (tree stems and limbs >3" in diameter) shall be delivered to the NR woodlot, with slash delivered to the 10 CES compost yard. Contractor may opt to purchase firewood at the published rate whenever possible (currently \$10 per cord). Coordinate wood delivery or purchase with Natural Resources.

#### VIX. BEETLE-INFESTED TREES

Trees infested with mountain pine beetle shall be chipped, debarked, or removed from site to be processed before beetles emerge in early July. If removed from site and not processed in a mill, infested wood should not be placed within five miles of any pines, to prevent beetle spread to other areas. Beetle-infested wood shall not be delivered to NR woodlot unless debarked. Coordinate with Natural Resources for site visit to check for beetle infestation.

#### X. CONE COLLECTION

If feasible, Natural Resources requests the opportunity to collect cones from high quality trees that must be cut during site clearing. A Natural Resources representative will assess this opportunity, and will coordinate with project manager on timing feasibility. Cones ripen in September. Natural Resources would fell trees for collection upon ripening, if this does not hinder construction

progress. Seed from cones would be utilized to grow tree seedlings for future reforestation needs on the Academy.

## APPENDIX A – PRUNING TECHNIQUES

### Pruning Cuts

Pruning cuts should be made so that only branch tissue is removed and stem tissue is not damaged. At the point where the branch attaches to the stem, branch and stem tissues remain separate, but are contiguous. If only branch tissues are cut when pruning, the stem tissues of the tree will probably not become decayed, and the wound will seal more effectively.

#### 1. Pruning living branches (Fig. 6)

To find the proper place to cut a branch, look for the **branch collar** that grows from the stem tissue at the underside of the base of the branch (Fig. 6A). On the upper surface, there is usually a **branch bark ridge** that runs (more or less) parallel to the branch angle, along the stem of the tree. A proper pruning cut does not damage either the branch bark ridge or the branch collar.

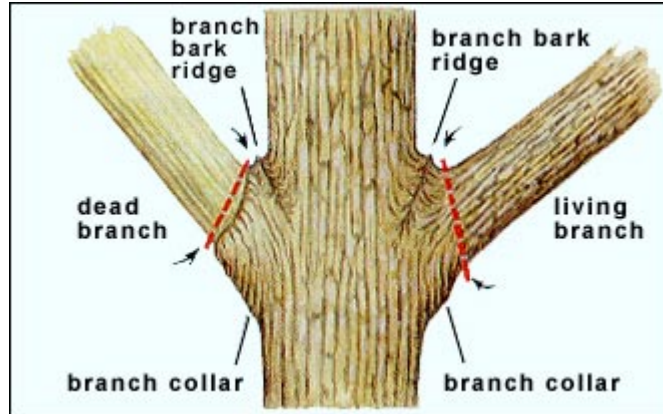
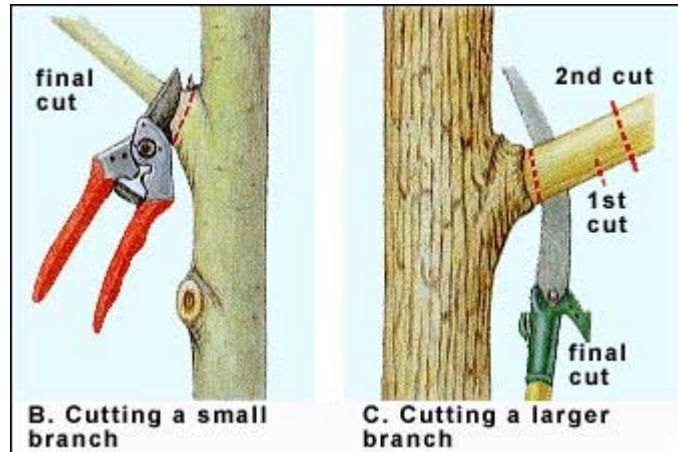


Figure 6A. Targeting the cut

A proper cut begins just outside the branch bark ridge and angles down away from the stem of the tree, avoiding injury to the branch collar (Fig. 6B). Make the cut as close as possible to the stem in the **branch axil**, but outside the branch bark ridge, so that stem tissue is not injured and the wound can seal in the shortest time possible. If the cut is too far from the stem, leaving a branch stub, the branch tissue usually dies and woundwood forms from the stem tissue. Wound closure is delayed because the woundwood must seal over the stub that was left.



The quality of pruning cuts can be evaluated by examining pruning wounds after one growing season. A concentric ring of woundwood will form from proper pruning cuts (Fig. 6B). **Flush cuts** made inside the branch bark ridge or branch collar, result in pronounced development of woundwood on the sides of the pruning wounds with very little woundwood forming on the top or bottom (Fig. 7D). As described above, stub cuts result in the death of the remaining branch and woundwood forms around the base from stem tissues.

When pruning small branches with hand pruners, make sure the tools are sharp enough to cut the branches cleanly without tearing. Branches large enough to require saws should be supported with one hand while the cuts are made. If the branch is too large to support, make a

three-step pruning cut to prevent bark ripping (Fig. 6C).

1. The first cut is a shallow notch made on the underside of the branch, outside the branch collar. This cut will prevent a falling branch from tearing the stem tissue as it pulls away from the tree.
2. The second cut should be outside the first cut, all the way through the branch, leaving a short stub.
3. The stub is then cut just outside the branch bark ridge/branch collar, completing the operation.

## **2. *Pruning dead branches* (Fig. 6)**

Prune dead branches in much the same way as live branches. Making the correct cut is usually easy because the branch collar and the branch bark ridge can be distinguished from the dead branch because they continue to grow (Fig. 6A). Make the pruning cut just outside of the ring of woundwood tissue that has formed, being careful not to cause unnecessary injury (Fig. 6C). Large dead branches should be supported with one hand or cut with the three-step method, just as live branches. Cutting large living branches with the three step method is more critical because of the greater likelihood of bark ripping.

(Appendix A is from a U.S. Forest Service publication)

## APPENDIX B –TREE CARE FOLLOWING PLANTING

After planting the tree, build a 4-inch tall berm around the edge of the hole. Fill the berm with mulch (i.e. shredded bark, compost). The mulch and berm make it easier to water the tree and reduce weed competition. Below are diagrams of a typical tree planting.

Right after planting, water the tree in by filling the bermed basin with water. This will settle the existing soil around the root ball. Fill the bermed basin with water once a week during the growing season, unless natural precipitation is abundant. The goal is to wean the tree slowly off of supplemental irrigation, and get the root system large enough for the tree to thrive on natural rainfall. Continue with winter watering once a month during extended dry periods from late October through March, unless ground is frozen.

**REMEMBER:** These are just guidelines. Use your index finger to check the soil moisture under the mulch. More plants are killed by over-watering than by under-watering.



(Portions of this appendix are from Douglas F. Welsh, Landscape Horticulturist Texas A&M University, College Station, Texas).



## US AIR FORCE ACADEMY

### SIGN SPECIFICATIONS

**Direction Signs:** Replace/install new road directional signs. Road signs are D-1 and D-2 direction signs, measuring 6-ft tall by 9-ft wide and 4-ft tall by 6-ft wide, respectively. Each road sign shall have 4 destination panels with arrows. All direction sign panels shall be interchangeable into each of the slots in the direction sign. Direction sign frames shall be aluminum with flat black factory finish. Frames shall provide 5 to 7 feet of clearance between the bottom of the sign and the ground. Direction sign panels shall consist of aluminum panels covered with high intensity prismatic reflective blue vinyl sheeting with high intensity prismatic reflective white letters. Backs of signs shall be flat black factory finish. Font for the letters shall be Helvetica Medium. Size of the letters for the D-1 signs shall be 6-inch capital letters and 4.5-inch lower case letters. Size of the letters for the D-2 signs shall be 4-inch capital letters and 3-inch lower case letters. Each sign frame post for the D-1 and D-2 signs shall be 6" deep by 4" wide. Each sign frame post for the D-1 signs shall be set 42" into the ground and held in place with concrete. Each sign frame post for the D-2 signs shall be set 36" into the ground and held in place with concrete. Concrete will be gently sloped away from pole base at the intersection with existing ground. All signs shall have frangible posts. All signs must be strong enough to withstand 100 mph winds. Lateral clearance will be a minimum of 12' from the edge of the white fog line or 6' from the edge of the paved shoulder or curb.



*Example D-1 Sign*

**Street Signs:** Replace/install new street signs at the identified intersections on base. Signs shall be mounted on existing telspar posts or street lamp poles. The bottom edge of the lowest street sign shall be at a height of 7' above the pavement of the road. For street signs where no telspar post or light pole exists contractor shall communicate with the construction inspector to determine the ideal mounting location. Street signs are 1-ft by 4-ft in size. Street signs shall consist of aluminum panels covered with high intensity prismatic reflective blue vinyl sheeting with high intensity prismatic reflective white letters. To the left of the street name the round USAFA logo shall appear in a six inch diameter circle. Backs of street signs shall be flat black factory finish in color. Font for the letters shall be Helvetica Medium. Size of the letters shall be

6-inch capital letters with 4.5-inch lower case letters. All signs shall have frangible posts. All signs must be strong enough to withstand 100 mph winds.



*Example Street Signs*

#### Color Specifications

Blue - 3M Reflective Blue High Intensity Prismatic #3935

White - 3M Reflective White High Intensity Prismatic #3930

#### Non-Standard Signs:

##### Airfield Gate Signs:

- All airfield gate signs will have a standardized frame. Each frame will have 5 panels which will be removable/replaceable. Frames will be designed to match existing airfield gate signs and a design drawing will be submitted prior to fabrication for approval by the CE Representative.
- All panels will consist of high intensity prismatic reflective materials.

##### I. Warning Panels:

- i. WARNING will appear in high intensity prismatic reflective red letters on high intensity prismatic reflective white sheeting. The heading, text and citation will appear in high intensity prismatic reflective black letters on high intensity prismatic reflective white sheeting.
- ii. WARNING type will be upper case Helvetica medium, match existing capital letter height, centered.
- iii. Heading type will be upper and lower case Helvetica medium, match existing capital letter height, flush left.
- iv. Text type will be upper and lower case Helvetica medium, match existing capital letter height, flush left.
- v. Citation will be upper and lower case Helvetica medium, match existing capital letter height, flush left.
- vi. Sign will appear as shown below



**Informational Signs:**

- All informational signs scheduled to be replaced will appear on high intensity prismatic reflective blue vinyl sheeting with high intensity prismatic reflective white letters.
- All sign backs will have a flat black factory finish.
- Sign lettering and size will match existing and will be field verified prior to fabrication.
- Information signs shall be mounted to telspar posts with a telspar post mounted in a telspar sleeve set in the ground.
- Any signs identified as “Flip” signs will be constructed such that a blank face will appear when the sign is in the flipped position.
- Corners will be rounded and border will have a white edge stripe.

**Low Profile Slider Signs:**

- All slider signs scheduled to be replaced will appear on high intensity prismatic reflective blue vinyl sheeting with high intensity prismatic reflective white letters.
- All sign backs will have a flat black factory finish.
- Sign lettering, shape and size will match existing and will be field verified prior to fabrication.
- Existing aluminum frames do not need to be replaced unless damaged.

Marquee Signs: Marquee sign elements shall satisfy the following requirements.

<u>Element</u>	<u>Material</u>	<u>Finish</u>	<u>Color</u>	<u>Dimension</u>
Frame	Aluminum/Metal	Extruded/Painted	*Matthews Paint MP25546 – High Intensity Blue or equal	Match Existing
Background Field	Metal	Cut Letters, Painted	*Matthews Paint MP25546 – High Intensity Blue or equal	Recessed by 1" to frame
Letters	Metal or plastic	Cut, 0.70" Colored	White	6" Capitals
Base, pedestal	Concrete	High Quality	Light Gray	Match Existing
Reveal	Concrete	High Quality	Light Gray	Match Existing

\* Lettering is to be white in color with upper case Helvetica Medium font and all letters left justified. Sign will be metal and mounted on a concrete base. The backing and frame color must be similar in color to high intensity prismatic reflective blue sheeting, however it will not be reflective or prismatic. Signs will be mounted on existing concrete bases unless concrete base is damaged.



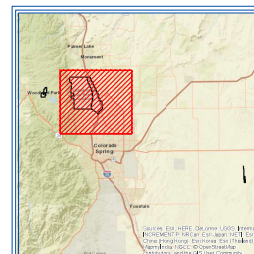
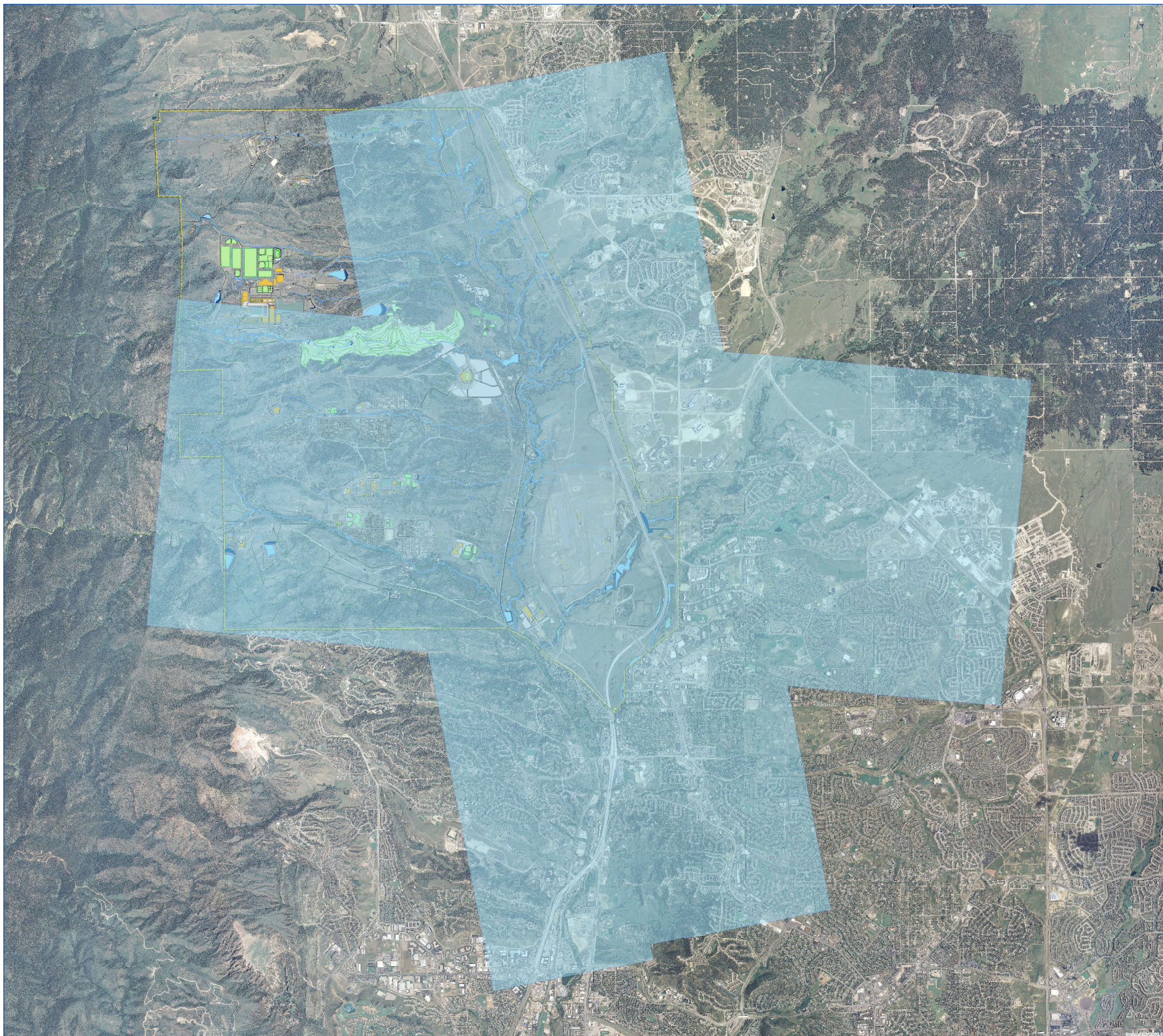
Figure 1 : Marquee sign dimensions. NOTE: Lettering shall be all upper case.



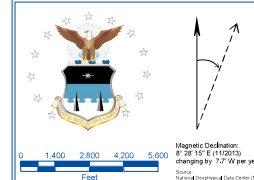
Figure 2 : Sample marquee sign

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- Stormwater Infrastructure Exclusion Area
- Airfield Area
- Installation Boundary
- Fence
- Gate
- Tower
- Building
- Railroad Track
- Pavement
- Dam
- Stream Centerline
- Water Feature
- Wetland
- Recreation Trail
- Playground
- Campground
- Golf Course Feature
- Recreation Feature

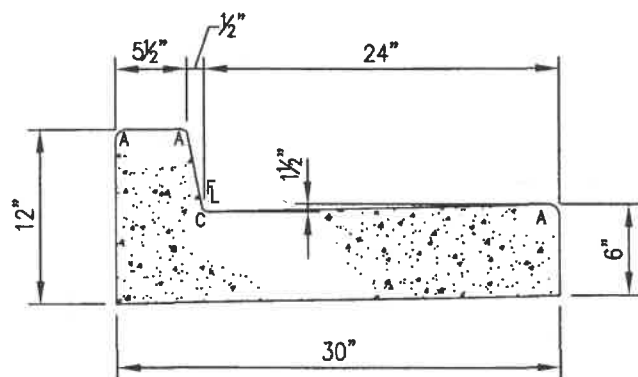


DATE		DRAWN BY		CHECKED BY	
DEPARTMENT OF THE AIR FORCE					
DIRECTORATE OF ENGINEERING & SERVICES DCS/PEE - WASHINGTON, D.C.					
UNITED STATES AIR FORCE ACADEMY					
COLORADO					
STORMWATER INFRASTRUCTURE RESTRICTED AREA					
SCALE: 1:50,000					
FOR MORE INFORMATION, CONTACT THE UNITED STATES AIR FORCE ACADEMY					
DRAWN BY: JACOB L. HARRIS					

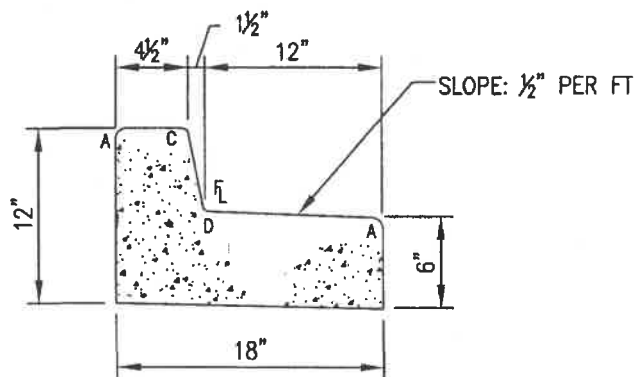


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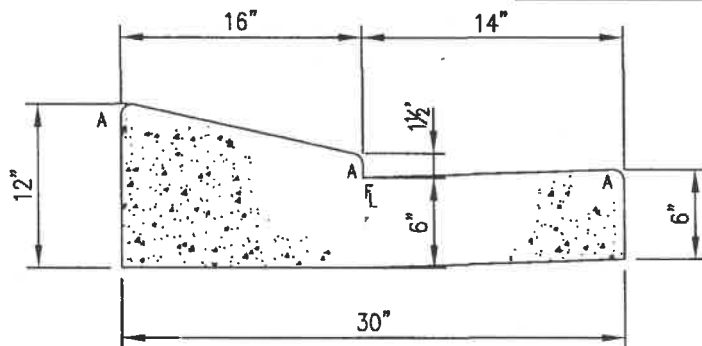


**TYPE 1**  
VERTICAL CURB AND GUTTER

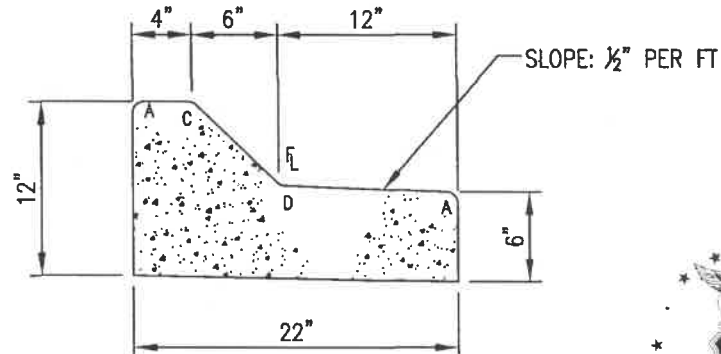


**TYPE 3**  
STANDARD MEDIAN CURB AND GUTTER

LENGTH FOR RADII	
A	= 1/2"
C	= 1 1/2"
D	= 1 1/2" TO 2"



**TYPE 4**  
MOUNTABLE MEDIAN CURB AND GUTTER



**TYPE 4**  
MOUNTABLE MEDIAN CURB AND GUTTER



UNITED STATES  
AIR FORCE ACADEMY

STANDARD DETAILS

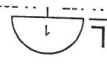
CURB AND GUTTER  
TYPE 1, 2, 3 & 4

SD-17

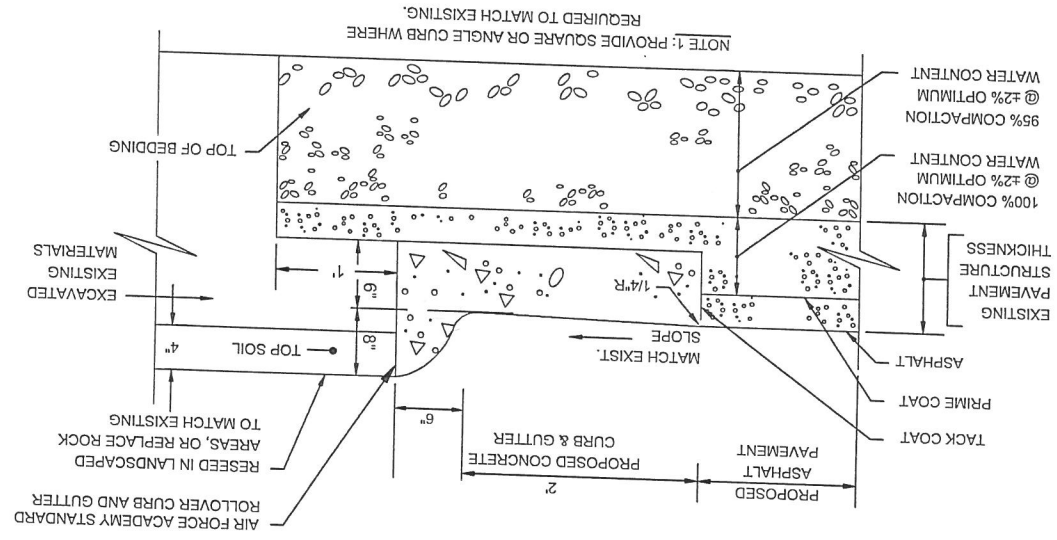


**MERRICK**

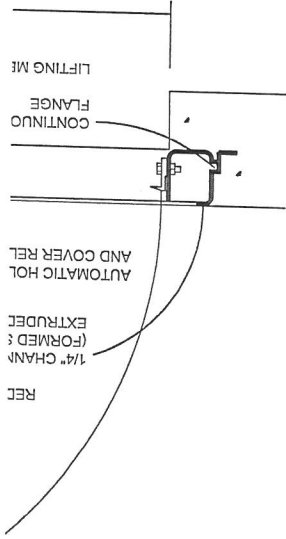
Merrick & Company  
Telephone (719)260-8874  
7222 Commerce Center Dr., Ste. 120  
Colorado Springs, CO 80919-2631



# CRETE CURB & GUTTER DETAIL



## BILCO DOOR DE



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05/19

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-- End of Section Table of Contents --

## SECTION 01 91 00.15 10

TOTAL BUILDING COMMISSIONING  
05/19

## PART 1 GENERAL

## 1.1 SUMMARY

Commission the building systems listed herein. Employ the services of an independent Commissioning Firm. The Commissioning Firm must be a 1st tier subcontractor of the General or Prime Contractor and must be financially and corporately independent of all other subcontractors. The Commissioning Firm must employ a Lead Commissioning Specialist that coordinates all aspects of the commissioning process. Conform to the commissioning procedures outlined in this specification.

## 1.2 UNIFIED FACILITIES GUIDE SPECIFICATION REFERENCES

This specification section is intended to work in conjunction with the requirements included in the Unified Facilities Guide Specifications (UFGS) referenced within this specification section. Comply with the requirements of the referenced UFGS to the extent specified herein. UFGS can be found at on the Whole Building Design Guide website at: <http://www.wbdg.org/>

## 1.3 SYSTEMS TO BE COMMISSIONED

Refer to Part 2.22 of specification sections 01 81 00 SUMMARY OF THE WORK, 01 86 26 ELECTRICAL REQUIREMENTS and related specification sections. Coordinate with Controls Venders (equipment manufacturer representatives), and provide support to the Cybersecurity Subject Matter Expert (SME) to ensure implementation of cybersecurity controls on all facility related control systems (frcs) to the maximum extent while ensuring all systems are fully functional as manufacturer and designer intent.

Coordinate commissioning and quality control activities for the following systems, equipment, and associated controls. System-specific requirements are located in the associated specification Sections. Commission the following systems, equipment, and associated controls in accordance with this section and the inspection, testing, and quality control requirements of their respective sections in addition to specification section 01 86 26 ELECTRICAL REQUIREMENTS:

- Heating, Ventilating, Air Conditioning, and Refrigeration Systems (HVAC)
- Building Automation System
- Utility Monitoring and Control System
- Lighting Systems
- Power Distribution Systems
- Renewable Energy Systems
- Service Water Heating Systems
- Plumbing Systems
- Natural Gas and Propane Systems
- Water Pumping and Mixing Systems
- Irrigation Systems

Water Harvesting/Reclaim Systems  
Energy and Water Utility Metering Systems and Sub-Meters  
Fenestration Control Systems  
Building Envelope: include moisture, thermal integrity, and air tightness for the entire building envelope

#### 1.4 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)

ASHRAE 180 (2012) Standard Practice for Inspection and Maintenance of Commercial Building HVAC Systems

ASHRAE 202 (2013; Addenda B 2018) Commissioning Process for Buildings and Systems

ASSOCIATED AIR BALANCE COUNCIL (AABC)

ACG Commissioning Guideline (2005) Commissioning Guideline

NATIONAL ENVIRONMENTAL BALANCING BUREAU (NEBB)

NEBB Commissioning Standard (2009) Procedural Standards for Whole Building Systems Commissioning of New Construction; 3rd Edition

SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)

SMACNA 1429 (1994) HVAC Systems Commissioning Manual, 1st Edition

U.S. ARMY CORPS OF ENGINEERS (USACE)

ER 25-345-1 (1991) Systems Operation and Maintenance Documentation

#### 1.5 COMMUNICATION WITH THE GOVERNMENT

The Lead Commissioning Specialist (CxC) must submit all plans, schedules, reports, and documentation directly to the Contracting Officer Representative concurrent with submission to the CQC System Manager. The Lead Commissioning Specialist must have direct communication with the Contracting Officer's Representative regarding all elements of the commissioning process; however, the Government has no direct contract authority with the Lead Commissioning Specialist.

#### 1.6 SEQUENCING AND SCHEDULING

##### 1.6.1 Sequencing

Complete the following prior to starting Functional Performance Tests of

mechanical systems:

- a. All equipment and systems have been completed, cleaned, flushed, disinfected, calibrated, tested, and operate in accordance with contract documents and construction plans and specifications.
- b. Performance Verification Tests of the controls systems have been completed and the Performance Verification Test Report has been submitted and approved in accordance with UFGS Section 23 09 00 INSTRUMENTATION AND CONTROL FOR HVAC.
- c. Testing, Adjusting, and Balancing has been completed and the Testing, Adjusting, and Balancing Report, has been submitted and approved in accordance with UFGS Section 23 05 93 TESTING, ADJUSTING, AND BALANCING FOR HVAC.
- d. The building envelope is enclosed according to contract documents with final construction completed, the Air Barrier Pressure Tests have been completed and the Air Leakage Test Reports and Diagnostic Test Reports have been submitted and approved in accordance with UFGS Section 07 05 23 PRESSURE TESTING AN AIR BARRIER SYSTEM FOR AIR TIGHTNESS.
- e. The Pre-Functional Checklists have been submitted and approved.
- f. The Certificate of Readiness for mechanical systems has been submitted and approved.

Complete the following prior to starting Functional Performance Tests of the electrical systems:

- a. All electrical power and lighting equipment and systems have been completed, calibrated, tested, and operate in accordance with contract documents and construction plans and specifications.
- b. The building envelope is enclosed according to contract documents with final construction completed.
- c. Ceiling tiles, floor coverings, and window coverings are in place.
- d. The Certificate of Readiness for electrical systems has been submitted and approved.
- e. Furniture is in place.

#### 1.6.2 Project Schedule

Include the following tasks in the project schedule required by Section 01 32 01.00 10 PROJECT SCHEDULE. Ensure sufficient time is scheduled to accommodate the requirements of this specification section. The order of items listed below is not intended to imply a specified sequence:

- a. Submission and approval of the Commissioning Firm and Commissioning Specialist
- b. Submission and approval of the Testing, Adjusting, and Balancing (TAB) Firm and TAB Specialist specified in UFGS Section 23 05 93 TESTING, ADJUSTING, AND BALANCING FOR HVAC
- c. Submission of the Design Review Report specified herein.

- d. Submission of the Design Review Report specified in UFGS Section 23 05 93 TESTING, ADJUSTING, AND BALANCING FOR HVAC.
- e. Submission and approval of the Construction Phase Commissioning Plan
- f. Installation of permanent utilities (gas, water, electric)
- g. Building Envelope Construction
- h. Submission and approval of the Building Envelope Inspection Checklists
- i. Air Barrier Pressure Tests specified in UFGS Section 07 05 23 PRESSURE TESTING AN AIR BARRIER SYSTEM FOR AIR TIGHTNESS
- j. Drainage and Vent, Building Sewers, Water Supply Systems and Backflow Prevention Assembly Tests specified in UFGS Section 22 00 00 PLUMBING, GENERAL PURPOSE
- k. Factory Acceptance Testing for each of the systems to be commissioned as required by technical specifications
- l. Manufacturer's Equipment Start-Up for each of the systems to be commissioned.
- m. Potable Water System Flushing specified in UFGS Section 22 00 00 PLUMBING, GENERAL PURPOSE
- n. Operational Tests of the plumbing system specified in UFGS Section 22 00 00 PLUMBING, GENERAL PURPOSE.
- o. Potable Water System Disinfection specified in UFGS Section 22 00 00 PLUMBING, GENERAL PURPOSE
- p. Submission and approval of the TAB Schematic Drawings, Report Forms, and Procedures specified in UFGS Section 23 09 93 TESTING, ADJUSTING, AND BALANCING FOR HVAC.
- q. Submission and approval of Duct Air Leakage Test Procedures specified in UFGS Section 23 95 93 TESTING, ADJUSTING, AND BALANCING FOR HVAC
- r. Duct Air Leakage Test Execution specified in UFGS Section 23 05 93 TESTING, ADJUSTING, AND BALANCING FOR HVAC
- s. Submission and approval of the Final Duct Air Leakage Test Report specified in UFGS Section 23 05 93 TESTING, ADJUSTING, AND BALANCING FOR HVAC
- t. Testing, Adjusting, and Balancing (TAB) Field Work required by UFGS Section 23 05 93 TESTING, ADJUSTING, AND BALANCING FOR HVAC
- u. Submission and approval of the TAB Report specified in UFGS Section 23 05 93 TESTING, ADJUSTING, AND BALANCING FOR HVAC
- v. TAB Field Acceptance Testing required by UFGS Section 23 05 93 TESTING, ADJUSTING, AND BALANCING FOR HVAC
- w. Submission and approval of the Start-Up Testing Report specified in UFGS Section 23 09 00 INSTRUMENTATION AND CONTROL FOR HVAC.



- x. Submission and approval of the Performance Verification Test Procedures specified in UFGS Section 23 09 00 INSTRUMENTATION AND CONTROL FOR HVAC.
- y. Performance Verification Tests required by UFGS Section 23 09 00 INSTRUMENTATION AND CONTROL FOR HVAC
- z. Performance Verification Test Report specified in UFGS Section 23 09 00 INSTRUMENTATION AND CONTROL FOR HVAC
- aa. Pre-Functional Checklist Submittal
- bb. Functional Performance Testing for each system to be commissioned
- cc. Integrated Systems Tests
- dd. Post-Test Deficiency Correction for each system to be commissioned
- ee. Re-Testing
- gg. Training for each of the systems to be commissioned
- hh. Systems Manual, submission and approval
- ii. Submission and approval of the Commissioning Report
- jj. Seasonal Testing
- kk. Post-Construction Endurance Testing
- ll. Post-Construction Site Visit

#### 1.7 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

##### SD-01 Preconstruction Submittals

Commissioning Firm; G, RO

Lead Commissioning Specialist; G, RO

Technical Commissioning Specialists; G, RO

Commissioning Firm's Contract; G, RO

##### SD-05 Design Data

Design Phase Commissioning Plan; G, RO

##### SD-06 Test Reports

Design Review Report; G, RO

Interim Construction Phase Commissioning Plan; G, RO

Final Construction Phase Commissioning Plan; G, RO

Template Building Envelope Inspection Checklists; G, RO

Building Envelope Inspection Checklists; G, RO

Pre-Functional Checklists; G, RO

Issues Log

Commissioning Report; G, RO

Post-Construction Trend Log Report; G, RO

#### SD-07 Certificates

Certificate of Readiness; G, RO

#### SD-10 Operation and Maintenance Data

Training Plan; G, RO

Training Attendance Rosters; G, RO

Systems Manual; G, RO

Systems Manual G, RO

#### SD-11 Closeout Submittals

Final Commissioning Report; G, RO

Final Construction Phase Commissioning Plan; G, RO

### 1.8 COMMISSIONING FIRM

Provide a Commissioning Firm that is certified in commissioning by one of the following: the AABC Commissioning Group (ACG); the National Environmental Balancing Bureau (NEBB); the International Certification Board/Testing, Adjusting, and Balancing Bureau (ICB/TABB), the Building Commissioning Association (BCA); the Association of Energy Engineers (AEE). The Commissioning Firm may employ a commissioning professional certified by the University of Wisconsin-Madison or the American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) as required in paragraph LEAD COMMISSIONING SPECIALIST as an alternative to certification of the Commissioning Firm. The Commissioning Firm must be certified in all systems to be commissioned to the extent such certifications are available from the certifying body. Describe any lapses in certification or disciplinary action taken by the certifying body against the proposed Commissioning Firm or Lead Commissioning Specialist in detail. Any firm or commissioning professional that has been the subject of disciplinary action by the certifying body within the five years preceding contract award is not eligible to perform any duties related to commissioning.

- a. Submit the Commissioning Firm's certification of qualifications including the name of the firm and certifications no later than 30 calendar days after Notice to Proceed. Submit one hard copy and an electronic copy.
- b. The Commissioning Firm's and Commissioning Specialists' certifications must be maintained for the entire duration of the duties specified herein. If, for any reason, the firm or a specialist loses a certification during this period, immediately notify the Contracting Officer's Representative and submit another Commissioning Firm or Commissioning Specialist for approval. All work specified in this specification section performed by the Commissioning Firm or associated Commissioning Specialists is invalid if the Commissioning Firm or Commissioning Specialist loses its certification prior to contract completion and must be performed by an approved successor.
- c. The Commissioning Firm must oversee and assist the General or Prime Contractor with the work specified herein. Submit the Commissioning Firm's Contract including the Scope of Work associated with the paragraph POST-CONSTRUCTION SUPPORT no later than 30 calendar days after approval of the Commissioning Firm. Submit one hard copy and an electronic copy.
- d. The Commissioning Firm may act as the Pressure Test Agency required by UFGS Section 07 05 23 PRESSURE TESTING AN AIR BARRIER SYSTEM FOR AIR TIGHTNESS provided that all qualification requirements of that specification section are met.

#### 1.8.1 Lead Commissioning Specialist

The Commissioning Firm must provide a Lead Commissioning Specialist (CxC) that has a minimum of five years of commissioning experience, including two projects of similar size and complexity, and that is one of the following: a NEBB qualified Systems Commissioning Administrator (SCA); ACG Certified Commissioning Authority (CxA); ICB/TABB Certified Commissioning Supervisor; BCA Certified Commissioning Professional (CCP); AEE Certified Building Commissioning Professional (CBCP); University of Wisconsin-Madison Qualified Commissioning Process Provider (QCxP); ASHRAE Commissioning Process Management Professional (CPMP).

- a. Submit the Lead Commissioning Specialist's certification of qualifications including the name of the specialist and firm; certifications; years of experience; and a listing of representative projects of similar size and complexity no later than 30 calendar days after Notice to Proceed. Submit one hard copy and an electronic copy.
- b. The Lead Commissioning Specialists certifications must be maintained for the entire duration of the duties specified herein. If, for any reason, the specialist loses a certification during this period, immediately notify the Contracting Officer's Representative and submit another Lead Commissioning Specialist for approval. All work specified in this specification section to be performed by the Lead Commissioning Specialist is invalid if the Lead Commissioning Specialist loses its certification prior to contract completion and must be performed by an approved successor.
- c. The Lead Commissioning Specialist must lead and oversee the commissioning work specified herein and be the primary point of

contact for the Government regarding the commissioning work. One of the Technical Commissioning Specialists may be the Lead Commissioning Specialist provided that all of the qualification requirements are met.

#### 1.8.2 Technical Commissioning Specialists

Technical Commissioning Specialists, employed by the Commissioning Firm and that have the following qualifications, must perform the technical work specified herein associated with each system to be commissioned:

- a. Mechanical Technical Commissioning Specialist: The technical work associated with mechanical systems including Heating, Ventilating, Air Conditioning, and Refrigeration Systems; Building Automation System; Utility Monitoring and Control System; Service Water Heating Systems; Plumbing Systems; Water Pumping and Mixing Systems; Irrigation Systems; ; Energy and Water Utility Metering Systems must be performed by a Commissioning Specialist certified by NEBB, ACG, ICB/TABB, or BCA in the commissioning of HVAC systems with five years of experience in the commissioning of HVAC systems.
- b. Electrical Technical Commissioning Specialist: The technical work associated with electrical systems including Lighting Systems; Power Distribution Systems; Power Generation Systems; Renewable Energy Systems; Electrical Utility Metering Systems must be performed by an engineering technician certified by the InterNational Electrical Testing Association (NETA) with five years of experience inspecting, testing, and calibrating electrical distribution and generation equipment, systems, and devices.
- c. Building Envelope Technical Commissioning SpecialistThe technical work associated with the Building Envelope system must be performed by a registered architect with five years of building envelope design or construction experienceor a professional with training and certification as an Air Barrier Installer from the Air Barrier Association of America (ABAA) or other 3rd party air barrier association. The Building Envelope Technical Commissioning Specialist must have experience coordinating and instructing personnel involved in installation, joining, and sealing of air barrier materials and components. The Commissioning Firm team member with the required experience related to the building envelope may act as the Air Barrier Inspector required by UFGS Section 07 27 10.00 10 BUILDING AIR BARRIER SYSTEM provided that all qualification requirements of that specification section are met. The Commissioning Firm team member with the required experience related to the building envelope may act as the thermographer required by UFGS Section 07 05 23 PRESSURE TESTING AN AIR BARRIER SYSTEM FOR AIR TIGHTNESS provided that all of the qualification requirements of that specification section are met.
- d. Submit the Technical Commissioning Specialist's certification of qualifications including the name of the specialist and firm; certifications; years of experience; and a listing of representative projects of similar size and complexity no later than 30 calendar days after Notice to Proceed. Submit one hard copy and an electronic copy.

#### 1.8.3 Commissioning Standard

Comply with the requirements of the commissioning standard under which the Commissioning Firm and Specialists qualifications are approved. When the firm and specialists are certified by BCA, AEE, ASHRAE, or the University

of Wisconsin-Madison, comply with the requirements of one of the acceptable standards unless otherwise stated herein. The acceptable standards are ACG Commissioning Guideline, NEBB Commissioning Standard, SMACNA 1429, or ASHRAE 202. Comply with applicable NETA testing standards for electrical systems.

- a. Implement all recommendations and suggested practices contained in the Commissioning Standard and electrical test standards.
- b. Use the Commissioning Standard for all aspects of Commissioning, including calibration of instruments.
- c. Where the instrument manufacturer calibration recommendations are more stringent than those listed in the Commissioning Standard, adhere to the manufacturer calibration recommendations.
- d. All quality assurance provisions of the Commissioning Standard such as performance guarantees are part of this contract.
- e. The Commissioning Specialists must develop commissioning procedures for any systems or system components not covered in the Commissioning Standard.
- f. Use any new requirements, recommendations, and procedures published or adopted prior to contract solicitation by the body responsible for the Commissioning Standard.

#### 1.9 SUSTAINABILITY THIRD PARTY CERTIFICATION (TPC)

The Commissioning Specialists must execute and document the commissioning activities required of the Commissioning Authority for the purposes of complying with the Third Party Certification (TPC) requirements for the project in accordance with Section 01 33 29 SUSTAINABILITY REPORTING. Provide all commissioning documentation required to meet the TPC requirements.

#### 1.10 ISSUES LOG

The Lead Commissioning Specialist must develop and maintain an Issues Log for tracking and resolution of all deficiencies discovered through submittal reviews, inspection, and testing. Include the date of final resolution of issues as confirmed by the Commissioning Specialist. Submit the Issues Log on a monthly basis at a minimum. At any point during construction, any commissioning team member finding deficiencies may communicate those deficiencies in writing to the Commissioning Specialist for inclusion into the Issues Log.

Track construction deficiencies identified in the Issues Log using QCS as specified in Specification Section 01 45 00.15 10 RESIDENT MANAGEMENT SYSTEM CONTRACTOR MODE(RMS CM).

#### 1.11 CERTIFICATE OF READINESS

Prior to scheduling Functional Performance Tests for each system, issue a Certificate of Readiness for the system certifying that the system is ready for Functional Performance Testing. The Certificate of Readiness must include, for each system to be commissioned, all equipment and system start-up reports; Performance Verification Test Reports; completed Building Envelope Inspection Checklists; completed Pre-Functional

Checklists; Testing, Adjusting, and Balancing (TAB) Report; HVAC Controls Start-Up Reports; and the Air Leakage Test Reports and Diagnostic Test Reports to the extent applicable to the system. The Contractor; the Lead Commissioning Specialist; the Contractor's Quality Control Representative; the Mechanical, Electrical, Controls, and TAB subcontractor representatives must sign and date the Certificate of Readiness. Submit the Certificate of Readiness for each system no later than 14 calendar days prior to Functional Performance Tests of that system. Submit one hard copy and an electronic copy. Do not schedule Functional Performance Tests for a system until the Certificate of Readiness for that system receives approval by the Government.

## PART 2 PRODUCTS

Not used

## PART 3 EXECUTION

### 3.1 DESIGN PHASE

#### 3.1.1 Design Commissioning Coordination Meeting

The Lead Commissioning Specialist (CxC) must lead a meeting prior to the interim design submittal for any system required to be commissioned to discuss the commissioning process including project contract requirements, lines of communication, roles and responsibilities, schedules, and documentation requirements. The Contractor's Superintendent or Project Manager, the Contractor's Quality Control Representative, the Designers of Record for the commissioned systems, and the Government must attend this meeting. The User and a Base Civil Engineer Office Representative, may attend this meeting.

#### 3.1.2 Design Phase Commissioning Plan

The Lead Commissioning Specialist (CxC) must prepare the Design Phase Commissioning Plan. Submit the Design Phase Commissioning Plan no later than 14 calendar days after approval of the Commissioning Specialists. Submit one hard copy and an electronic copy.

Outline the commissioning process, commissioning team members and responsibilities, lines of communication, and documentation requirements for the design phase of the project in the Design Phase Commissioning Plan. Identify the Commissioning Standard chosen for the project.

#### 3.1.3 Design Review

The Lead Commissioning Specialist and Technical Commissioning Specialists must review the design-build construction contract, Design Plans and Specifications, the Basis of Design, and the Owner's Project Requirements Document prior to 60 percent completion of the design. The Owner's Project Requirements Document is attached as Appendix A. The Owner's Project Requirements Document is not contract requirements and is provided for commissioning review purposes only. The Commissioning Specialists must assess the completeness and clarity of the Owner's Project Requirements, verify that the requirements stated in the design-build construction contract and the Owner's Project Requirements are addressed in the Basis of Design, and verify that the Design Plans and

Specifications are prepared in accordance with the Basis of Design, the design-build construction contract, the Unified Facilities Criteria (UFC) referenced by the design-build construction contract, and the Owner's Project Requirements. The Commissioning Specialists must also identify any deficiencies that would prevent the building systems from operating or performing effectively. The Commissioning Specialists must backcheck the reviewed documents at all subsequent design documentation submissions.

The Commissioning Specialists must provide a Design Review Report for each submittal identifying any discrepancies between the reviewed documents or deficiencies that would prevent the building systems and features from operating or performing effectively in accordance with the design-build construction contract and Owner's Project Requirements Document and from being adequately maintainable. Individually list each deficiency and the corresponding proposed corrective action necessary for proper system performance in the Design Review Report. Submit one hard copy and an electronic copy of the report with the corrected final design submission. The Contracting Officer's Representative, the Lead Commissioning Specialist, and the Designers of Record for the associated systems must meet, discuss, and resolve any outstanding items contained in the report no later than 14 calendar days after submission of the report.

### 3.2 CONSTRUCTION PHASE

#### 3.2.1 Construction Commissioning Coordination Meeting

The Lead Commissioning Specialist must lead a Construction Commissioning Coordination Meeting no later than 30 days following construction notice to proceed to discuss the commissioning process including contract requirements, lines of communication, roles and responsibilities, schedules, documentation requirements, inspection and test procedures, and logistics as specified in this specification section. The Contractor's Superintendent or Project Manager, the Contractor's Quality Control Representative, and the Government must attend this meeting. Invite the User and a Base Civil Engineer Office Representative, to attend this meeting.

#### 3.2.2 Construction Phase Commissioning Plan

##### 3.2.2.1 Interim Construction Phase Commissioning Plan

The Lead Commissioning Specialist (Cx/C) must prepare the Interim Construction Phase Commissioning Plan. Submit the Interim Construction Phase Commissioning Plan no later than 30 calendar days after the Construction Commissioning Coordination Meeting and no later than 14 days prior to the start of construction of the building envelope. Submit one hard copy and an electronic copy.

Identify the commissioning and testing standards and outline the overall commissioning process, the commissioning schedule, the commissioning team members and responsibilities, lines of communication, documentation requirements for the construction phase of the project, and Template Building Envelope Inspection Checklists in the Interim Construction Phase Commissioning Plan.

#### 3.2.2.1.1 Checklists

Download example Building Envelope Inspection Checklists, Pre-Functional Checklists, Integrated Systems Test Checklists, and Functional Performance Test Checklists for specification section 01 91 00.15 10 TOTAL BUILDING COMMISSIONING at the following location:

<http://www.wbdg.org/ffc/dod/unified-facilities-guide-specifications-ufgs/forms-graphic>

The checklists submitted in the Interim and Final Construction Phase Commissioning Plans must contain the same level of detail shown in the examples. The submitted checklists are not required to match the format of the examples.

#### 3.2.2.1.2 Template Building Envelope Inspection Checklists

The Building Envelope Technical Commissioning Specialist must develop the Template Building Envelope Inspection Checklists. Include all items that verify the building materials and construction maintain the required thermal and moisture integrity and air tightness of the building envelope system in the Building Envelope Inspection Checklists.

#### 3.2.2.2 Final Construction Phase Commissioning Plan

The Lead Commissioning Specialist (Cx) must prepare the Final Construction Phase Commissioning Plan. Submit the Final Construction Phase Commissioning Plan no later than 30 calendar days prior to the start of Pre-Functional Checks. Submit one hard copy and an electronic copy. Once approved, file the approved plan in the Sustainability eNotebook.

Include the information provided in the Interim Construction Phase Commissioning Plan. In addition, the Technical Commissioning Specialist must develop the Pre-Functional Checklists, Integrated Systems Test Checklists, and Functional Performance Test Checklists for each building, for each system required to be commissioned, and for each component for inclusion in the Final Construction Phase Commissioning Plan.

##### 3.2.2.2.1 Pre-Functional Checklists

The Pre-Functional Checklists must include items for physical inspection or testing that demonstrate that installation and start-up of equipment and systems is complete. Refer to paragraph Pre-Functional Checks for more information.

##### 3.2.2.2.2 Functional Performance Test Checklists

Functional Performance Test Checklists must include procedures that explain, step-by-step, the actions and expected results that will demonstrate that the system performs in accordance with the contract. Refer to paragraph Functional Performance and Integrated Systems Tests for more information. Include the following sections and details appropriate to the systems being tested in the Functional Performance Test Checklists:

- a. Notable system features including information about controls to facilitate understanding of system operation
- b. Conclusions and recommendations. Conclusions must clearly indicate if system does or does not perform in accordance with contract requirements. Recommendation must clearly indicate that the system should or should not be accepted by the Government.



- c. Test conditions including date, beginning and ending time, and beginning and ending outdoor air conditions
- d. Attendees
- e. Identification of the equipment involved in the test
- f. Control system feature identification
- g. Point-to-point observations including demonstrating system flow meters and sensors have been calibrated and are correctly displayed on the Operator work station
- h. Actuator operation observations demonstrating actuator responses to commands from the control system
- i. As-found condition of the system operation
- j. List of test items with step numbers along with the corresponding feature or control operation, intended test procedure, expected system response, and pass/fail indication.
- k. Space for comments for each test item.

#### 3.2.2.2.3 Integrated Systems Test Checklists

Integrated Systems Test Checklists must include test procedures that explain, step-by-step, the actions and expected results that will demonstrate that the interactive operations between systems performs in accordance with the contract. Refer to paragraph Functional Performance and Integrated Systems Tests for more information. Include the following sections in the Integrated Systems Test Checklists:

- a. Notable features of the interconnected systems organized by discipline including information to facilitate understanding of system operation
- b. Conclusions and recommendations. Conclusions must clearly indicate if the systems do or do not perform in accordance with contract requirements. Recommendation must clearly indicate that the systems should or should not be accepted by the Government
- c. Test conditions including date and beginning and ending time
- d. Attendees
- e. Identification of the equipment and systems involved in the test
- f. List of test items with step numbers along with the corresponding feature or control operation, intended test procedure, expected system response, and pass/fail indication.
- g. Space for comments for each test item.

#### 3.2.3 Construction Submittals

Provide all submittals associated with the systems to be commissioned, including shop drawings; equipment submittals; test plans, procedures, and reports; and resubmittal's to the Commissioning Specialists. The Technical Commissioning Specialist must review the submittals to the

extent necessary verify that the equipment and system installation will comply with the contract requirements, the Unified Facilities Criteria (UFC) referenced by the design-build contract, and the requirements of the Basis of Design and the Owner's Project Requirements Document.

#### 3.2.4 Inspection and Testing

Demonstrate that all system components have been installed, that each control device and item of equipment operates, and that the systems operate and perform, including interactive operation between systems, in accordance with contract documents and the Owner's Project Requirements. Requirements in related specification sections are independent from the requirements of this section and do not satisfy any of the requirements specified in this specification section. Provide all materials, services, and labor required to perform the Pre-Functional Checks, Building Envelope Inspection, Integrated Systems Tests, and Functional Performance Tests.

##### 3.2.4.1 Commissioning Team

Provide a commissioning representative for each sub-contractor associated with the systems to be commissioned. Each commissioning representative is responsible for coordination of their respective sub-contractor's execution of the commissioning activities and participation in the inspection and testing required by this specification section. The Cybersecurity Subject Matter Expert (SME) shall be a member of the Commissioning Team and each commissioning representative shall provide support for and coordinate with the SME to ensure implementation of cybersecurity controls on the respective systems to the maximum extent while ensuring that the systems are fully functional as designer and manufacturer intended. The designers listed below are the designers of record for their respective systems. Substitutes must be approved by the Contracting Officer's Representative.

##### 3.2.4.1.1 Building Envelope Inspections Team

The following team members must participate in building envelope inspections:

Designation	Function
CxB	Building Envelope Technical Commissioning Specialist
QAR	Contracting Officer's Quality Assurance Representative
CQC	Contractor's Quality Control Personnel
BEC	Contractor's Building Envelope Commissioning Representative
AD	

##### 3.2.4.1.2 Mechanical System Pre-Functional Checks Team

The following team members must participate in Pre-Functional checks of mechanical systems:

Designation	Function
CxM	Mechanical System Technical Commissioning Specialist
QAR	Contracting Officer's Quality Assurance Representative
CQC	Contractor's Quality Control Personnel
MC	Contractor's Mechanical Commissioning Representative
EC	Contractor's Electrical Commissioning Representative
CC	Contractor's Controls Commissioning Representative
TABC	Contractor's TAB Commissioning Representative
PC	Contractor's Plumbing Commissioning Representative
IC	Contractor's Irrigation Commissioning Representative
SME	Cybersecurity Subject Matter Expert

#### 3.2.4.1.3 Electrical System Pre-Functional Checks Team

The following team members must participate in Pre-Functional checks of electrical systems:

Designation	Function
CxE	Electrical System Technical Commissioning Specialist
QAR	Contracting Officer's Quality Assurance Representative
CQC	Contractor's Quality Control Personnel
EC	Contractor's Electrical Commissioning Representative
SME	Cybersecurity Subject Matter Expert

#### 3.2.4.1.4 Mechanical Systems Test Team

The following team members must participate in Functional Performance and Integrated Systems Testing of mechanical systems:

Designation	Function
CxM	Mechanical System Technical Commissioning Specialist
QAR	Contracting Officer's Quality Assurance Representative

Designation	Function
CQC	Contractor's Quality Control Personnel
MC	Contractor's Mechanical Commissioning Representative
EC	Contractor's Electrical Commissioning Representative
CC	Contractor's Controls Commissioning Representative
TABC	Contractor's TAB Commissioning Representative
PC	Contractor's Plumbing Commissioning Representative
IC	Contractor's Irrigation Commissioning Representative
MD	Mechanical Designer
PD	Plumbing Designer
ID	Irrigation Designer
SME	Cybersecurity Subject Matter Expert

#### 3.2.4.1.5 Electrical Systems Test Team

The following team members must participate in Functional Performance and Integrated Systems Testing of electrical systems:

Designation	Function
CxE	Electrical System Technical Commissioning Specialist
QAR	Contracting Officer's Quality Assurance Representative
CQC	Contractor's Quality Control Personnel
EC	Contractor's Electrical Commissioning Representative
SME	Cybersecurity Subject Matter Expert

#### 3.2.4.1.6 Other Pre-Functional and Functional Performance Participants

The following may participate as team members during Pre-Functional Checks and Functional Performance Testing:

Designation	Function

Designation	Function
BCE	Base Civil Engineer Office Representative
User	Using Agent's Representative

#### 3.2.4.2 Building Envelope Inspection

Document building envelope inspection by the commissioning team using the approved Template Building Envelope Inspection Checklists. Indicate commissioning team member inspection and acceptance of each Building Envelope Inspection Checklist item by initials at the time they are inspected and found to be in conformance with contract requirements. Inspect checklist items before they become hidden as construction progresses.

- a. Submit the completed and initialed Building Envelope Inspection Checklists no later than 7 calendar days after completion of inspection of all checklists items. Submit one hard copy and an electronic copy.
- b. The Building Envelope Technical Commissioning Specialist must make at least two site visits to the site to observe construction of the building envelope in-progress. On each visit, the Building Envelope Commissioning Specialist must review the Contractor's in-progress checklists to ensure that the commissioning team is inspecting the building envelope as required.
- c. The Building Envelope Technical Commissioning Specialist must witness the building envelope pressure tests and diagnostic tests specified in UFGS Section 07 05 23 PRESSURE TESTING AN AIR BARRIER SYSTEM FOR AIR TIGHTNESS. The Building Envelope Technical Commissioning Specialist must review the resulting reports and provide recommendations for correction of any deficiencies or further testing.

#### 3.2.4.3 Pre-Functional Checks

Pre-Functional Checklists from the approved Final Construction Phase Commissioning Plan must be completed by the commissioning team. Complete one Pre-Functional Checklist for each individual item of equipment or system for each system required to be commissioned including, but not limited to, ductwork, piping, equipment, fixtures (lighting and plumbing), and controls. Indicate commissioning team member inspection and acceptance of each Pre-Functional Checklist item by initials. Acceptance of each Pre-Functional Checklist item by each team member indicates that item conforms to the construction contract and accepted design requirements in their area of responsibility. Technical Commissioning Specialist acceptance of each Pre-Functional Checklist item indicates that each item has been installed correctly and in accordance with contract documents and the Owner's Project Requirements. Submit the completed and initialed Pre-Functional Checklists no later than 7 calendar days after completion of inspection of all checklists items for each system. Submit one hard copy and an electronic copy. Include manufacturer start-up checklists associated with equipment with the submission of the Pre-Functional Checklists.

#### 3.2.4.4 Testing, Adjusting, and Balancing (TAB) Report and Field Acceptance Testing

The Mechanical System Technical Commissioning Specialist must review the pre-final TAB Report required by UFGS Section 23 05 93 TESTING, ADJUSTING, AND BALANCING FOR HVAC. Identify any deficiencies to the Contracting Officer's Representative and the Contractor's Quality Control Personnel. Resolve all deficiencies prior to TAB Field Acceptance Testing.

The Mechanical System Technical Commissioning Specialist must witness the TAB Field Acceptance Testing specified by UFGS Section 23 05 93 TESTING, ADJUSTING, AND BALANCING FOR HVAC. Include a certification by the Mechanical Technical Specialist that no outstanding deficiencies exist in the systems relative to Testing, Adjusting, and Balancing with the final TAB Report submittal.

#### 3.2.4.5 HVAC Controls Test Reports

The Mechanical System Technical Commissioning Specialist must review the Start-Up Testing Report and the PVT Procedures and Reports required by UFGS Section 23 09 00 INSTRUMENTATION AND CONTROL FOR HVAC and UFGS Section 25 10 10 UTILITY MONITORING AND CONTROL SYSTEM (UMCS) Front End and Integration. Include a certification by the Mechanical System Technical Commissioning Specialist that the submittals contain no deficiencies or that the submittals do not indicate any deficiencies in the HVAC systems or HVAC control systems with each of these submittals.

#### 3.2.4.6 Tests

##### 3.2.4.6.1 Functional Performance and Integrated Systems Tests

Schedule Functional Performance Tests for each system only after the Certificate of Readiness has been approved by the Government for the system. Correct all deficiencies identified through any prior review, inspection, or test activity before the start of Functional Performance Tests. Perform Integrated Systems Tests only after the Functional Performance Tests for each associated system are completed with all deficiencies resolved and after the related Functional Performance Test Checklists have been signed by each commissioning team member.

- a. Functional Performance Tests and Integrated Systems Tests must be performed with the Contracting Officer's Quality Assurance Representative present.
- b. Abort Functional Performance Tests or Integrated Systems Tests when any system deficiency prevents the successful completion of the test.
- c. Technical Commissioning Specialists must lead and document all Functional Performance Tests and Integrated Systems Tests for the systems to be commissioned with the Contractor and appropriate sub-contractors performing the Functional Performance Tests and Integrated Systems Tests. The representatives listed in the paragraph Commissioning Team must attend the tests. Abort Functional Performance Tests or Integrated Systems Tests when any required commissioning team member is not present for the test.

#### 3.2.4.6.1.1 Checklist

Use the Functional Performance Test and Integrated Systems Test Checklists from the approved Final Construction Phase Commissioning Plan to guide the Functional Performance Tests and Integrated Systems Tests. Functional Performance Tests must be performed for each item of equipment and each system required to be commissioned and verify all sensor calibrations, control responses, safeties, interlocks, operating modes, sequences of operation, capacities, lighting levels, and all other performance requirements comply with construction contract and accepted design requirements regardless of the specific items listed within the Functional Performance Test and Integrated Systems Test Checklists provided. Testing must progress from equipment or components to subsystems to systems to interlocks and connections between systems. Integrated Systems Tests must be performed for the interactive operation between systems such as HVAC systems, fire protection systems, back-up electrical supply, energy generation systems, and other systems, and verify correct interactive operation, acceptable speed of response, and other contract requirements for both normal and failure modes. Examples of Integrated Systems Tests include the correct operation of HVAC systems during emergency system activation, correct operation of uninterruptible power supplies or energy generators and connected systems, or lighting system operation during power outage or emergency system activation. The order of components and systems to be tested must be determined by the Technical Commissioning Specialists.

#### 3.2.4.6.1.2 Acceptance

Indicate acceptance of each item of equipment and systems tested by signature of each commissioning team member for each Functional Performance Test or Integrated Systems Test Checklist. The Contractor's Quality Control Representative and the Technical Commissioning Specialists must indicate acceptance after the equipment and systems are free of deficiencies.

#### 3.2.4.6.2 HVAC Test Methods

Perform Functional Performance Tests in accordance with the following:

##### 3.2.4.6.2.1 Prior to Testing

Prior to testing operating modes, sequences of operation, interlocks, and safeties, complete control point-to-point observations, test sensor calibrations, and test actuator commands.

##### 3.2.4.6.2.2 Simulating Conditions

Over-writing control input values through the controls system is not acceptable, unless approved by the Contracting Officer's Representative. Identify proposed exceptions in a protocol submitted to the Contracting Officer's Representative for approval. Before simulating conditions, overwriting values (if approved), or changing set-points, calibrate all sensors, transducers and devices. Below are several examples of exceptions that would be considered acceptable:

- a. When varying static pressures inside ductwork can not be simulated within the duct, and where a sensor signals the controls system to initiate sequences at various duct static pressures, it is acceptable to simulate the various pressures with a Pneumatic Squeeze-Bulb Type

Signaling Device with gauge temporarily attached to the sensing tube leading to the transmitter. It is not acceptable to reset the various set-points, nor to simulate an electric analog signal (unless approved as noted above).

- b. Dirty filter pressure drops can be simulated using sheets of cardboard at filter face.
- c. Freeze-stat safeties can be simulated by packing portion of sensor with ice.
- d. High outside air temperatures can be simulated with a hair blower.
- e. High entering cooling coil temperatures can be used to simulate entering cooling coil conditions.
- f. Do not use signal generators to simulate sensor signals unless approved by the Contracting Officer's Representative, as noted above, for special cases.
- g. Control set points can be altered. For example, to see the air conditioning compressor lockout work at an outside air temperature below 55 degrees F, when the outside air temperature is above 55 degrees F, temporarily change the lockout set point to be 0 degrees F above the current outside air temperature. Caution: Set points are not to be raised or lowered to a point such that damage to the components, systems, or the building structure and/or contents will occur.
- h. Test duct mounted smoke detectors in accordance with the manufacturer's recommendations. Perform the tests with air system at minimum airflow condition in ductwork.
- i. Test current sensing relays used for fan and pump status signals to control system to indicate unit failure and run status by resetting the set point on the relay to simulate a lost belt or unit failure while the unit is running. Confirm that the failure alarm was generated and received at the control system. After the test is conducted, return the set point to its original set-point or a set-point as indicated by the Contracting Officer's Representative.

#### 3.2.4.6.2.3 Setup

Perform each test under conditions that simulate actual conditions as close as is practically possible. Provide all necessary materials and system modifications to produce the necessary flows, pressures, temperatures, and other conditions necessary to execute the test according to the specified conditions. At completion of the test, return the affected building equipment and systems to their pre-test condition.

#### 3.2.4.6.3 Sample Strategy

Perform Functional Performance Tests and Integrated Systems Tests for all equipment and systems. Prepare and complete a Functional Performance Test Checklist for each item of equipment or system. Prepare and complete an Integrated Systems Test Checklist for each item of equipment or system.



#### 3.2.4.6.4 Seasonal Tests

##### 3.2.4.6.4.1 Initial Functional Performance Tests

Perform Initial Functional Performance Tests as soon as all contract work is completed, regardless of the season. Develop and implement means of artificial loading to demonstrate, to a reasonable level of confidence, the ability of the HVAC systems to handle peak seasonal loads.

##### 3.2.4.6.4.2 Full-Load Conditions

In addition to the Initial Functional Performance Tests, perform Functional Performance Tests of HVAC systems under full-load conditions during peak heating and cooling seasons during outdoor air condition design extremes. Test cooling equipment and systems with the building fully occupied when performing the Functional Performance Tests during peak cooling season.

Schedule Seasonal Functional Performance Tests in coordination with the Government.

##### 3.2.4.6.4.3 System Acceptance

Systems may be partially accepted by the Government prior to seasonal testing if they comply with all construction contract and accepted design requirements that can be tested during initial Functional Performance Tests. All Functional Performance Test procedures must be completed prior to full systems acceptance.

##### 3.2.4.6.5 Aborted Tests and Re-Testing

Abort Functional Performance Tests, Integrated Systems Tests, or Seasonal Tests if any deficiency prevents successful completion of the test or if any required commissioning team member is not present for the test. Reimburse the Government for all costs associated with effort lost due to re-testing due to test failures and aborted tests. These costs must include salary, travel costs, and per diem for Government commissioning team members. Re-test only after all deficiencies identified during the original tests have been corrected.

##### 3.2.4.6.5.1 100 Percent Sample

Systems or equipment for which 100 percent sample size are tested fail if one or more of the test procedures results in discovery of a deficiency and the deficiency cannot be resolved within 5 minutes during the test.

Re-test to the extent necessary to confirm that the deficiencies have been corrected without negatively impacting the performance of the rest of the system.

#### 3.2.5 Training Plan

Develop a training plan which identifies all training required by specification sections associated with commissioned systems. Include a matrix listing each training requirement, content of the training, the trainer name, trainer contact information, and schedule and location of training. Submit one hard copy and an electronic copy of the Training Plan to the Commissioning Specialists and the Government no later than 30 calendar days prior to the associated training.

Document training attendance using training attendance rosters and provide completed attendance rosters to the Commissioning Specialists and the Government no later than 7 calendar days following the completion of training for each system to be commissioned. Submit one hard copy and an electronic copy..

### 3.2.6 Systems Manual

Prepare and submit a Systems Manual including a signed certification or letter from the Technical Commissioning Specialists and the Lead Commissioning Specialist stating that the Systems Manual is complete, clear, and accurate. The Systems Manual, for all commissioned systems, must conform to Appendix A SYSTEMS MANUAL ORGANIZATION AND CONTENT to ER 25-345-1, available at the USACE Publications website at the following location:  
<https://www.publications.usace.army.mil/USACE-Publications/Engineer-Regulations/>. Update and resubmit the Systems Manual based on any corrective action taken during the warranty period.

Submit Systems Manual no later than 30 calendar days following completion of Functional Performance Tests and Integrated Systems Tests. Submit three hard copies and an electronic copy.

### 3.3 COMMISSIONING REPORT

Following the completion of Functional Performance Tests and Integrated Systems Tests, with the exception of Seasonal Tests, the Lead Commissioning Specialist must prepare a Commissioning Report.

- a. Include an executive summary describing the overall commissioning process, the results of the commissioning process, any outstanding deficiencies and recommended resolutions, and any seasonal testing that must be scheduled for a later date. Indicate, in the executive summary, whether the systems meet the requirements of the construction contract and accepted design and the Owner's Project Requirements.
- b. Detail any deficiencies discovered during the commissioning process and the corrective actions taken in the report. Include the completed Building Envelope Inspection Checklists, Pre-Functional Checklists, Functional Performance Test Checklists, Integrated Systems Test Checklists, the Commissioning Plans, the Issues Log, Performance Verification Test Reports, Training Attendance Rosters, the Design Review Report, the final TAB Report.
- c. Submit the Commissioning Report no later than 14 calendar days following commissioning team acceptance of all Functional Performance Tests and Integrated Systems Tests with the exception of Seasonal Tests. Submit three hard copies and an electronic copy.
- d. Following any Seasonal Tests or Post-Construction Activities, update the Final Commissioning Report to reflect any changes and resubmit. File the approved, updated, Final Commissioning Report in the Sustainability eNotebook.

**APPENDIX A - OWNER'S PROJECT REQUIREMENTS DOCUMENT**

**OWNER'S PROJECT REQUIREMENTS DOCUMENT**

Project: Project, Location, PN #####

Approved:

Name	Design Agent's Representative	Date
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Name	Owner's Representative	Date
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**OWNER'S PROJECT REQUIREMENTS DOCUMENT**

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## 1. Owner and User Requirements

### a. Primary Purpose, Program, and Use

Explain the purpose, program, and use of the facility. (i.e. Army Reserve Center used for training reserve units. Training includes spaces such as weapons, medical, vehicle repair, cooking, etc.)

### b. Project History

Explain the history of the project related to design/construction (i.e. D/B/B, D/B, IDIQ, JOC, COE in-house, A/E, etc.). Explain any additional project background that would impact energy/sustainability goals.

### c. Broad Goals

i. Future Expansion: Explain goals related to potential future expansion.

ii. Flexibility: Explain goals related to flexibility for layout and use of the building. (i.e. high rate of office churn, expected frequency of renovation, etc.)

iii. Quality of Materials: Explain goals related to quality of materials. (i.e. highest quality materials, 50 yr life, 25 yr life, highest quality within budget, etc.)

iv. Construction Costs: Explain goals related to construction costs. (i.e. how low can you go, set project amount, select simplest systems for low cost, etc.)

v. Operational Costs: Explain goals related to operational costs. (i.e. low utilities based on water and energy conservation, trade-off allowable on maintenance costs to reduce utility cost, utility cost unimportant compared to construction cost, etc.)

## 2. Environmental and Sustainability Goals

### a. LEED/Green Globes Goal

Set LEED/Green Globes goal and explain sustainable features permissible or preferred to be incorporated. Explain relative importance of LEED/Green Globes goal within project scope. Indicate requirement from service or agency specific criteria and policy.

### b. Other

Explain any special sustainability or environmental goals associated with the project. Identify specific sustainability features that may be required or desired. (i.e. hydro-power, solar power, on-site water treatment, on-site water infiltration, impervious cover reduction, parking capacity, etc.)



### 3. Energy Efficiency Goals

#### a. Goals/Policy

Explain the specific project goals and requirements regarding energy efficiency. Incorporate the requirements of UFC 1-200-02 High Performance and Sustainable Building Requirements and/or other relevant agency policies.

#### b. Systems and Feature Energy Impacts

Identify and explain envelope, system, or site and building features that will be incorporated to maximize energy efficiency. Identify features that must be incorporated that will reduce or limit energy efficiency.

#### 4. Indoor Environmental Quality Requirements

##### a. Space Type 1

i. Intended Use: Explain how the space will be used (i.e. classroom occasionally used as conference room).

ii. Occupancy Schedule: Describe the occupancy including number of people at various times (i.e. drill weekend-maximum capacity, weekdays-20 percent; or 0700-0900 - none, 0900-1400 - 30 people, 1400-1600 - none).

iii. Environmental Requirements: Describe the environmental requirements of the space. Include description of temperatures, humidity levels, ventilation rates, air quality, lighting levels, or any other specific parameters desired (i.e. 75 deg F, 50 percent rh, 30 fc, etc.).

iv. Occupant System Control Ability: Describe the desired level of control the occupants will have over the thermal comfort and lighting systems. (i.e. adjustable thermostat for every person, adjustable thermostat in all private offices, no adjustable thermostats, adjustable thermostat in senior rank also controlling other offices, occupancy sensors for lighting, adjustable dimming, etc.)

v. Type of Lighting: Describe the type of lighting desired (i.e. task lighting with minimal overhead, maximize daylight with dimming on overhead, accent lighting, particular fixtures, etc.).

vi. After-hour Use Accommodations: Describe whether and how often the space may be used after hours. Describe the systems that activate when an occupant uses the building after-hours. Describe the level of control of after-hour use HVAC.

(Example: Space is rarely used after-hours by few occupants. HVAC and lighting system should activate when occupants enter after-hours. The HVAC operation will be limited to that required to provide heating, A/C, and ventilation to the occupied space alone.) (Example: Space is rarely used after-hours by few occupants. Lighting and heating systems should activate. Ventilation and cooling should remain in normal after-hour operation.)

##### b. Space Type 2

## 5. Equipment and System Expectations

### a. HVAC Systems

i. Quality and Reliability: Explain the level of quality and reliability required of the HVAC systems.

(Example: Equipment efficiency should meet ASHRAE 90.1-2013 and FEMP/Energy Star requirements. Due to critical nature of facility, additional redundancy in the cooling and heating systems is required, i.e. multiple chillers, boilers, and pumps.) (Example: No specific quality or reliability requirements specified. Equipment should remain serviceable over life of building or to the extent typical of the type of equipment.)

ii. Type: Explain the type of equipment desired.

(Example: Boilers should be condensing type. Use hydronic heating and cooling. Use self-contained A/C units in computer rooms.)

iii. Automation: Explain the level of automation in the HVAC System desired.

(Example: Single loop HVAC systems permissible. Use packaged controls only.) (Example: Control HVAC systems from DDC system connected to the base UMCS.) (Example: Boilers should have packaged controls connected to the DDC system.)

iv. Flexibility: Describe the desired level of flexibility of the HVAC system.

(Example: System should accommodate frequent office layout changes including private office wall movement.) (Example: Layout will remain mostly unchanged; no flexibility required.) (Example: Accommodate potential for conference and classrooms to change to offices.)

v. Maintenance Requirements: Describe the level of maintenance available or the requirements of the equipment regarding maintainability.

(Example: Equipment should be located to allow easy maintenance access. Equipment vendors or repair service should be able to respond within 24 hrs.)

### b. Lighting Systems

i. Quality and Reliability: Explain the level of quality and reliability required of the lighting system controls.

(Example: The building lighting system should meet ASHRAE 90.1 - IP requirements.)

ii. Type: Explain the type of lighting or control equipment desired.

(Example: High-efficiency fluorescent lamps with high-efficiency ballasts will be specified. Indirect lighting will be used in all office and classroom spaces. Lighting foot-candle levels may be reduced to 45 foot-candles in lieu of the typical 50 foot-candles when indirect lighting is used.)

iii. Automation: Explain the level of automation in the lighting control

system desired.

(Example: Provide occupancy sensors in restrooms, corridors, and storage areas.)

iv. Flexibility: Describe the desired level of flexibility of the lighting system and control systems.

(Example: Provide dual level switching in classrooms and conference rooms.)

v. Maintenance Requirements: Describe the level of maintenance available or the requirements of the equipment regarding maintainability.

(Example: )

#### c. Domestic Hot Water Systems

i. Quality and Reliability: Explain the level of quality and reliability required of the domestic hot water systems.

(Example: Equipment efficiency should meet ASHRAE and FEMP/Energy Star requirements. Due to critical nature of facility, additional redundancy in the water heating systems is required, i.e. multiple hot water heaters and circulation pumps.) (Example: No specific quality or reliability requirements specified. Equipment should remain serviceable over life of building or to the extent typical of the type of equipment.)

ii. Type: Explain the type of equipment desired.

(Example: Gas-fired storage tank water heater with mixing valve for temperature control.) (Example: Instantaneous electric water heater at lavatories.) (Example: Instantaneous electric water heater with integral control system for eyewash/showers.)

iii. Automation: Explain the level of automation in the domestic hot water control system desired.

(Example: Occupancy schedule control for recirculation loop and gas burner. Connect package controls to DDC system.)

iv. Flexibility: Describe the desired level of flexibility of the domestic hot water systems.

(Example: No anticipated changes to restroom layout; no additional flexibility required.)

v. Maintenance Requirements: Describe the level of maintenance available or the requirements of the equipment regarding maintainability.

(Example: Equipment should be located to allow easy maintenance access. Equipment vendors or repair service should be able to respond within 24 hrs.)

#### d. On-site Power Systems

i. Quality and Reliability: Explain the level of quality and reliability required of the on-site power system.

ii. Type: Explain the type of on-site power system desired.

iii. Automation: Explain the level of automation in the on-site power system desired.

iv. Flexibility: Describe the desired level of flexibility of the on-site power system.

v. Maintenance Requirements: Describe the level of maintenance available or the requirements of the on-site power system regarding maintainability.

e. Other Systems

i. Quality and Reliability: Explain the level of quality and reliability required of the system.

ii. Type: Explain the type of system desired.

iii. Automation: Explain the level of automation in the system desired.

iv. Flexibility: Describe the desired level of flexibility of the system.

v. Maintenance Requirements: Describe the level of maintenance available or the requirements of the system regarding maintainability.

## 6. Building Occupant and O&M Personnel Requirements

### a. Facility Operation

Describe how the facility will be operated. Who operates the facility? Who maintains the facility? Who pays the utility bills?

### b. UMCS (EMCS or FMCS)

Will the building be tied to an UMCS/EMCS/FMCS? What system will be connected to? Provide information regarding connection requirements, protocols, and control, scheduling and monitoring points.

### c. Occupant Training and Orientation

How much training and orientation is desired for building occupants? Will training need to be provided for all systems? To what extent do the occupants need to understand and use the systems?

### d. O&M Staff Training and Orientation

How much training and orientation is desired for building occupants? Will training need to be provided for all systems? To what extent do the occupants need to understand and use the systems?

-- End of Section --

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## SECTION 02 41 00

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05/10

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ATTACHMENTS:

For Information Only - As-Built Drawings

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## SECTION 02 41 00

DEMOLITION  
05/10

## PART 1 GENERAL

## Attachments:

For Information Only - As-Built Drawings

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

## AIR-CONDITIONING, HEATING AND REFRIGERATION INSTITUTE (AHRI)

AHRI Guideline K (2009) Guideline for Containers for Recovered Non-Flammable Fluorocarbon Refrigerants

## AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO M 145 (1991; R 2012) Standard Specification for Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes

AASHTO T 180 (2017) Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop

## AMERICAN SOCIETY OF SAFETY PROFESSIONALS (ASSP)

ASSP A10.6 (2006) Safety & Health Program Requirements for Demolition Operations - American National Standard for Construction and Demolition Operations

## CARPET AND RUG INSTITUTE (CRI)

CRI 104 (2015) Carpet Installation Standard for Commercial Carpet

CRI 105 (2015) Carpet Installation Standard for Residential Carpet

## U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1 (2014) Safety and Health Requirements Manual

## U.S. DEFENSE LOGISTICS AGENCY (DLA)

DLA 4145.25 (Jun 2000; Reaffirmed Oct 2010) Storage and Handling of Liquefied and Gaseous Compressed Gases and Their Full and Empty Cylinders  
<http://www.aviation.dla.mil/UserWeb/aviationengineerir>

## U.S. DEPARTMENT OF DEFENSE (DOD)

DOD 4000.25-1-M (2006) MILSTRIP - Military Standard Requisitioning and Issue Procedures

MIL-STD-129 (2014; Rev R) Military Marking for Shipment and Storage

## U.S. FEDERAL AVIATION ADMINISTRATION (FAA)

FAA AC 70/7460-1 (2015; Rev L) Obstruction Marking and Lighting

## U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

40 CFR 61 National Emission Standards for Hazardous Air Pollutants

40 CFR 82 Protection of Stratospheric Ozone

49 CFR 173.301 Shipment of Compressed Gases in Cylinders and Spherical Pressure Vessels

## 1.2 PROJECT DESCRIPTION

## 1.2.1 Definitions

## 1.2.1.1 Demolition

Demolition is the process of wrecking or taking out any load-supporting structural member of a facility together with any related handling and disposal operations.

## 1.2.1.2 Deconstruction

Deconstruction is the process of taking apart a facility with the primary goal of preserving the value of all useful building materials.

## 1.2.1.3 Demolition Plan

Demolition Plan is the planned steps and processes for managing demolition activities and identifying the required sequencing activities and disposal mechanisms.

## 1.2.1.4 Deconstruction Plan

Deconstruction Plan is the planned steps and processes for dismantling all or portions of a structure or assembly, to include managing sequencing activities, storage, re-installation activities, salvage and disposal mechanisms.

### 1.2.2 Demolition Plan

Prepare a Demolition Plan and submit proposed salvage, demolition, and removal procedures for approval before work is started. Include in the plan procedures for careful removal and disposition of materials specified to be salvaged, coordination with other work in progress, a disconnection schedule of utility services, a detailed description of methods and equipment to be used for each operation and of the sequence of operations. Coordinate with Waste Management Plan in accordance with Section 01 74 19 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL. Include statements affirming Contractor inspection of the existing roof deck and its suitability to perform as a safe working platform or if inspection reveals a safety hazard to workers, state provisions for securing the safety of the workers throughout the performance of the work. Provide procedures for safe conduct of the work in accordance with EM 385-1-1. Plan shall be approved by Contracting Officer prior to work beginning.

### 1.2.3 General Requirements

Do not begin demolition or deconstruction until authorization is received from the Contracting Officer. Remove rubbish and debris from the project site; do not allow accumulations inside or outside the buildings. The work includes demolition,, salvage of identified items and materials, and removal of resulting rubbish and debris. Remove rubbish and debris from Government property daily, unless otherwise directed. Store materials that cannot be removed daily in areas specified by the Contracting Officer.

In the interest of occupational safety and health, perform the work in accordance with EM 385-1-1, Section 23, Demolition, and other applicable Sections.

### 1.3 ITEMS TO REMAIN IN PLACE

Take necessary precautions to avoid damage to existing items to remain in place, to be reused, or to remain the property of the Government. Repair or replace damaged items as approved by the Contracting Officer. Coordinate the work of this section with all other work indicated. Construct and maintain shoring, bracing, and supports as required. Ensure that structural elements are not overloaded. Increase structural supports or add new supports as may be required as a result of any cutting, removal, deconstruction, or demolition work performed under this contract. Provide new supports and reinforcement for existing construction weakened by demolition, deconstruction, or removal work. Repairs, reinforcement, or structural replacement require approval by the Contracting Officer prior to performing such work.

#### 1.3.1 Existing Construction Limits and Protection

Do not disturb existing construction beyond the extent indicated or necessary for installation of new construction. Provide temporary shoring and bracing for support of building components to prevent settlement or other movement. Provide protective measures to control accumulation and migration of dust and dirt in all work areas. Remove snow, dust, dirt, and debris from work areas daily.

#### 1.3.2 Weather Protection

For portions of the building to remain, protect building interior and materials and equipment from the weather at all times. Where removal of existing roofing is necessary to accomplish work, have materials and

workmen ready to provide adequate and temporary covering of exposed areas.

#### 1.3.3 Trees

Protect trees within the project site which might be damaged during demolition or deconstruction, and which are indicated to be left in place, by a 6 foot high fence. Erect and secure fence a minimum of 5 feet from the trunk of individual trees or follow the outer perimeter of branches or clumps of trees. Replace any tree designated to remain that is damaged during the work under this contract with like-kind or as approved by the Contracting Officer.

#### 1.3.4 Utility Service

Maintain existing utilities indicated to stay in service and protect against damage during demolition and deconstruction operations. Prior to start of work, utilities serving each area of alteration or removal will be shut off by the Government and disconnected and sealed by the Contractor.

#### 1.3.5 Facilities

Protect electrical and mechanical services and utilities. Where removal of existing utilities and pavement is specified or indicated, provide approved barricades, temporary covering of exposed areas, and temporary services or connections for electrical and mechanical utilities. Floors, roofs, walls, columns, pilasters, and other structural components that are designed and constructed to stand without lateral support or shoring, and are determined to be in stable condition, must remain standing without additional bracing, shoring, or lateral support until demolished or deconstructed, unless directed otherwise by the Contracting Officer. Ensure that no elements determined to be unstable are left unsupported and place and secure bracing, shoring, or lateral supports as may be required as a result of any cutting, removal, deconstruction, or demolition work performed under this contract.

#### 1.4 BURNING

The use of burning at the project site for the disposal of refuse and debris will not be permitted.

#### 1.5 FOR INFORMATION ONLY AS-BUILT DRAWINGS

For information only As-Built drawings consisting of .TIFF images, .pdf files, and .dwg cad files of the existing dormitories have been compiled into a .zip archive and are included with this RFP as an attachment.

#### 1.6 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

##### SD-01 Preconstruction Submittals

Demolition Plan; G, RO  
Existing Conditions

## SD-07 Certificates

Notification; G, RO

## SD-11 Closeout Submittals

Receipts

## 1.7 QUALITY ASSURANCE

Submit timely notification of demolition projects to Federal, State, regional, and local authorities in accordance with 40 CFR 61, Subpart M. Notifications shall be in accordance with paragraph 1.8.1 Licenses, Permits and Notifications of Section 02 82 14.00 10 ASBESTOS HAZARD CONTROL ACTIVITIES. Comply with federal, state, and local hauling and disposal regulations. In addition to the requirements of the "Contract Clauses," conform to the safety requirements contained in ASSP A10.6. Use of explosives will not be permitted.

## 1.7.1 Dust and Debris Control

Prevent the spread of dust and debris and avoid the creation of a nuisance or hazard in the surrounding area. Do not use water if it results in hazardous or objectionable conditions such as, but not limited to, ice, flooding, or pollution.

## 1.8 PROTECTION

## 1.8.1 Traffic Control Signs

a. Where pedestrian and driver safety is endangered in the area of removal work, use traffic barricades with flashing lights. Notify the Contracting Officer prior to beginning such work.

Provide a minimum of 2 FAA type L-810 steady burning red obstruction lights on temporary structures (including cranes) over 100 feet, but less than 200 ft, above ground level. The use of LED based obstruction lights are not permitted. For temporary structures (including cranes) over 200 ft above ground level provide obstruction lighting in accordance with FAA AC 70/7460-1. Light construction and installation shall comply with FAA AC 70/7460-1. Lights shall be operational during periods of reduced visibility, darkness, and as directed by the Contracting Officer. Maintain the temporary services during the period of construction and remove only after permanent services have been installed and tested and are in operation.

## 1.8.2 Protection of Personnel

Before, during and after the demolition work continuously evaluate the condition of the structure being demolished and take immediate action to protect all personnel working in and around the project site. No area, section, or component of floors, roofs, walls, columns, pilasters, or other structural element will be allowed to be left standing without sufficient bracing, shoring, or lateral support to prevent collapse or failure while workmen remove debris or perform other work in the immediate area.

### 1.9 RELOCATIONS

Perform the removal and reinstallation of relocated items as indicated with workmen skilled in the trades involved. Repair or replace items to be relocated which are damaged by the Contractor with new undamaged items as approved by the Contracting Officer. See the bridging documents for items to be relocated and reinstalled.

### 1.10 EXISTING CONDITIONS

Before beginning any demolition or deconstruction work, survey the site and examine the drawings and specifications to determine the extent of the work. Record existing conditions in the presence of the Contracting Officer showing the condition of structures and other facilities adjacent to areas of alteration or removal. Photographs sized 4 inch will be acceptable as a record of existing conditions. Include in the record the elevation of the top of foundation walls, finish floor elevations, possible conflicting electrical conduits, plumbing lines, alarms systems, the location and extent of existing cracks and other damage and description of surface conditions that exist prior to before starting work. It is the Contractor's responsibility to verify and document all required outages which will be required during the course of work, and to note these outages on the record document. Submit survey results.

## PART 2 PRODUCTS

### 2.1 FILL MATERIAL

- a. Comply with excavating, backfilling, and compacting procedures for soils used as backfill material to fill basements, voids, depressions or excavations resulting from demolition or deconstruction of structures.
- b. Fill material shall conform to the definition of satisfactory soil material as defined in AASHTO M 145, Soil Classification Groups A-1, A-2-4, A-2-5 and A-3. In addition, fill material shall be free from roots and other organic matter, trash, debris, frozen materials, and stones larger than 2 inches in any dimension.
- c. Proposed fill material must be sampled and tested by an approved soil testing laboratory, as follows:

Soil classification	AASHTO M 145
Moisture-density relations	AASHTO T 180, Method B or D

## PART 3 EXECUTION

### 3.1 EXISTING FACILITIES TO BE REMOVED

Inspect and evaluate existing structures onsite for reuse. Existing construction scheduled to be removed for reuse shall be disassembled. Dismantled and removed materials are to be separated, set aside, and prepared as specified, and stored or delivered to a collection point for reuse, remanufacture, recycling, or other disposal, as specified. Materials shall be designated for reuse onsite whenever possible.

### 3.1.1 Structures

- a. Remove existing structures indicated to be removed completely, including all below grade foundations and footings. Interior walls, retaining walls and partitions shall be removed completely. Remove sidewalks, curbs, gutters and street light bases as indicated.
- b. Demolish structures in a systematic manner from the top of the structure to the ground. Complete demolition work above each tier or floor before the supporting members on the lower level are disturbed. Demolish concrete and masonry walls in small sections. Remove structural framing members and lower to ground by means of derricks, platforms hoists, or other suitable methods as approved by the Contracting Officer.
- c. Locate demolition and deconstruction equipment throughout the structure and remove materials so as to not impose excessive loads to supporting walls, floors, or framing.

### 3.1.2 Utilities and Related Equipment

#### 3.1.2.1 General Requirements

Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by the Contracting Officer. Do not interrupt existing utilities serving facilities occupied and used by the Government except when approved in writing and then only after temporary utility services have been approved and provided. Do not begin demolition or deconstruction work until all utility disconnections have been made. Shut off and cap utilities for future use, as indicated.

#### 3.1.2.2 Disconnecting Existing Utilities

Remove existing utilities, as indicated and terminate in a manner conforming to the nationally recognized code covering the specific utility and approved by the Contracting Officer. When utility lines are encountered but are not indicated on the drawings, notify the Contracting Officer prior to further work in that area. Remove meters and related equipment and deliver to a location in accordance with instructions of the Contracting Officer.

### 3.1.3 Paving and Slabs

Remove concrete and asphaltic concrete paving and slabs including aggregate base as indicated on the drawings. Provide neat sawcuts at limits of pavement removal as indicated. Pavement and slabs designated to be recycled and utilized in this project shall be moved, ground and stored as directed by the Contracting Officer. Pavement and slabs not to be used in this project shall be removed from the Installation at Contractor's expense.

### 3.1.4 Locksets on Swinging Doors

Remove all locksets from all swinging doors indicated to be removed and disposed of. Deliver the locksets and related items to a designated location for receipt by the Contracting Officer after removal.

### 3.2 CONCURRENT EARTH-MOVING OPERATIONS

Do not begin excavation, filling, and other earth-moving operations that are sequential to demolition or deconstruction work in areas occupied by structures to be demolished or deconstructed until all demolition and deconstruction in the area has been completed and debris removed. Fill holes, open basements and other hazardous openings.

### 3.3 DISPOSITION OF MATERIAL

#### 3.3.1 Title to Materials

Except for salvaged items specified in related Sections, and for materials or equipment scheduled for salvage, all materials and equipment removed and not reused or salvaged, shall become the property of the Contractor and shall be removed from Government property. Title to materials resulting from demolition and deconstruction, and materials and equipment to be removed, is vested in the Contractor upon approval by the Contracting Officer of the Contractor's demolition, deconstruction, and removal procedures, and authorization by the Contracting Officer to begin demolition and deconstruction. The Government will not be responsible for the condition or loss of, or damage to, such property after contract award. Showing for sale or selling materials and equipment on site is prohibited.

#### 3.3.2 Reuse of Materials and Equipment

Remove and store materials and equipment indicated to be reused or relocated to prevent damage, and reinstall as the work progresses. Coordinate the re-use of materials and equipment with the re-use requirements in accordance with Section 01 74 19 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL. Capture re-use of materials in the diversion calculations for the project.

#### 3.3.3 Salvaged Materials and Equipment

Remove materials and equipment that are indicated to be removed by the Contractor and that are to remain the property of the Government, and deliver to a storage site at the Air Force Academy as directed by the Contracting Officer.

- a. Salvage items and material to the maximum extent possible.
- b. Store all materials salvaged for the Contractor as approved by the Contracting Officer and remove from Government property before completion of the contract. Coordinate the salvaged materials with tracking requirements in accordance with Section 01 74 19 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL. Capture salvaged materials in the diversion calculations for the project.
- c. Remove salvaged items to remain the property of the Government in a manner to prevent damage, and packed or crated to protect the items from damage while in storage or during shipment. Items damaged during removal or storage must be repaired or replaced to match existing items. Properly identify the contents of containers. Deliver the following items reserved as property of the Government to the areas designated by the Contracting Officer.

Remove historical items in a manner to prevent damage. Deliver the



following historical items to the Government for disposition: Corner stones, contents of corner stones, and document boxes wherever located on the site.

#### 3.3.4 Disposal of Ozone Depleting Substance (ODS)

Class I and Class II ODS are defined in Section, 602(a) and (b), of The Clean Air Act. Prevent discharge of Class I and Class II ODS to the atmosphere. Place recovered ODS in cylinders meeting AHRI Guideline K suitable for the type ODS (filled to no more than 80 percent capacity) and provide appropriate labeling. Recovered ODS shall be removed from Government property and disposed of in accordance with 40 CFR 82. Products, equipment and appliances containing ODS in a sealed, self-contained system (e.g. residential refrigerators and window air conditioners) shall be disposed of in accordance with 40 CFR 82. Submit Receipts or bills of lading, as specified. Submit a shipping receipt or bill of lading for all containers of ozone depleting substance (ODS) shipped to the Defense Depot, Richmond, Virginia to the US Air Force Academy BCE.

##### 3.3.4.1 Special Instructions

No more than one type of ODS is permitted in each container. A warning/hazardous label shall be applied to the containers in accordance with Department of Transportation regulations. All cylinders including but not limited to fire extinguishers, spheres, or canisters containing an ODS shall have a tag with the following information:

- a. Activity name and unit identification code
- b. Activity point of contact and phone number
- c. Type of ODS and pounds of ODS contained
- d. Date of shipment
- e. National stock number (for information, call (804) 279-4525).

#### 3.3.5 Transportation Guidance

Ship all ODS containers in accordance with MIL-STD-129, DLA 4145.25 (also referenced one of the following: Army Regulation 700-68, Naval Supply Instruction 4440.128C, Marine Corps Order 10330.2C, and Air Force Regulation 67-12), 49 CFR 173.301, and DOD 4000.25-1-M.

#### 3.4 CLEANUP

Remove debris and rubbish from basement and similar excavations. Remove and transport the debris in a manner that prevents spillage on streets or adjacent areas. Apply local regulations regarding hauling and disposal.

#### 3.5 DISPOSAL OF REMOVED MATERIALS

##### 3.5.1 Regulation of Removed Materials

Dispose of debris, rubbish, scrap, and other nonsalvageable materials resulting from removal operations with all applicable federal, state and local regulations as contractually specified in the Waste Management Plan.

### 3.5.2 Burning on Government Property

Burning of materials removed from demolished and deconstructed structures will not be permitted on Government property.

### 3.5.3 Removal to Spoil Areas on Government Property

Transport noncombustible materials removed from demolition and deconstruction structures to designated spoil areas on Government property.

### 3.5.4 Removal from Government Property

Transport waste materials removed from demolished and deconstructed structures, except waste soil, from Government property for legal disposal. Dispose of waste soil as directed.

## 3.6 REUSE OF SALVAGED ITEMS

Recondition salvaged materials and equipment designated for reuse before installation. Replace items damaged during removal and salvage operations or restore them as necessary to usable condition.

-- End of Section --

**ATTACHMENT TO SECTION 02 41 00  
FOR INFORMATION ONLY  
AS-BUILT DRAWINGS**

**(PROVIDED UNDER SEPARATE COVER)**



**CONSOLIDATE PREP SCHOOL DORMITORIES  
PNXQPZ104002**

**US AIR FORCE ACADEMY, COLORADO**



US ARMY CORPS OF ENGINEERS  
OMAHA DISTRICT

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## **APPENDIX A – BRIDGING DOCUMENTS**



### **CONSOLIDATE PREP SCHOOL DORMITORIES PNXQPZ104002**

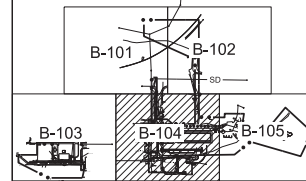
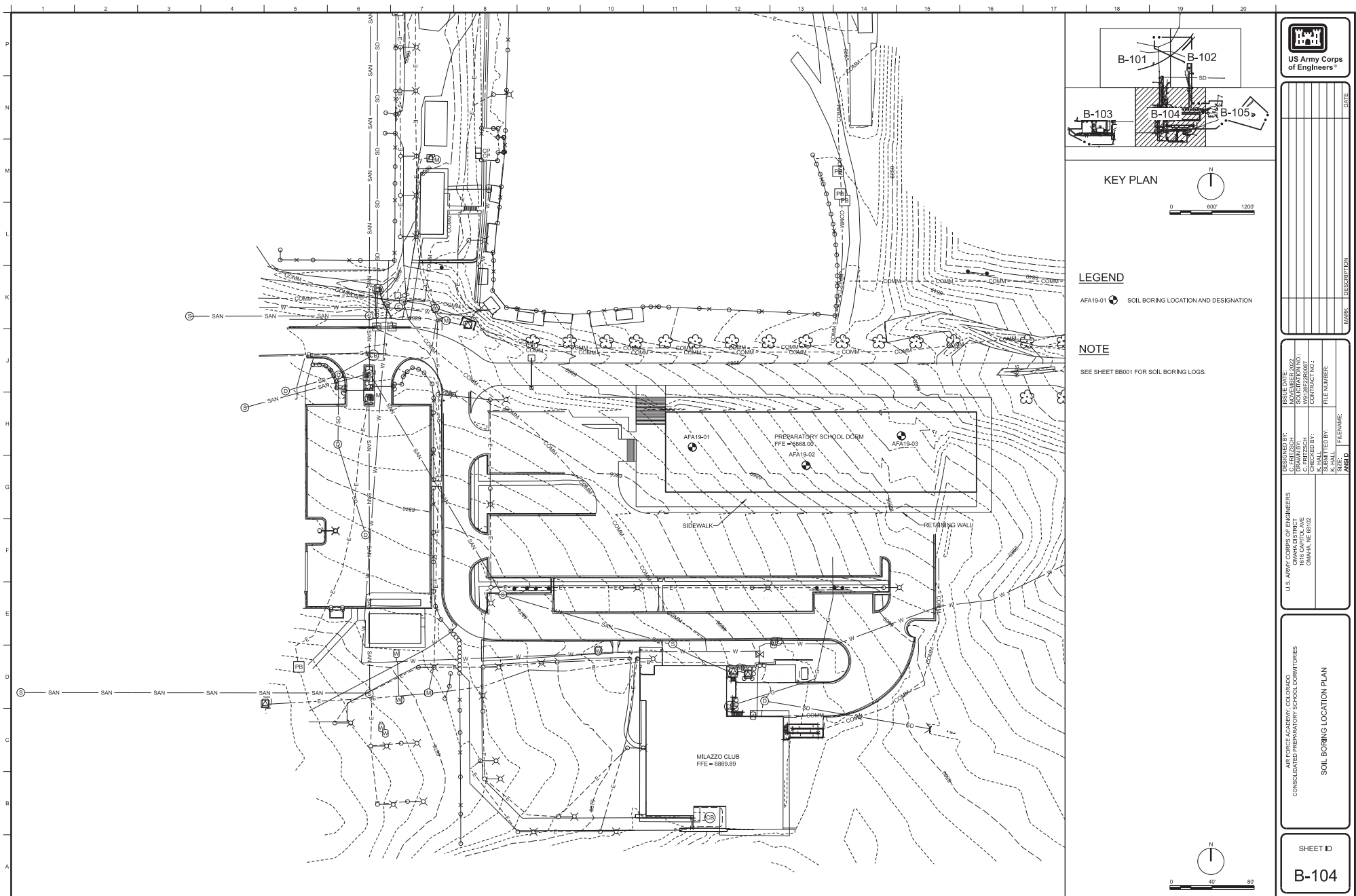
### **US AIR FORCE ACADEMY, COLORADO**



US ARMY CORPS OF ENGINEERS  
OMAHA DISTRICT

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KEY PLAN



LEGEND

AFA19-01 SOIL BORING LOCATION AND DESIGNATION

NOTE

SEE SHEET BB001 FOR SOIL BORING LOGS.



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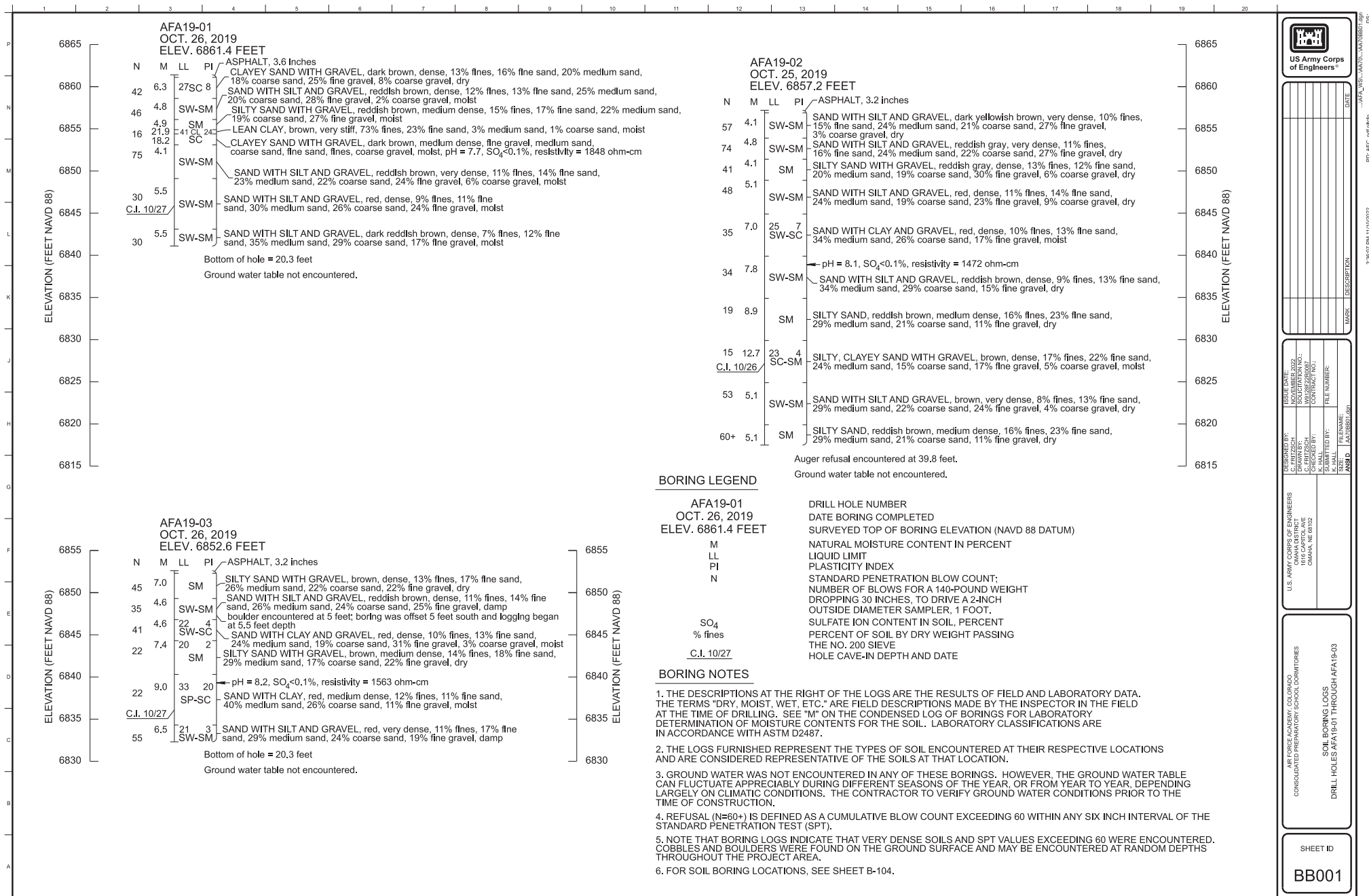
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U.S. ARMY CORPS OF ENGINEERS OMAHA DISTRICT 1001 G STREET, S.W. OMAHA, NE 68102
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AIR FORCE GARNY, COLORADO CONSOLIDATED PREPARATORY SCHOOL DOMINORIES
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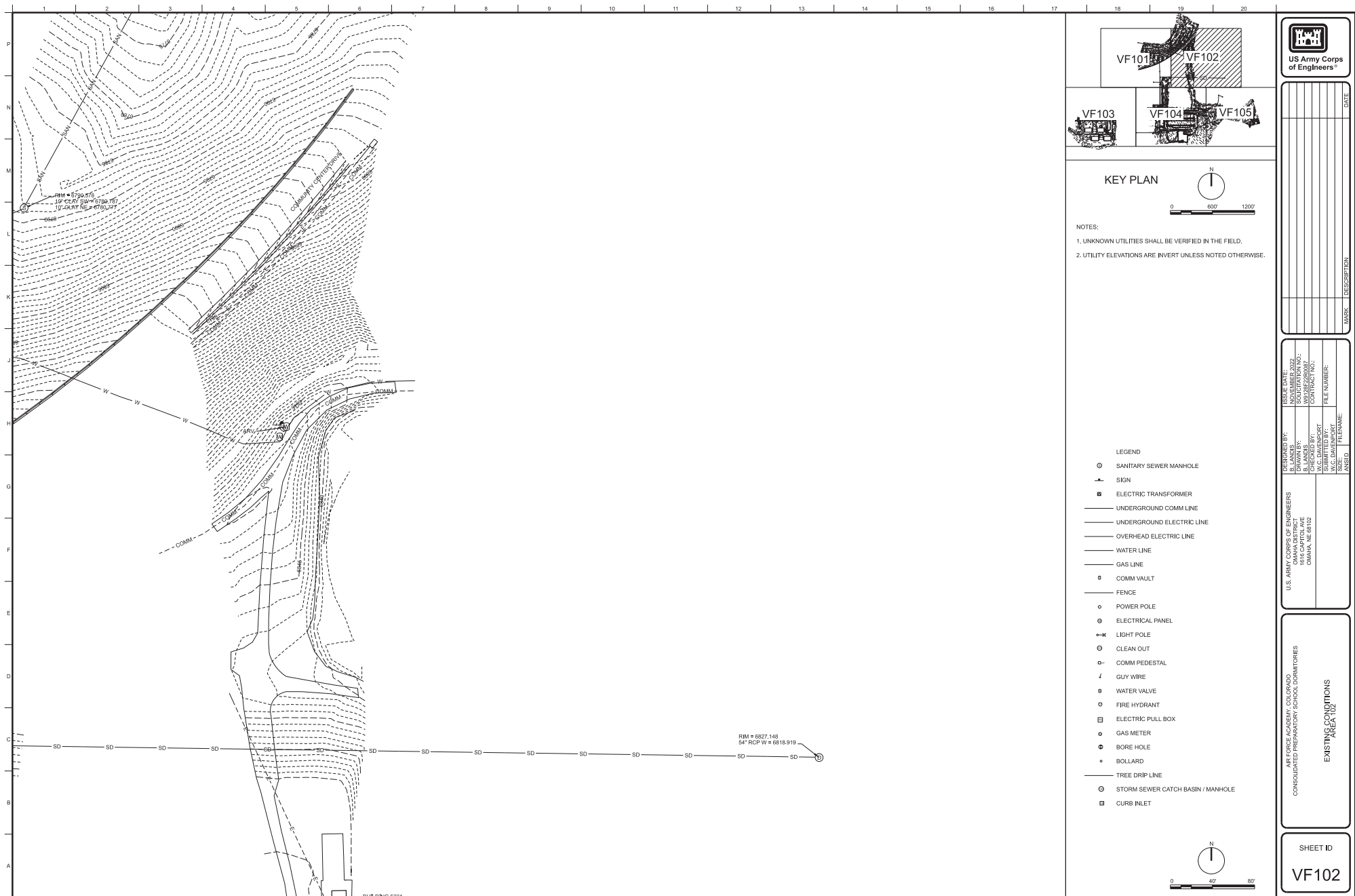
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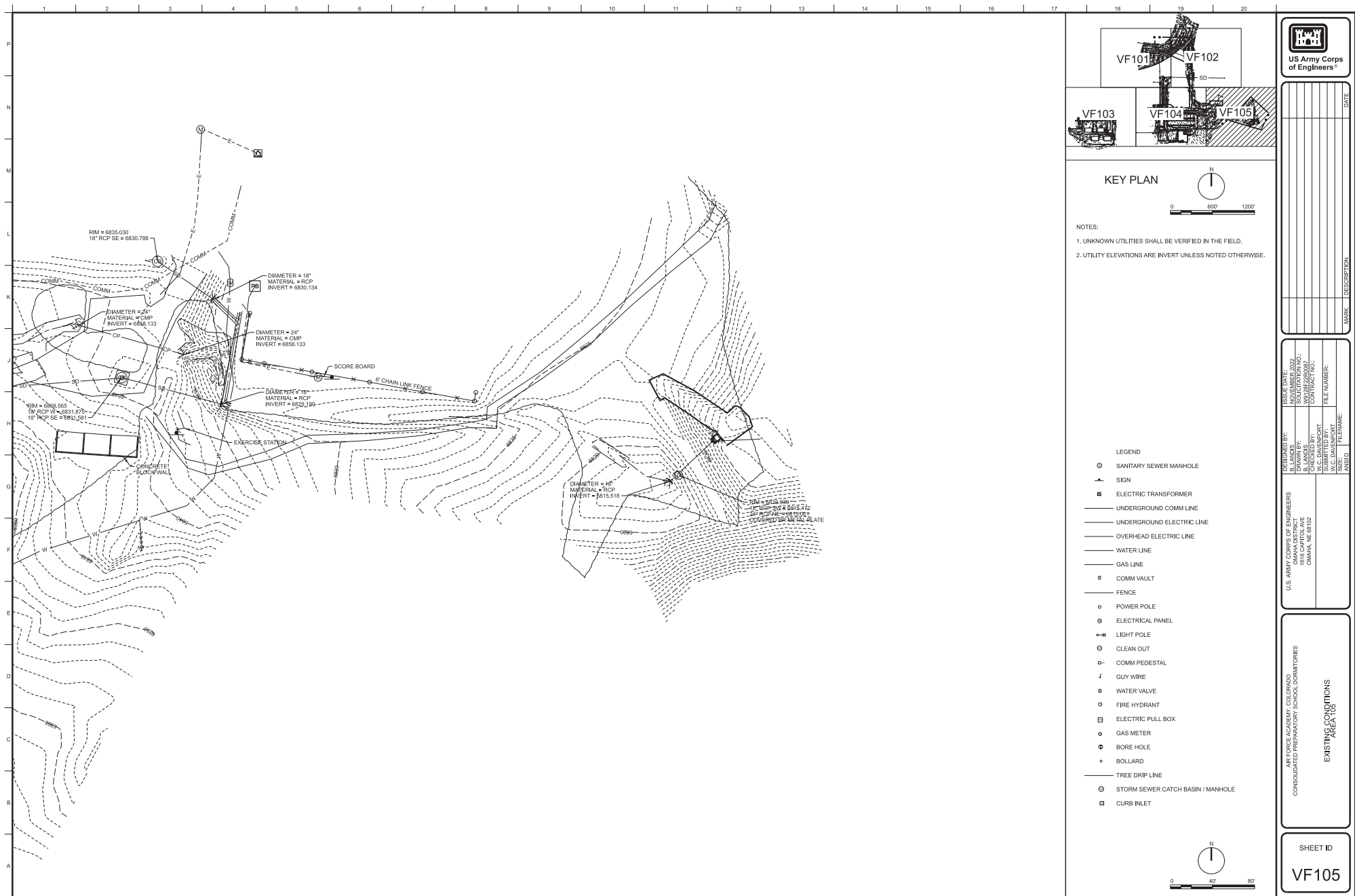






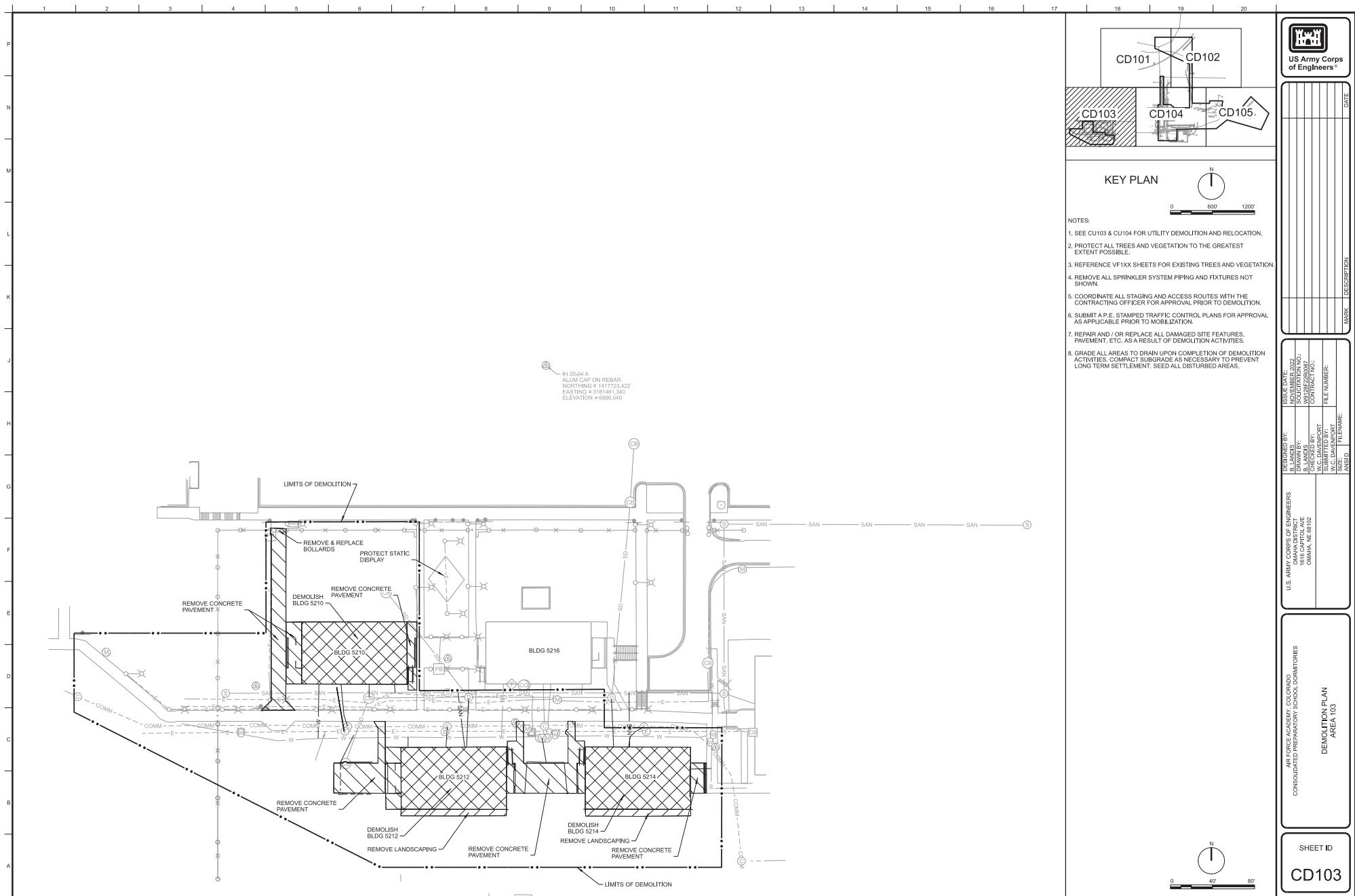


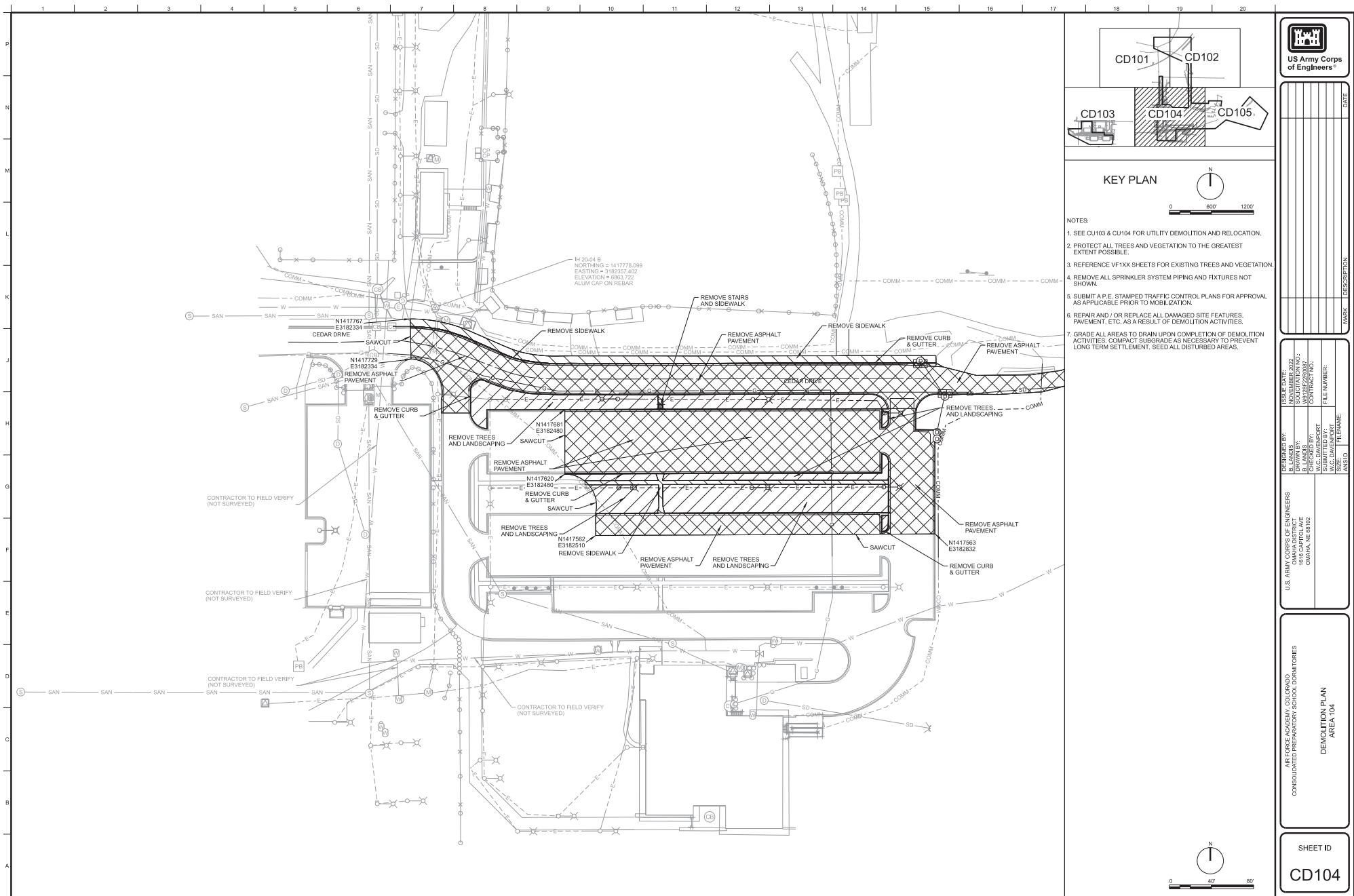


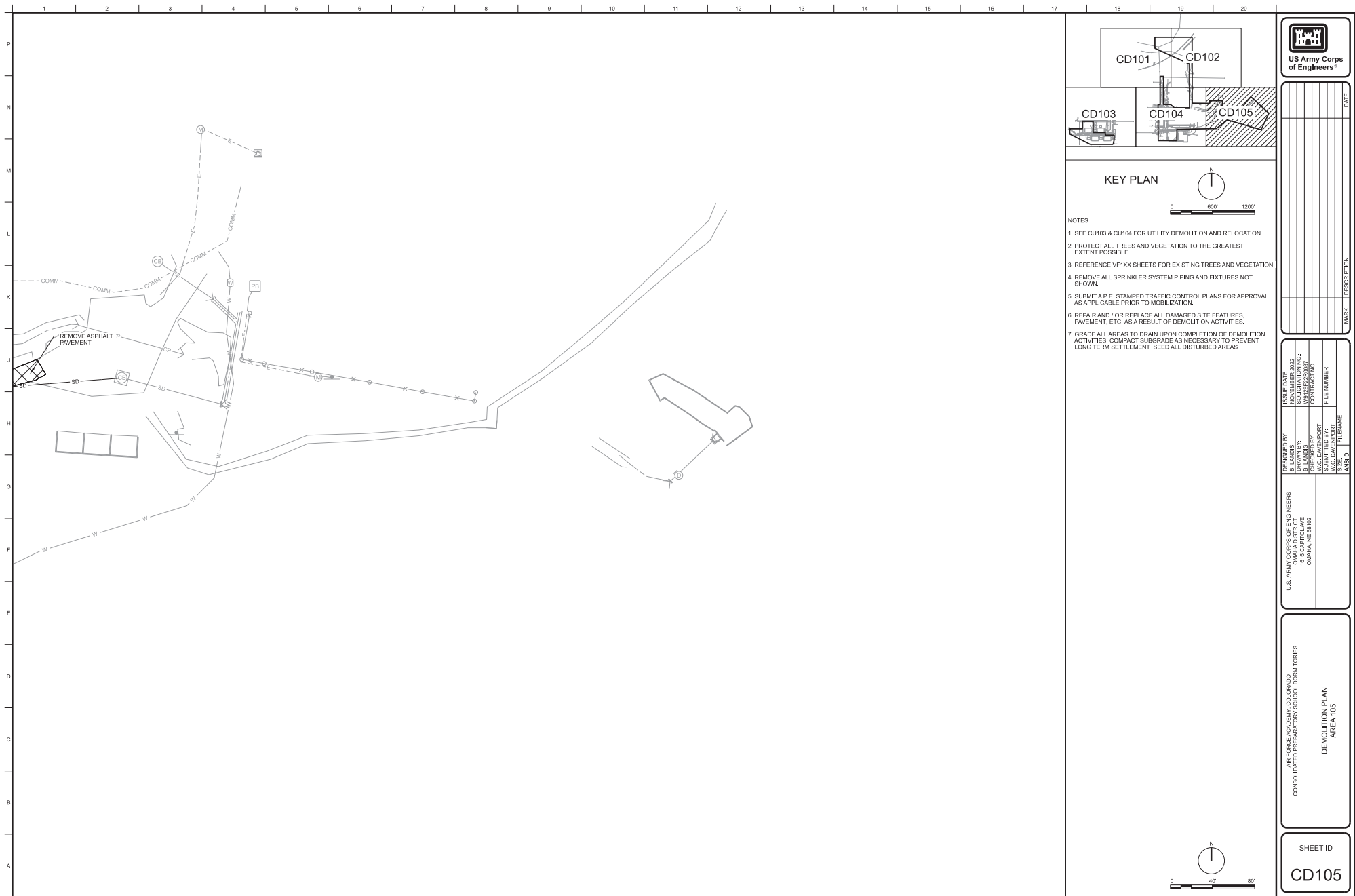








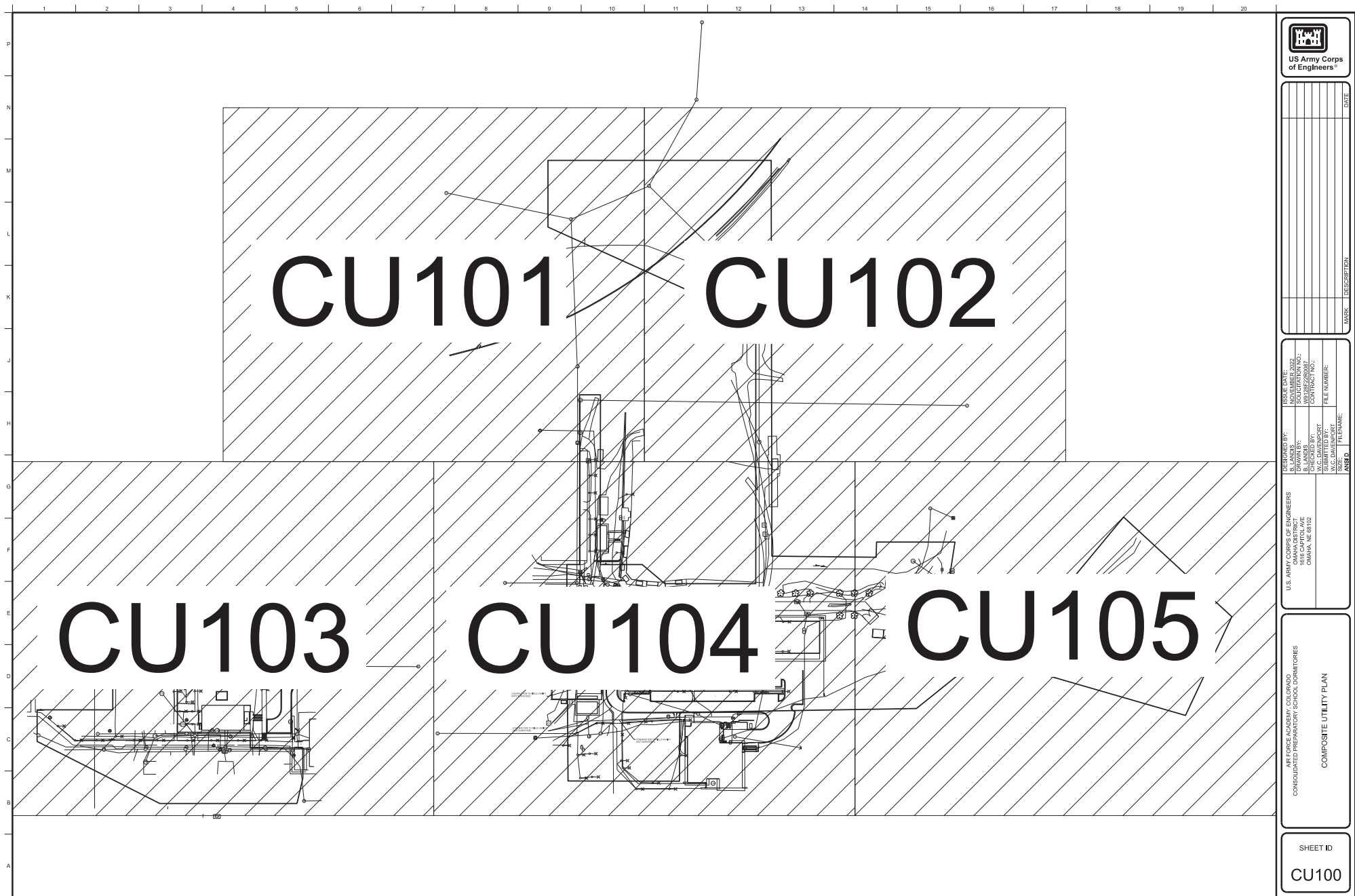












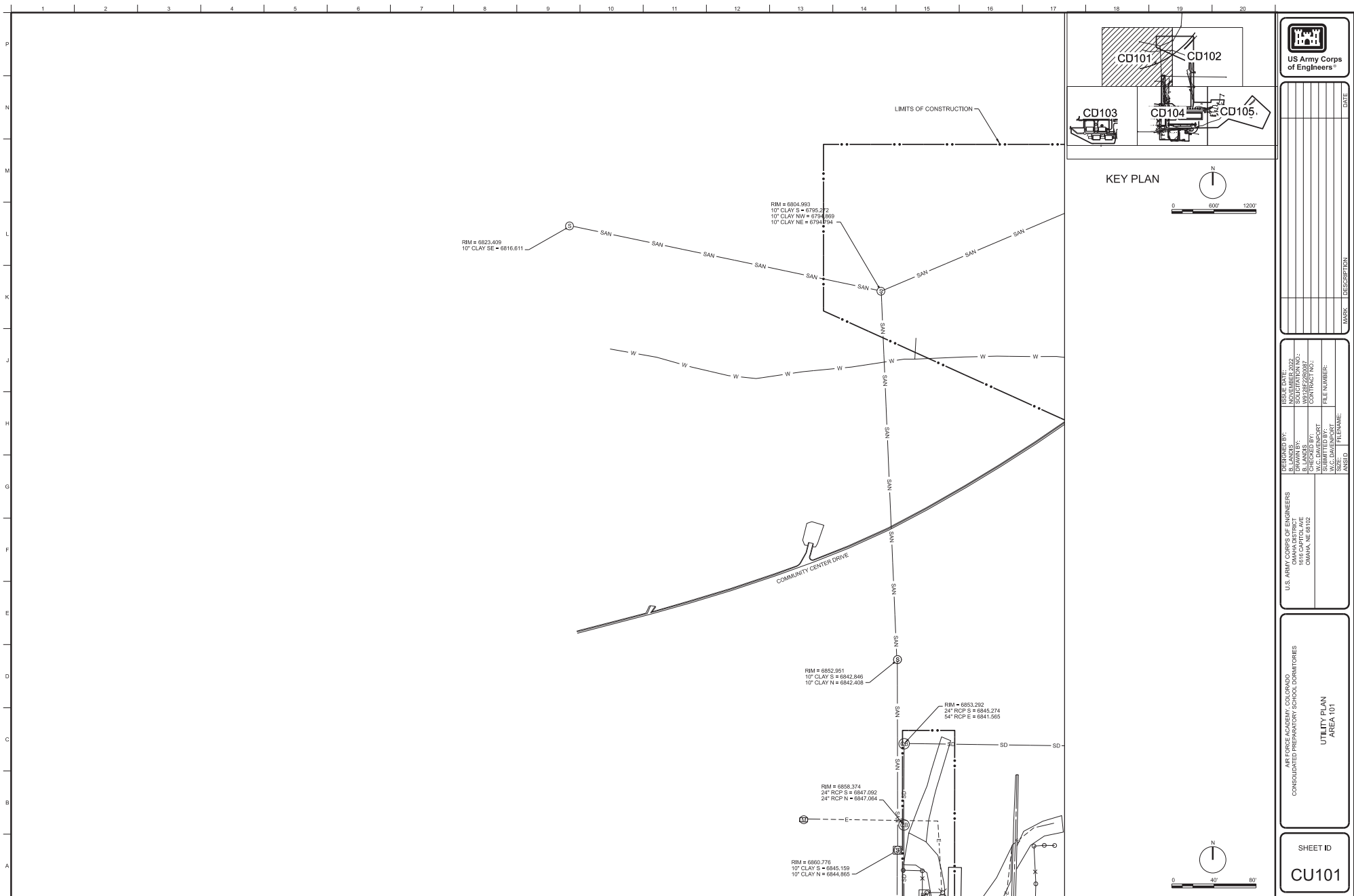
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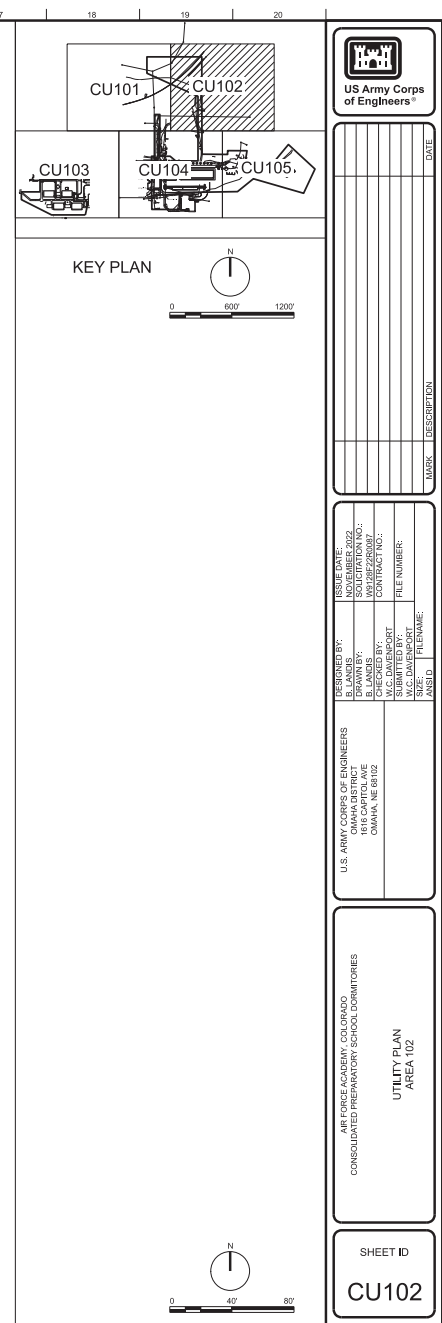
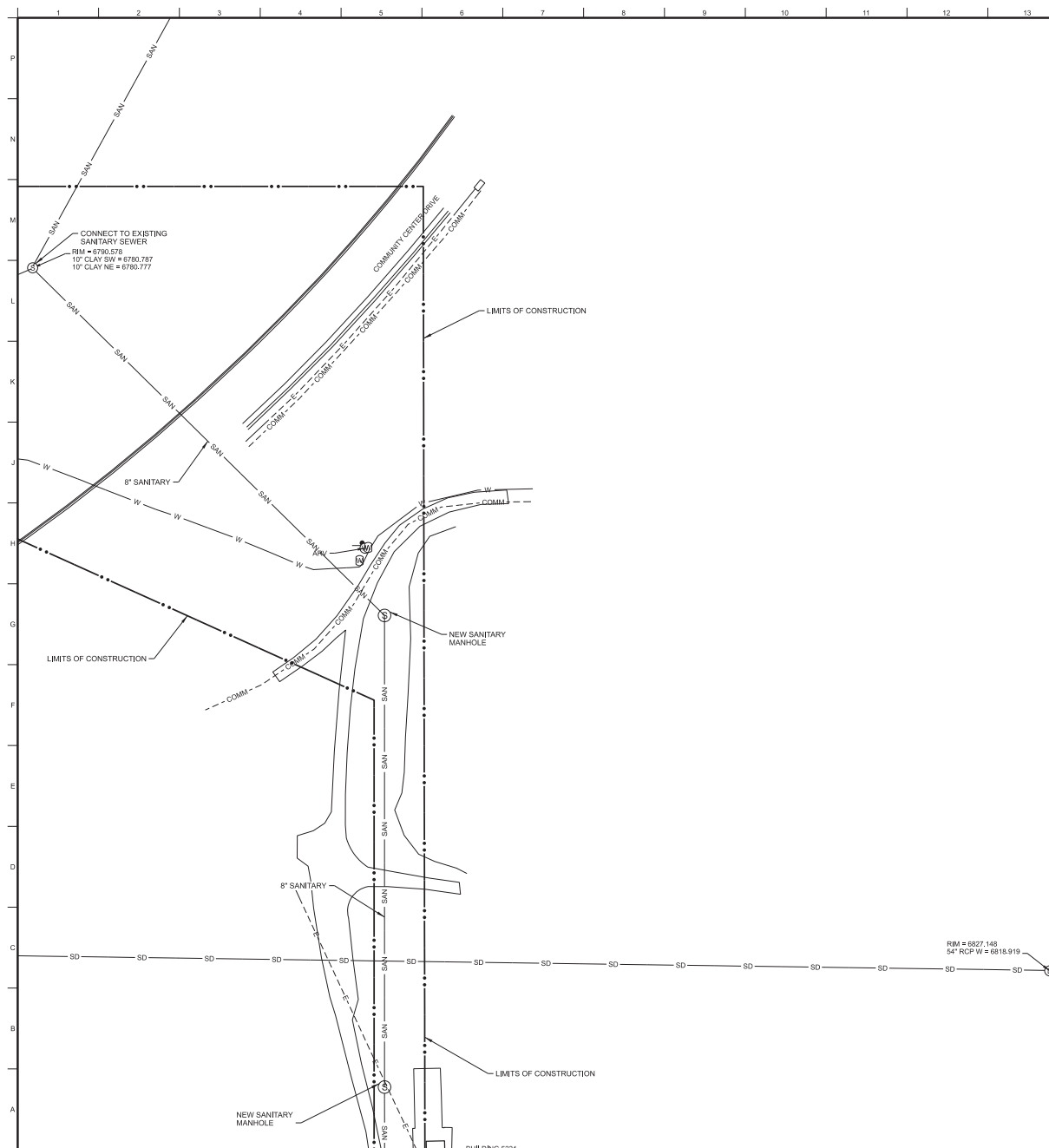
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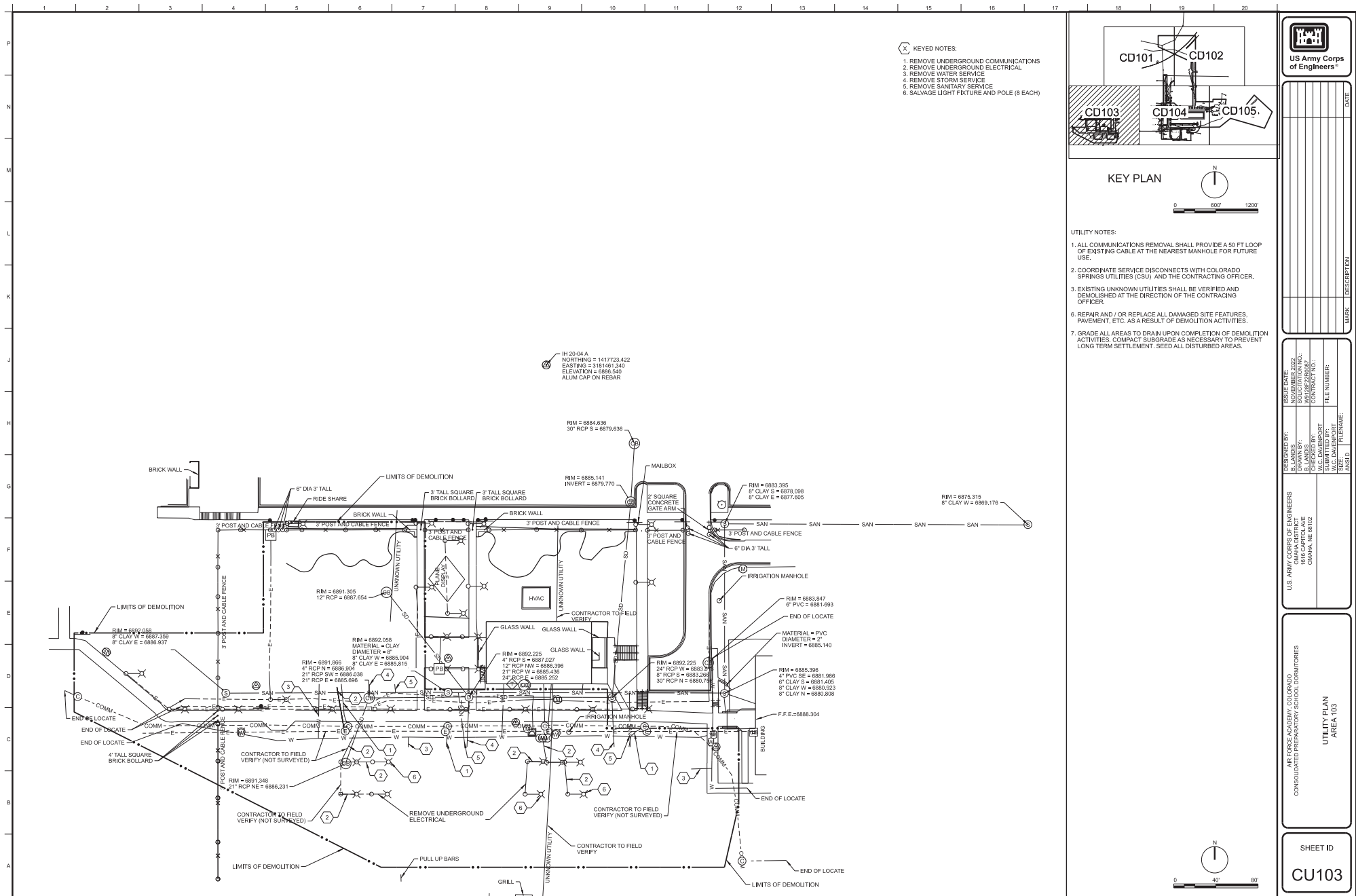
AIR FORCE CANARY, COLORADO CONSOLIDATED PREPATORY SCHOOL DOMINATORIES COMPOSITE UTILITY PLAN
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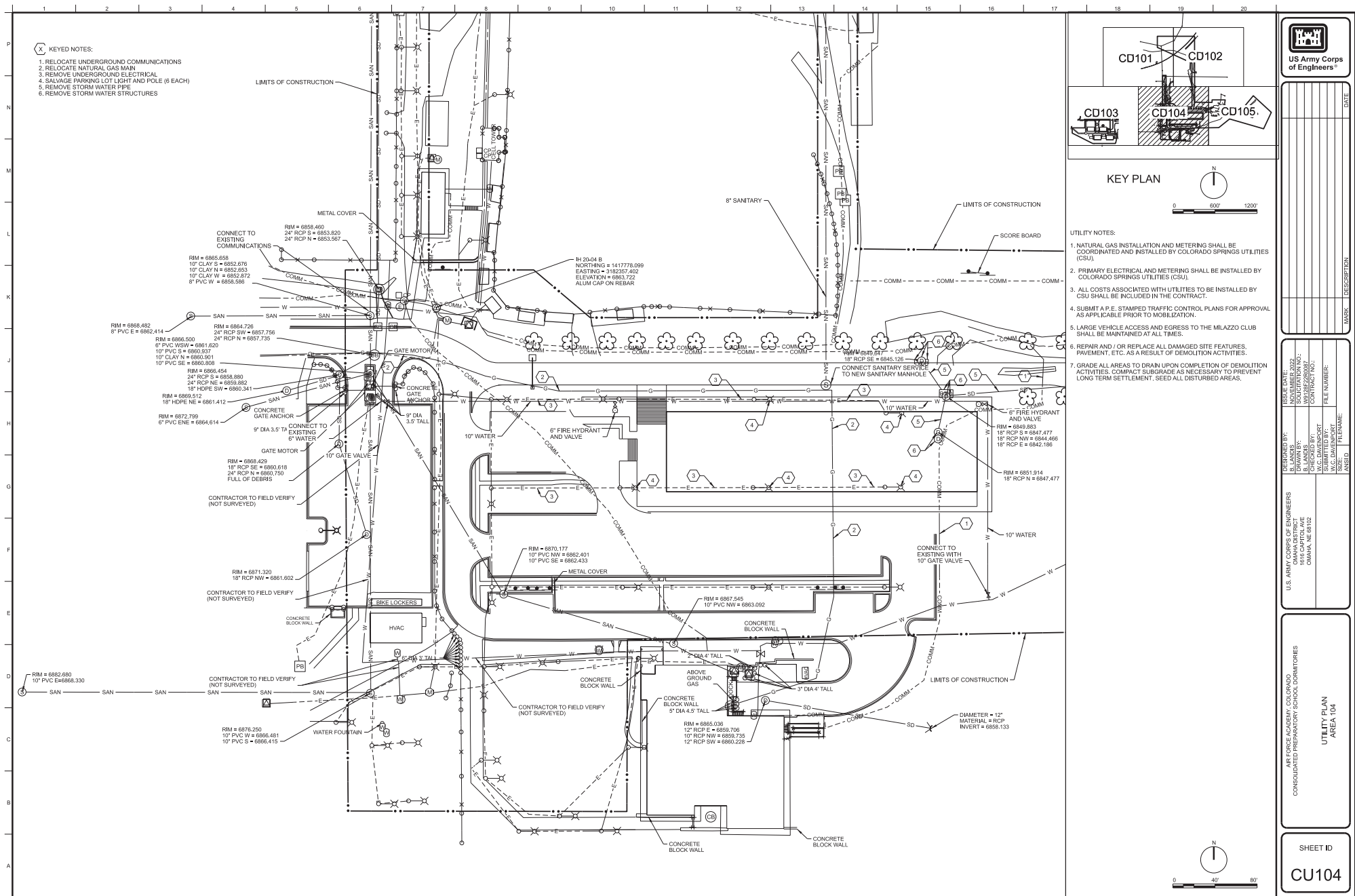
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## **APPENDIX B – ROOM DATA SHEETS**



### **CONSOLIDATE PREP SCHOOL DORMITORIES PNXQPZ104002**

### **US AIR FORCE ACADEMY, COLORADO**



US ARMY CORPS OF ENGINEERS  
OMAHA DISTRICT

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## **FUNCTIONAL AREA REQUIREMENTS - ROOM-BY-ROOM.**

### **A. Finishes and Construction:**

The Consolidate Prep. School Dormitories project does not require any special finishes or extraordinary wall construction. Finishes should be of a type and quality appropriate for a room function, such as porcelain tile for restrooms, durable gypsum wallboard for corridors, etc.

### **B. Architectural Design:**

Room Data Sheets do not provide comprehensive fully developed listing of Architectural Design items. Designers will need to coordinate with the end user during project design to develop complete requirements. Items listed on Room Data Sheets are design items known at this time for implementation in the facility. Reference Room Finish Schedule drawing for room finishes. Provide window treatment and signage.

### **B. Furniture Fixtures and Equipment:**

Room Data Sheets do not provide comprehensive fully developed listing of furniture, ESS/IDS items, Audio/Visual Equipment, or GFGI equipment. Designers will need to coordinate with the end user during project design to develop complete Furniture Fixtures and Equipment requirements. Items listed on Room Data Sheets are key items known at this time to be installed in the facility or are intended to show general space use.

### **C. Additional Requirements**

Room Data Sheets list functional requirements, but is not comprehensive in listing all requirements necessary to meet applicable code criteria. Provide all features and finishes necessary to meet applicable code criteria.

## VESTIBULE

- A. Summary:** Entrance Vestibule
- B. Quantity:** 1
- C. Functional Requirements:** Provide a vestibule at the primary building entrance. Provide a minimum distance between successive doors as necessary per applicable code and sustainability requirements. Provide vestibule with a recessed walk-off mat. Provide an electronic card reader at the second set of vestibule doors.
- D. Adjacency:** See SECTION 01 82 00 for adjacency requirements.
- E. Maximum Area:** See attachment to SECTION 01 82 00 for room layout
- F. Number of Occupants:** 0 FTEs
- G. Architectural Design:**
- **Special Construction**
    - Infrastructure for electronic card reader at second pair of vestibule doors
  - **Communications**
    - 1 Voice (for wall mounted telephone)
  - **Built-In Equipment**
    - None
  - **Finishes**
    - Wall: Paint
    - Floor: Walk Off Mat
    - Base: As appropriate for floor finish
    - Ceiling: Painted moisture-resistant gypsum board
- H. Furniture, Fixtures, and Equipment:**
- **CFCI (Furniture Bid)**
    - None
  - **CFCI (ESS/IDS Bid)**
    - Electronic Card Reader
  - **CFCI (A/V Equipment Bid)**
    - None
  - **GFGI (NIC)**
    - None



## LOBBY

- A. Summary:** Lobby
- B. Quantity:** 1
- C. Functional Requirements:** Provide a lobby providing access to stairs, elevator, elevator machine/control room, and Facility Manager Storage / Office. Provide a bracket for a wall mounted TV in the lobby. The TV will serve as an electronic bulletin board for the facility. Provide space for each squadron to store and display their squadron's marching flags.
- D. Adjacency:** See SECTION 01 82 00 for adjacency requirements.
- E. Maximum Area:** See SECTION 01 82 00 for area requirements.
- F. Number of Occupants:** 0 FTEs
- G. Architectural Design:**
- **Special Construction** ○ None
  - **Communications** ○
  - **Built-In Equipment** ○ 1 TV wall mount bracket
  - **Finishes**
    - Wall: Painted gypsum board
    - Floor: Durable, non-slip, attractive finishes required. VCT and finished concrete are not allowed.
    - Base: As appropriate for floor finish
    - Ceiling: Painted gypsum board
- H. Furniture, Fixtures, and Equipment:**
- **CFCI (Furniture Bid)** ○ None
  - **CFCI (ESS/IDS Bid)** ○ None
  - **CFCI (A/V Equipment Bid)** ○ One 42" flat screen TV
  - **GFGI (NIC)** ○ None

## STAIRS

- A. Summary:** Stairs
- B. Quantity:** 2 (serving all floors)
- C. Functional Requirements:** Provide stairs to provide building vertical circulation and meet life safety requirements. Provide an electronic card reader at the exterior door of the secondary set of stairs, or if providing a vestibule for the secondary set of stairs, provide an electronic card reader at the interior set of vestibule doors.
- D. Adjacency:** See SECTION 01 82 00 for adjacency requirements.
- E. Maximum Area:** See SECTION 01 82 00 for area requirements.
- F. Number of Occupants:** 0 FTEs
- G. Architectural Design:**
- **Special Construction**
    - Infrastructure for electronic card reader at secondary stairs exterior door.
  - **Communications**
    - Conduit, infrastructure and cabling for CCTV camera system to head end equipment and CQ desk
  - **Built-In Equipment**
    - None
  - **Finishes**
    - Wall: Painted gypsum board or CMU
    - Floor: Durable, non-slip, attractive finishes required. VCT and finished concrete are not allowed.
    - Base: As appropriate for floor finish
    - Ceiling: Painted gypsum board
- H. Furniture, Fixtures, and Equipment:**
- **CFCI (Furniture Bid)**
    - None
  - **CFCI (ESS/IDS Bid)**
    - Electronic Card Reader
  - **CFCI (A/V Equipment Bid)**
    - None
  - **GFGI (NIC)**
    - None

## STUDENT BELONGINGS STORAGE ROOM

- A. Summary:** Storage Room
- B. Quantity:** 1 to 3 rooms
- C. Functional Requirements:** Provide a storage room or rooms for student belongings on the first floor. The intent is to store excess student belongs that do not fit in individual dorm rooms. Each of the three squadrons shall have an equally sized caged storage area. A squadron's caged area shall not be split between two rooms.
- D. Adjacency:** See SECTION 01 82 00 for adjacency requirements.
- E. Area Requirements:** Total Area is approximately 600 SF +/-.
- F. Number of Occupants:** 0 FTEs
- G. Architectural Design:**
- **Special Construction**
    - Lockable caged storage area.
  - **Communications**
    - Conduit, infrastructure and cabling for CCTV camera system to head end equipment and CQ desk
  - **Built-In Equipment**
    - None
  - **Finishes**
    - Wall: Painted gypsum board
    - Floor: Sealed concrete
    - Base: Resilient
    - Ceiling: Painted exposed to structure
- H. Furniture, Fixtures, and Equipment:**
- **CFCI (Furniture Bid)**
    - 36"d industrial shelving
  - **CFCI (ESS/IDS Bid)**
    - None
  - **CFCI (A/V Equipment Bid)**
    - None
  - **GFGI (NIC)**
    - None

## ELEVATOR AND ELEVATOR MACHINE/CONTROL ROOM

- A. Summary:** Elevator Shaft and Elevator Machine/Control Room
- B. Quantity:** 1 (serving all floors)
- C. Functional Requirements:** Provide an elevator and elevator machine/control room in accordance with UFC 3-490-06.
- D. Adjacency:** See SECTION 01 82 00 for adjacency requirements.
- E. Maximum Area:** See SECTION 01 82 00 for area requirements.
- F. Number of Occupants:** 0 FTEs
- G. Architectural Design:**
- **Special Construction** ○ None
  - **Communications** ○ None
  - **Built-In Equipment** ○ None
  - **Finishes**
    - Wall: Painted gypsum board or CMU for Elevator Machine/Control Room
    - Floor: Sealed Concrete for Elevator Machine/Control Room
    - Base: Resilient for Elevator Machine/Control Room
    - Ceiling: Painted exposed to structure for Elevator Machine/Control Room
    - Stainless steel wall finish for elevator cab
    - Elevator cab flooring to match adjacent flooring outside elevator
- H. Furniture, Fixtures, and Equipment:**
- **CFCI (Furniture Bid)** ○ None
  - **CFCI (ESS/IDS Bid)** ○ None
  - **CFCI (A/V Equipment Bid)** ○ None
  - **GFGI (NIC)** ○ None

## CHARGE OF QUARTERS (CQ) DESK

**A. Summary:** Watch Station Desk

**B. Quantity:** 3

**C. Functional Requirements:** Provide CQ Desk areas. The CQ desk area shall be centrally located and unenclosed. The CQ desk shall be permanently constructed casework covered in a stainless steel finish, with solid surface countertops. Each desk shall be sized to be manned by two people. Each desk shall have two monitoring stations for CCTV feeds for their respective floor's public areas including corridors, dayroom, study room, stairs, and laundry room, as well as the building primary entrance and building perimeter. Provide a bracket for a wall mounted TV near the CQ Desk. The TV will serve as an electronic bulletin board for the facility. Provide an Automatic Emergency Defibrillator and Cabinet near each CQ Desk. Provide wall space for a government furnished/government installed squadron chain of command sign.

**D. Adjacency:** See SECTION 01 82 00 for adjacency requirements.

**E. Maximum Area:** See SECTION 01 82 00 for area requirements.

**F. Number of Occupants:** 0 FTEs

**G. Architectural Design:**

- **Special Construction**
  - Electrical infrastructure to support CCTV monitors and a student laptop.
- **Communications**
  - Conduit, infrastructure and cabling for two CCTV camera monitoring stations, connecting to CQ desk.
  - 3x4 port outlets at each CQ desk
- **Built-In Equipment**
  - Stainless steel CQ Desk with solid surface countertops
  - Automatic Emergency Defibrillator and cabinet
- **Finishes**
  - Wall: Painted gypsum board
  - Floor: Durable, non-slip, attractive finishes required. VCT and finished concrete are not allowed.
  - Base: As appropriate for floor finish
  - Ceiling: Acoustical ceiling tile

**H. Furniture, Fixtures, and Equipment:**

- **CFCI (Furniture Bid)**
  - 2 ergonomic desk chair w/ arms and casters
  - Small waste receptacle
- **CFCI (ESS/IDS Bid)**
  - None
- **CFCI (A/V Equipment Bid)**
  - One 42" flat screen TV
- **GFGI (NIC)**
  - Squadron chain of command sign

## STORAGE ROOM

- A. Summary:** Storage Room
- B. Quantity:** 3
- C. Functional Requirements:** Provide a room for student gear/general storage on the second, third, and fourth floors. This storage supplements the student gear storage space located on the first floor.
- D. Adjacency:** See SECTION 01 82 00 for adjacency requirements.
- E. Maximum Area:** See SECTION 01 82 00 for area requirements.
- F. Number of Occupants:** 0 FTEs
- G. Architectural Design:**
- **Special Construction** ○ None
  - **Communications** ○ Conduit, infrastructure and cabling for CCTV camera system to head end equipment and CQ desk
  - **Built-In Equipment** ○ None
  - **Finishes**
    - Wall: Painted gypsum board
    - Floor: Sealed concrete
    - Base: Resilient
    - Ceiling: Painted exposed to structure
- H. Furniture, Fixtures, and Equipment:**
- **CFCI (Furniture Bid)** ○ Approximately 24"d industrial shelving
  - **CFCI (ESS/IDS Bid)** ○ None
  - **CFCI (A/V Equipment Bid)** ○ None
  - **GFGI (NIC)** ○ None

## DAY ROOM

**A. Summary:** Dayroom

**B. Quantity:** 3

**C. Functional Requirements:** Provide a day room on each dormitory floor excluding the first floor. The day room serves as a space for cadet candidates to socialize, play games, relax, and conduct noisy activities. The day room shall include wall and base cabinets, along with a countertop equipped with a single bowl sink with a goose necked swivel faucet. The countertop shall accommodate a microwave and a coffee machine. In addition, the wall cabinets shall include space and utility connections for a microwave. Provide space and utility connections for a commercial refrigerator, commercial upright freezer, and an ice machine. Provide space with interior translucent windows. Coordinate window locations with location of flat screen TV, to reduce risk of glare and enable darkened conditions for watching TV. If exterior windows are provided, windows shall have window treatment. Provide an HDMI wall faceplate, conduit, and cable connecting to the wall mounted TV location, to enable cadet candidates to connect media players such as laptops, Blu-ray players, and phones to the TV.

**D. Adjacency:** See SECTION 01 82 00 for adjacency requirements.

**E. Maximum Area:** See SECTION 01 82 00 for area requirements.

**F. Number of Occupants:** 0 FTEs

**G. Architectural Design:**

- **Special Construction**
  - STC 47 walls and STC 33 solid wood core doors
  - Utility connections for refrigerator, microwaves, sink, and coffee maker
- **Communications**
  - Wifi Coverage (blanket coverage throughout building)
  - Provide 1 wall mount phone port installed 48" AFF near an entry door
  - Provide conduit and pullstring for future Cable TV
  - Wall mounted HDMI faceplate, conduit, and cable connection to wall mounted TV location
  - Conduit, infrastructure and cabling for CCTV camera system to head end equipment and CQ desk
- **Built-In Equipment**
  - 4' X 3' Whiteboard
  - 2' X 3' Tackboard
  - 1 TV wall mount bracket
  - Wall and base cabinet with sink, 10 linear feet minimum
- **Finishes**
  - Wall: Painted gypsum board with a minimum of one wall of floor to ceiling dry erase magnetic wallcovering
  - Floor: Carpet Tile
  - Base: Resilient
  - Ceiling: Acoustical Ceiling Tile

**H. Furniture, Fixtures, and Equipment:**

- **CFCI (Furniture Bid)**
  - Minimum 10 person lounge seating
  - Occasional tables for lounge seating
  - Top-Freezer Refrigerator (3 per room)
  - 2 microwaves (one on counter, one attached to cabinets)

- Café type break tables and chairs (2 sets of 4 chairs around table)
  - Ping pong table (1 per dayroom)
  - Foosball table (1 per dayroom)
  - Ice machine
  - Large Waste Receptacle
  - Recycle Receptacle
- **CFCI (ESS/IDS Bid)**
  - CCTV camera system
- **CFCI (A/V Equipment Bid)**
  - One 75" flat screen TV
- **GFGI (NIC)**
  - None



## DORM ROOM

**A. Summary:** Dorm Room

**B. Quantity:** 126

**C. Functional Requirements:** Provide dorm rooms for cadet candidates. Each dorm room contains two cadet candidates who will live there during the yearlong prep school program. Each Dorm Room shall have built-in closet/cabinet storage units for each student. The storage units consist of a low drawer/cabinet as the base, a closet/wardrobe as the middle section, with another cabinet above the closet/wardrobe. Closet/wardrobe shall have hooks, as well as a clothes rod. Storage unit doors shall be hinged as opposed to sliding. The storage units shall have a stained wood finish. The wall with the storage units and entrance door shall have a stained wood finish applied to the entire wall from floor to ceiling. The window wall of each dorm room shall have an interior knee wall running up to an interior horizontal mullion to provide space for power and communications outlets. Provide the knee wall with a solid surface window sill. No floor mounted mechanical equipment shall be located along the window wall. Entrance door shall be minimum 36 inches wide. Windows shall be non-operable. Windows shall have window treatment.

**D. Adjacency:** See SECTION 01 82 00 for adjacency requirements.

**E. Maximum Area:** See attachment to SECTION 01 82 00 for room layout

**F. Number of Occupants:** 2 FTEs per room

**G. Architectural Design:**

- **Special Construction**
  - STC 50 walls with gasketed STC 33 doors
- **Communications**
  - 4 NIPRNET drops to .edu switch; 4 voice drops (standard faceplate has two NIPRNET drops and two voice drops on faceplate, only one pair active at a time) one standard faceplate per student.
- **Built-In Equipment**
  - Closet/cabinet storage units (1 unit per cadet candidate)
- **Finishes**
  - Wall: Painted gypsum board
  - Floor: Carpet tile (installed to appear as broadloom)
  - Base: Resilient
  - Ceiling: Acoustical Ceiling Tile

**H. Furniture, Fixtures, and Equipment:**

- **CFCI (Furniture Bid)**
  - 2 XL Twin beds per room (not bunked)
  - Under bed storage (four drawers per bed)
  - 2 Waterproof mattresses – XL Twin
  - 2 desks (straight, with overhead storage)
  - 2 ergonomic desk chairs w/ arms and casters
  - Roller shades – blackout
  - 2 Desk lighting (integral with desk overhead storage)
  - 2 small waste receptacles
- **CFCI (ESS/IDS Bid)**
  - None
- **CFCI (A/V Equipment Bid)**
  - None
- **GFGI (NIC)**
  - Wall mirror (size and location?)

## STUDY ROOM

**A. Summary:** Group Study Room

**B. Quantity:** 3

**C. Functional Requirements:** Provide a cadet candidate study/conference room for a minimum of 10 personnel. Space shall serve as a quiet space for joint study activities. Space will also be utilized by staff on an as needed basis as a conference room. A portion of the walls shall consist of translucent wall systems, to show that the room is occupied and provide a general sense of activity occurring. Interior window locations shall be coordinated with located of flat screen TV, to reduce risk of glare and enable darkened conditions for watching TV. Provide a magnetic whiteboard wall treatment on a minimum of 1 long wall. Provide an HDMI wall faceplate, conduit, and cable connecting to the wall mounted TV location, to enable cadet candidates to connect media players such as laptops, Blu-ray players, and phones to the TV. If exterior windows are provided, windows shall have window treatment.

**D. Adjacency:** See SECTION 01 82 00 for adjacency requirements.

**E. Maximum Area:** See SECTION 01 82 00 for area requirements.

**F. Number of Occupants:** 0 FTEs

**G. Architectural Design:**

- **Special Construction**
  - Magnetic whiteboard wall treatment (provide on 1 long wall)
  - STC 47 walls, with gasketed STC 33 doors
- **Communications**
  - Wifi Coverage (blanket coverage throughout building)
  - Provide 1 wall-mounted phone port installed 48" AFF near an entry door
  - Provide conduit and pullstring for future Cable TV
  - Wall mounted HDMI faceplate, conduit, and cable connection to wall mounted TV location
  - Conduit, infrastructure and cabling for CCTV camera system to head end equipment and CQ desk
- **Built-In Equipment**
  - 1 TV wall mount bracket
- **Finishes**
  - Wall: Painted gypsum board with minimum of one wall of floor to ceiling dry erase magnetic wallcovering
  - Floor: Carpet tile
  - Base: Resilient
  - Ceiling: Acoustical Ceiling Tile

**H. Furniture, Fixtures, and Equipment:**

- **CFCI (Furniture Bid)**
  - Conference Table with Chairs (for 10 personnel), power and comm in table top
  - Chairs with casters and arms
  - Credenza at TV
  - Large waste receptacle
- **CFCI (ESS/IDS Bid)**
  - CCTV camera system
- **CFCI (A/V Equipment Bid)**
  - One 75" flat screen TV
- **GFGI (NIC)**
  - None

## COMMANDER'S OFFICE

- A. Summary:** Private Office
- B. Quantity:** 3
- C. Functional Requirements:** Provide a private administrative office. Exterior windows shall be provided with window treatment.
- D. Adjacency:** See SECTION 01 82 00 for adjacency requirements.
- E. Maximum Area:** 150 SF
- F. Number of Occupants:** 1 FTE
- G. Architectural Design:**

- **Special Construction**
  - STC 47 walls and gasketed STC 33 doors
- **Communications**
  - 2 faceplates, one each on adjoining walls (2 voice 2 data per faceplate)
  - Coordinate standard communication outlet location to match power outlet locations
- **Built-In Equipment**
  - None
- **Finishes**
  - Wall: Painted gypsum board
  - Floor: Carpet tile
  - Base: Resilient
  - Ceiling: Acoustical ceiling tile

## H. Furniture, Fixtures, and Equipment:

- **CFCI (Furniture Bid)**
  - 1 U shaped desk, height adjustable return, wardrobe storage for uniform, under desk storage, overhead storage, under cabinet desk light
  - Freestanding desk light
  - Seating area furniture
  - 1 ergonomic desk chair w/ arms and casters
  - Lateral filing cabinet for PII with bookshelf above
  - Small waste receptacle
- **CFCI (ESS/IDS Bid)**
  - None
- **CFCI (A/V Equipment Bid)**
  - None
- **GFGI (NIC)**
  - 1 computer
  - 2 desktop computer monitors
  - 1 desktop printer

## AMT OFFICE

- A. Summary:** Private Office
- B. Quantity:** 6
- C. Functional Requirements:** Provide a private administrative office. Exterior windows shall be provided with window treatment. Provide a magnetic whiteboard wall treatment on a minimum of 1 wall.
- D. Adjacency:** See SECTION 01 82 00 for adjacency requirements.
- E. Maximum Area:** 110 SF
- F. Number of Occupants:** 1 FTE
- G. Architectural Design:**

- **Special Construction**
  - STC 47 walls with gasketed STC 33 doors
  - Magnetic whiteboard wall treatment (provide on 1 wall)
- **Communications**
  - 4 NIPRNET drop – drops located on 2 walls
  - 2 Voice drop – drops located on 2 walls
  - Coordinate standard communication outlet location to match power outlet locations
- **Built-In Equipment**
  - Closing door whiteboard (or wall covering to be confirmed)
- **Finishes**
  - Wall: Painted gypsum board
  - Floor: Carpet tile
  - Base: Resilient
  - Ceiling: Acoustical ceiling tile

## H. Furniture, Fixtures, and Equipment:

- **CFCI (Furniture Bid)**
  - 1 L shaped desk, overhead storage above return, wardrobe storage for uniform, under desk storage with pencil sorter, under cabinet desk light
  - 2 side chairs
  - 1 ergonomic desk chair w/ arms and casters
  - Lateral filing cabinet for PII with bookshelf above
  - Small waste receptacle
- **CFCI (ESS/IDS Bid)**
  - None
- **CFCI (A/V Equipment Bid)**
  - None
- **GFGI (NIC)**
  - 1 computer
  - 2 desktop computer monitors
  - 1 desktop printer

## OVERFLOW PRIVATE OFFICE

- A. Summary:** Private Office
- B. Quantity:** 3
- C. Functional Requirements:** Provide a private administrative office. Exterior windows shall be provided with window treatment. Provide a magnetic whiteboard wall treatment on a minimum of 1 wall.
- D. Adjacency:** See SECTION 01 82 00 for adjacency requirements.
- E. Maximum Area:** 110 SF
- F. Number of Occupants:** 1 FTE
- G. Architectural Design:**

- **Special Construction**
  - STC 47 walls with gasketed STC 33 doors
  - Magnetic whiteboard wall treatment (provide on 1 wall)
- **Communications**
  - 4 NIPRNET drop – drops located on 2 walls
  - 2 Voice drop – drops located on 2 walls
  - Coordinate standard communication outlet location to match power outlet locations
- **Built-In Equipment**
  - Stained wood chair rails with decorative profile – all walls
  - Framed Image Display System – all walls
- **Finishes**
  - Wall: Painted gypsum board
  - Floor: Carpet tile
  - Base: Resilient
  - Ceiling: Acoustical ceiling tile

## H. Furniture, Fixtures, and Equipment:

- **CFCI (Furniture Bid)**
  - 1 L shaped desk, overhead storage above return, wardrobe storage for uniform, under desk storage with pencil sorter, under cabinet desk light
  - 2 side chairs
  - 1 ergonomic desk chair w/ arms and casters
  - Lateral filing cabinet for PII with bookshelf above
  - Small waste receptacle
- **CFCI (ESS/IDS Bid)**
  - None
- **CFCI (A/V Equipment Bid)**
  - None
- **GFGI (NIC)**
  - 1 computer
  - 2 desktop computer monitors
  - 1 desktop printer

## **FACILITY MANAGER STORAGE / OFFICE**

- A. Summary:** Private Office
- B. Quantity:** 1
- C. Functional Requirements:** Provide a private facility manager office. The space will be sized for a desk, as well as for tool storage. If exterior windows are provided, provide window treatment.
- D. Adjacency:** See SECTION 01 82 00 for adjacency requirements.
- E. Maximum Area:** See SECTION 01 82 00 for area requirements.
- F. Number of Occupants:** 1 FTE
- G. Architectural Design:**

- **Special Construction** ○ None
- **Communications**
  - 4 NIPRNET drop – drops located on 2 walls
  - 2 Voice drop – drops located on 2 walls
  - Coordinate standard communication outlet location to match power outlet locations
- **Built-In Equipment** ○ None
- **Finishes**
  - Wall: Painted gypsum board
  - Floor: Sealed concrete
  - Base: Resilient
  - Ceiling: Painted exposed ceiling

### **H. Furniture, Fixtures, and Equipment:**

- **CFCI (Furniture Bid)**
  - 1 single pedestal desk
  - 2 side chairs
  - 1 ergonomic desk chair w/ arms and casters
  - 1 Lateral filing cabinet (4-5 drawers)
  - 1 Small waste receptacle
  - general storage shelving and cabinets
- **CFCI (ESS/IDS Bid)** ○ None
- **CFCI (A/V Equipment Bid)** ○ None
- **GFGI (NIC)**
  - 1 computer
  - 2 desktop computer monitors
  - 1 desktop printer

## **MEN and WOMEN LATRINES**

- A. Summary:** Toilet Room and Showers
- B. Quantity:** 6
- C. Functional Requirements:** Provide multiple occupant toilet rooms with water closets, urinals, and lavatories in accordance with UFC 3-420-01. Minimum fixture count shall be as listed in SECTION 01 82 00. Fixture dimensions and layout clearances shall be designed to applicable accessibility criteria. Shower stalls do not need individual changing stalls.
- D. Adjacency:** See SECTION 01 82 00 for adjacency requirements.
- E. Maximum Area:** See SECTION 01 82 00 for area requirements.
- F. Number of Occupants:** 0 FTEs
- G. Architectural Design:**
- **Special Construction**
    - None
  - **Built-In Equipment**
    - Wall mounted water closets (handicap accessible stall as required by ABA)
    - Surface mounted jumbo-roll toilet tissue dispenser (1 per stall)
    - Urinals (handicap accessible urinals as required by ABA)
    - Lavatories in solid surface counter
    - Mirror (Continuous – entire length of vanity, from counter to soffit)
    - Paper towel dispenser and waste receptacle
    - Hand dryers – recessed – stainless steel (1 per room)
    - Soap dispensers
    - Ceiling mounted toilet partitions
    - Wall mounted urinal partitions
    - Accessible Showers stall – with soap dish, grab bars and two shower rod and curtains per shower
    - Showers stall – with soap dish and one shower rod and curtains per shower
    - Towel/clothes hook (1 per shower)
    - Coat hook (1 per toilet stall, located on compartment door.
    - Sanitary Napkin Disposer in Women's Latrines (1 per stall)
  - **Finishes**
    - Wall: 2"x2" ceramic tile
    - Floor: 2"x2" ceramic tile
    - Base: 2"x2" ceramic tile
    - Ceiling: Painted moisture-resistant gypsum board
- H. Furniture, Fixtures, and Equipment:**
- **CFCI (Furniture Bid)**
    - None
  - **CFCI (ESS/IDS Bid)**
    - None
  - **CFCI (A/V Equipment Bid)**
    - None
  - **GFGI (NIC)**
    - None

## LAUNDRY ROOM

- A. Summary:** Laundry Room
- B. Quantity:** 3
- C. Functional Requirements:** Provide laundry rooms. Each laundry room shall accommodate 6 washers and 8 dryers.
- D. Adjacency:** See SECTION 01 82 00 for adjacency requirements.
- E. Maximum Area:** See SECTION 01 82 00 for area requirements.
- F. Number of Occupants:** 0 Person
- G. Architectural Design:**
- **Special Construction**
    - Utility connections for washers and dryers
    - STC 50 walls and gasketed STC 33 doors
  - **Communications**
    - Conduit, infrastructure and cabling for CCTV camera system to head end equipment and CQ desk
  - **Built-In Equipment**
    - None
  - **Finishes**
    - Wall: Painted moisture-resistant gypsum board
    - Floor: Sealed concrete
    - Base: Resilient
    - Ceiling: Painted moisture-resistant gypsum board
- H. Furniture, Fixtures, and Equipment:**
- **CFCI (Furniture Bid)**
    - 8 dryers
    - 6 washers
  - **CFCI (ESS/IDS Bid)**
    - None
  - **CFCI (A/V Equipment Bid)**
    - None
  - **GFGI (NIC)**
    - None



## BUSINESS CENTER

- A. Summary:** Business Center/Printer Station
- B. Quantity:** 3
- C. Functional Requirements:** Each Business Center shall be an alcove accessible primarily to students and occasionally by staff. The alcove will be size to accommodate two full size floor model printer/copier/scan/fax machines. Provide alcove with printer and office supplies storage.
- D. Adjacency:** See SECTION 01 82 00 for adjacency requirements.
- E. Maximum Area:** See SECTION 01 82 00 for area requirements.
- F. Number of Occupants:** 0 FTE
- G. Architectural Design:**
- **Special Construction** ○ None
  - **Communications** ○ 4 NIPRNET drops
  - **Built-In Equipment** ○ None
  - **Finishes**
    - Wall: Painted gypsum board
    - Floor: Carpet tile
    - Base: Resilient
    - Ceiling: Acoustical ceiling tile
- H. Furniture, Fixtures, and Equipment:**
- **CFCI (Furniture Bid)** ○ None
  - **CFCI (ESS/IDS Bid)** ○ None
  - **CFCI (A/V Equipment Bid)** ○ None
  - **GFGI (NIC)** ○ 2 floor model printers per room

## JANITORIAL CLOSET

- A. Summary:** Janitorial Closet
- B. Quantity:** 3
- C. Functional Requirements:** Provide an area for janitorial supplies and equipment
- D. Adjacency:** See SECTION 01 82 00 for adjacency requirements.
- E. Maximum Area:** See SECTION 01 82 00 for area requirements.
- F. Number of Occupants:** 0 Person
- G. Architectural Design:**
- **Special Construction**
    - Floor drain
  - **Built-In Equipment**
    - One mop holder with shelf
    - Utility Sink with backsplash
    - Heavy duty built in wall shelves
  - **Finishes**
    - Wall: Painted moisture-resistant gypsum board with water resistant wall protection at utility sink
    - Floor: Sealed concrete
    - Base: Resilient
    - Ceiling: Painted moisture-resistant gypsum board
- H. Furniture, Fixtures, and Equipment:**
- **CFCI (Furniture Bid)**
    - None
  - **CFCI (ESS/IDS Bid)**
    - None
  - **CFCI (A/V Equipment Bid)**
    - None
  - **GFGI (NIC)**
    - None

## TRASH/RECYCLING STORAGE

- A. Summary:** Trash and Recycling Storage Room
- B. Quantity:** 3
- C. Functional Requirements:** Provide a trash and recycling storage space for consolidating trash and recycling for each floor. Provide space with 6'-0" wide doors.
- D. Adjacency:** See SECTION 01 82 00 for adjacency requirements.
- E. Maximum Area:** See SECTION 01 82 00 for area requirements.
- F. Number of Occupants:** 0 FTE
- G. Architectural Design:**

- **Special Construction**      ○ None
- **Built-In Equipment**      ○ None
- **Communications**      ○ None
- **Finishes**
  - Wall: Painted gypsum board or CMU
  - Floor: Sealed concrete
  - Base: Resilient
  - Ceiling: Painted exposed ceiling

**H. Furniture, Fixtures, and Equipment:**

- **CFCI (Furniture Bid)**      ○ None
- **CFCI (ESS/IDS Bid)**      ○ None
- **CFCI (A/V Equipment Bid)** ○ None
- **GFGI (NIC)**      ○ None

## MAIN TELECOMMUNICATIONS ROOM

- A. Summary:** Unclassified Communications Room
- B. Quantity:** 3 Minimum
- C. Functional Requirements:** Provide area for supplemental horizontal distribution of unclassified communications, NIPRnet, .edu, and base telephone system
- D. Adjacency:** See SECTION 01 82 00 for adjacency requirements. Location per UFC for cable runs not to exceed 295 feet. This room shall be an interior room with a door opening into the corridor.
- E. Minimum Area:** Per I3A
- F. Number of Occupants:** 0 FTE
- G. Architectural Design:**
- **Special Construction**
    - Requirements Per UFC
    - Dedicated HVAC for Space
  - **Built-In Equipment**
    - Two communications equipment racks per I3A per room
    - Patch Panels per UFC
    - Patch Cables
  - **Communications**
    - 1 Voice (For wall mounted telephone)
  - **Finishes**
    - Wall: Painted gypsum board or CMU
    - Floor: Sealed concrete
    - Base: Resilient
    - Ceiling: Painted exposed ceiling
- H. Furniture, Fixtures, and Equipment:**
- **CFCI (Furniture Bid)**
    - None
  - **CFCI (ESS/IDS Bid)**
    - None
  - **CFCI (A/V Equipment Bid)**
    - None
  - **GFGI (NIC)**
    - Network Switch Equipment
    - UPS Rack Mounted

## MECHANICAL ROOM

- I. Summary:** Mechanical Equipment Room
- J. Quantity:** 1 to 2 rooms
- K. Functional Requirements:** Provide area for facility mechanical systems
- L. Adjacency:** See SECTION 01 82 00 for adjacency requirements.
- M. Maximum Area:** See SECTION 01 82 00 for area requirements.
- N. Number of Occupants:** 0 FTE
- O. Architectural Design:**
- **Special Construction**
    - Floor drain ( 1 per room)
  - **Built-In Equipment**
    - Hose bib (1 per room)
  - **Communications**
    - 1 Voice per room (For wall mounted telephone)
    - 1 NIPRNET per room
  - **Finishes**
    - Wall: Painted gypsum board or CMU
    - Floor: Sealed concrete
    - Base: Resilient
    - Ceiling: Painted exposed ceiling
- P. Furniture, Fixtures, and Equipment:**
- **CFCI (Furniture Bid)**
    - None
  - **CFCI (ESS/IDS Bid)**
    - None
  - **CFCI (A/V Equipment Bid)**
    - None
  - **GFGI (NIC)**
    - None

## **ELECTRICAL ROOM**

- A. Summary:** Electrical Equipment Room
- B. Quantity:** As necessary
- C. Functional Requirements:** Provide area for facility electrical systems
- D. Adjacency:** See SECTION 01 82 00 for adjacency requirements.
- E. Maximum Area:** See SECTION 01 82 00 for area requirements.
- F. Number of Occupants:** 0 FTE
- G. Architectural Design:**
- **Special Construction** ☐ None
  - **Built-In Equipment** ☐ None
  - **Communications** ☐ 1 Voice (For wall mounted telephone)
  - **Finishes**
    - ☐ Wall: Painted gypsum board or CMU
    - ☐ Floor: Sealed concrete
    - ☐ Base: Resilient
    - ☐ Ceiling: Painted exposed ceiling
- H. Bid Options:**
- **CFCI (Furniture Bid)** ☐ None
  - **CFCI (ESS/IDS Bid)** ☐ None
  - **CFCI (A/V Equipment Bid)** ☐ None
  - **GFGI (NIC)** ☐ None

## LACTATING MOTHER'S SPACE

- A. Summary:** Lactation Room
- B. Quantity:** 1
- C. Functional Requirements:** Provide a space for lactating mother's to express milk. Space shall be design per Federal Policy. The space shall be equipped with a sink, table, chair, electrical outlets for breast pumps, a small refrigerator, and a paper towel dispenser. This space shall be equipped with a lockable door. The space may be able to a be a multipurpose space based on allocated square footage and furnishings.
- D. Adjacency:** See SECTION 01 82 00 for adjacency requirements.
- E. Maximum Area:** See SECTION 01 82 00 for area requirements.
- F. Number of Occupants:** 0 FTEs
- G. Architectural Design:**
- **Special Construction** ○ None
  - **Communications** ○ None
  - **Built-In Equipment** ○ 5 linear feet of countertop with sink and under counter casework – provide ABA compliant approach to sink.  
○ Wall mounted paper towel dispenser
  - **Finishes** ○ Wall: Painted gypsum board  
○ Floor: Carpet tile  
○ Base: Resilient  
○ Ceiling: Acoustical ceiling tile
- H. Furniture, Fixtures, and Equipment:**
- **CFCI (Furniture Bid)** ○ Rocker/Glider chair  
○ Side Table  
○ Refrigerator
  - **CFCI (ESS/IDS Bid)** ○ None
  - **CFCI (A/V Equipment Bid)** ○ None
  - **GFGI (NIC)** ○ None

## **CORRIDOR**

- A. Summary:** Corridor
- B. Quantity:** As required
- C. Functional Requirements:** Provide corridors for circulation. Fire extinguishers are not required in this facility. Provide brackets for wall mounted TVs near the entrance to stairs. The TVs will serve as electronic bulletin boards for the facility.
- D. Adjacency:** See SECTION 01 82 00 for adjacency requirements.
- E. Maximum Area:** See SECTION 01 82 00 for area requirements.
- F. Number of Occupants:** 0 Person
- G. Architectural Design:**
- **Special Construction**
    - Durable concrete finish, non-slip, attractive finish
  - **Built-In Equipment**
    - 6 Drinking fountains with bottle filler, located at both ends of the second, third, and fourth floors
    - 6 TV wall mount brackets
  - **Communications**
    - Conduit, infrastructure and cabling for CCTV camera
  - **Finishes**
    - Wall: Painted gypsum board
    - Floor: Durable, non-slip, attractive finishes required. VCT and finished concrete are not allowed.
    - Base: As appropriate for floor finish
    - Ceiling: Acoustical ceiling tile
- H. Furniture, Fixtures, and Equipment:**
- **CFCI (Furniture Bid)**
    - None
  - **CFCI (ESS/IDS Bid)**
    - CCTV camera system
  - **CFCI (A/V Equipment Bid)**
    - Six 42" flat screen TV
  - **GFGI (NIC)**
    - None



**APPENDIX C – USAFA DESIGN STANDARDS  
2011 – FOR INFORMATION ONLY  
(provided under separate cover)**



**CONSOLIDATE PREP SCHOOL DORMITORIES**

**PNXQPZ104002**

**US AIR FORCE ACADEMY, COLORADO**



US ARMY CORPS OF ENGINEERS  
OMAHA DISTRICT

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**APPENDIX D – SIGNED REQUEST FOR  
WAIVER TO AIRFIELD AND AIRSPACE  
CRITERIA, FORM AF505**



**CONSOLIDATE PREP SCHOOL DORMITORIES**

**PNXQPZ104002**

**US AIR FORCE ACADEMY, COLORADO**



US ARMY CORPS OF ENGINEERS  
OMAHA DISTRICT

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# REQUEST FOR WAIVER TO AIRFIELD AND AIRSPACE CRITERIA

## SECTION I. (To be completed by installation)

WAIVER NUMBER Permanent Waiver P-04, Amendment

PROPONENT 10 CES/CENPP

INSTALLATION

United States Air Force Academy

MAJCOM

USAF

1. ACTION REQUESTED (If submitting a request for a construction or Air Show waiver, complete items 1-6 only. Do not proceed to page 2.)

PERMANENT WAIVER

☐ EXTENSION

☒ AMENDMENT

☐ AIR SHOW

☐ OTHER

2. CRITERIA TO BE WAIVED ☒ UFC 3-260-01 ☐ UFC 3-260-04 ☐ UFC 3-535-01 ☐ OTHER

TABLE NUMBER, PARAGRAPH, CATEGORY, ITEM, ETC. (e.g., Table 3-7, Item 7; Table 3-8, Item 3)

UFC 3-260-01, Table 3-7, Items 5-11

3. DESCRIPTION OF VIOLATION (Describe the obstruction and list any airfield imaginary surfaces to be violated. Support details with maps delineating imaginary surfaces. Provide pertinent elevations, heights, and distances impacting surfaces. For waivers to airfield marking or lighting, illustrate the change being requested.)

This is an Amendment Request to USAFA Permanent Waiver P-04, dated: 22 May 2013 (Atch 1), in compliance with UFC 3-260-01 (dated 4 Feb 19), Appendix B paragraph B1-2.1.2 (Permanent Waivers, pg #424); paragraph B1-2.1.9 (Amendment of Waivers, pg #426); and paragraph B1-2.2 (Contents of Waiver Request Package pg #426). The west Approach/Departure Clearance Surface of runway 08/26 at the United States Air Force Academy (USAFA) Main Airfield is obstructed by a topographic mountain ridge that starts approximately 4,611 feet west of the runway end and continues to the termination of the Approach/Departure Clearance Surface, 10,000 feet from runway end. At its termination point, the Approach/Departure Clearance Surface elevation is 6781 feet, approximately 85 feet below the earth's surface elevation (Atch 2). The 2013 Permanent Waiver recognizes this topographic ridge, vegetation and the installation's buildings/facilities as obstructions located within the 08/26 west Approach/Departure Clearance Surface (Atch 1).

Currently, several existing facilities supporting Prep-School operations are located on the aforementioned topographic mountain ridge obstructing the 08/26 runway west Approach/Departure Clearance Surface (Atch 3). USAFA's Installation Development Plan (IDP) identifies existing and future facilities required to support the functions of the Cadet Prep-School program to include the construction of a Dormitory and new Academic Building west of the existing proposed master plan location. The Prep School Master Plan also includes plans for an Athletic Building that was originally sited as an addition to the existing fitness center, not as a stand-alone facility east of the existing Prep School complex and within the Approach/Departure Clearance Surface. However, the IDP also depicts potential growth east of the existing campus substantiating the Master Plans proposed growth east (Atch 5).

CRITERIA TO BE WAIVED: UFC 3-260-01, Table 3-7, No. 5-11 (Air Space Imaginary Surfaces, VFR Airfields, Pg#73-75), establishes a 40:1 horizontal to vertical dimension

4. JUSTIFICATION OF WAIVER (Explain why the criteria needs to be waived. Operational and mission concerns should be addressed. For temporary waiver requests, include action programmed to correct the violation, programmed FY, programmed cost estimate, and project number.)

ALTERNATIVE COURSES OF ACTION: USAFA Permanent Waiver P-04 (2013) recognizes the existing topographic obstruction and land uses/facilities in this area that are critical to support the Academy's mission. The new Prep-School facilities could push West of the existing school location, but would not be able to create a consolidated campus for cadets as is proposed in the Prep-School Master Plan due to lack of contiguous space. A contiguous Prep-School campus is important for developing students who desire to obtain a USAFA appointment as it will simulate the USAFA main cadet campus, create efficiency of Prep-School cadet training, academics, and athletics, and thereby increase likelihood of success at USAFA. Additionally, the existing Prep-School site is in a developed urban setting and nearby undeveloped land is very limited. The current Academic building siting is outside the Approach/Departure Clearance Surface and should remain there.

RATIONAL JUSTIFICATION: UFC 3-260-01 (Section B1-2.1.2, Permanent Waivers), establishes that violations which cannot be reasonably corrected, or where risks have been accepted at an appropriate level, may be considered as Permanent Waivers. Runway 08/26 west Approach/Departure Clearance Surface violations are the result of

PROJECT NUMBER (Temporary & Construction Waivers Only)

5. RISK ASSESSMENT SUMMARY (Provide Risk Level and a brief summary of findings in the Risk Assessment Report. Attach AF Form 4437 to waiver package.)

The Risk Assessment (Atch 4) for this Permanent Waiver Request was predicated on a coordination meeting addressing the Master Plan and its implications on Airfield operations safety. The unmitigated risk level was assessed as medium (II,D). Controlling factors include limiting building heights on the ridge to a topographic elevation of 6,924 ft (or ~60ft for the building itself); understanding the crosswind runway is normally only used for recoveries toward the west and not from the mountains to the east; ensuring that only approximately 1/2 of the proposed dorm and the athletic building is in the approach/departure clearance area; and the academic building remaining outside the area of concern. Knowing the primary winds are from the north and south, crosswind conditions are less than 1% of flying operations and the overwhelming majority of those are landing toward the west, and a permanent waiver already exists for the topographic and existing building/structures, this proposed Master Plan siting risk assessment was mitigated down to "Low" risk.

PROOF OF COORDINATION: Personnel involved with the development of the risk assessment include the following:

FAA OE/AAA PART 77 CASE/ASN NUMBER

6. INSTALLATION COORDINATION AND APPROVAL (Digital Signature)

<b>CIVIL ENGINEER (CE)</b> JEOUN.JIMMY.JO <small>Digitally signed by JEOUN.JIMMY.JOSEPH.1237435385 Date: 2019.08.31 15:22:27 -0600</small> SEPH.1237435385	<b>AIRFIELD MANAGER (AM)</b> ALEXANDER.DONA <small>Digitally signed by ALEXANDER.DONALD.J.R.1097763280 Date: 2019.11.01 16:14:01 -0600</small> LD.J.R.1097763280	<b>AIRFIELD OPS (OSA) /TERPS</b> GLADNEY.JOHN. <small>Digitally signed by GLADNEY.JOHN.H.IV.1238113705 Date: 2019.11.01 15:53:35 -0600</small> H.IV.1238113705	<b>BASE SAFETY (SE)</b> VIGUERIA.JOSEP <small>Digitally signed by VIGUERIA.JOSEP.1153814631 Date: 2019.11.01 15:49:47</small> H.R.1153814631
<b>OTHER</b> JOHNSON.ANDR <small>Digitally signed by JOHNSON.ANDRE.T.1048943965 Date: 2019.10.11 11:29:51 -0600</small> E.T.1048943965	<b>OTHER</b> [Empty Signature Box]	<b>OTHER</b> [Empty Signature Box]	<b>PERIOD VALID</b> Permanent
<b>INSTALLATION COMMANDER</b> BRIAN S. HARTLESS, Colonel, USAF Commander, 10th Air Base Wing		<b>SIGNATURE</b> HARTLESS.BRIAN.S.1069425344 <small>Digitally signed by HARTLESS.BRIAN.S.1069425344 Date: 2019.11.05 16:48:27 -0700</small>	

**STOP! DO NOT CONTINUE FOR CONSTRUCTION OR AIR SHOW WAIVERS**

## REQUEST FOR WAIVER TO AIRFIELD AND AIRSPACE CRITERIA (Continued)

SECTION II. COORDINATION IN GRANTING WAIVER (To be completed by MAJCOM) (Digital Signature)

AFCEC (CP) <i>(Active Duty Only)</i> GIBSON.JOHN.W.123154 3658 <small>Digitally signed by GIBSON.JOHN.W.1231543658 Date: 2019.11.12 07:51:05 -0500</small>	AFIMSC (DET) <i>(Active Duty Only)</i>	LOGISTICS (A4)  CRUZ- GONZALEZ.CARLOS.R.1181611444 <small>Digitally signed by CRUZ- GONZALEZ.CARLOS.R.1181611444 Date: 2020.01.27 13:21:13 -0700</small>
OPERATIONS (A3) GARVER.JOHN.M.1083628 720 <small>Digitally signed by GARVER.JOHN.M.1083628720 Date: 2020.02.04 11:45:22 -0700</small>	SAFETY (SE)	OTHER

SECTION III. WAIVER APPROVAL (To be completed by MAJCOM) (Digital Signature)

ADDITIONAL CONDITIONS APPLIED IN GRANTING WAIVER	
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TITLE OF AUTHORIZING OFFICIAL	SIGNATURE
HOUSTON R. CANTWELL, Col, USAF, Vice Superintendent	CANTWELL.HOUSTON.R.10488941 66 <small>Digitally signed by          CANTWELL.HOUSTON.R.1048894166          Date: 2020.02.12 20:32:42 -07'00'</small>

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**Air National Guard:** Upon MAJCOM approval, forward package to Installation BCE.

Refer to the *Airfield Planning Playbook* for specific guidance on filling out this form.

# **APPENDIX E – PRELIMINARY SOILS REPORT**



## **CONSOLIDATE PREP SCHOOL DORMITORIES PNXQPZ104002**

### **US AIR FORCE ACADEMY, COLORADO**



US ARMY CORPS OF ENGINEERS  
OMAHA DISTRICT

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**PRELIMINARY SOILS REPORT  
PREPARATORY SCHOOL DORMITORY  
U.S. AIR FORCE ACADEMY  
COLORADO  
JANUARY 2020**

**1. Scope**

This report provides preliminary soils information for the Preparatory School Dormitory project at the U. S. Air Force Academy (Academy) located in Colorado. The project consists of a four-story building located south of the east end of Cedar Drive, in an existing parking lot for the athletic fields in the Community Center Area of the Academy.

This project is considered Phase One of a three-phase plan as outlined in the Preparatory School Master Plan. The Master Plan includes elevations of three terrazzo levels, each with a proposed new building. The proposed preparatory school dormitory is located on the lower terrazzo level, which has an assigned elevation of 6863.0 feet North American Vertical Datum of 1988 (NAVD88); however, the dormitory finished floor elevation has an assigned elevation of 6868.0 feet NAVD88. Since the site is located on an existing parking lot, access to remaining parking stalls must be maintained during and after this Phase is constructed. Therefore, the entire lower terrazzo level cannot be raised during construction of Phase One. Retaining walls will be required in order to construct both the building and the terrazzo area on the south side of the building. According to preliminary site plans, retaining wall heights will vary from three to 18 feet. Cedar Drive will be re-aligned and a fire access lane will be constructed.

The results of a preliminary subsurface investigation and laboratory testing of soil samples obtained are included. The Contractor is responsible for conducting a site-specific subsurface investigation on which final design shall be based. The information contained in this report may be used for preliminary design and to supplement the final report; however, the Contractor is responsible for obtaining the additional data needed for all aspects of final design. In the event of a discrepancy between data presented in this report and data obtained during the Contractor's site-specific geotechnical investigation, data obtained by the Contractor shall govern.

**2. Subsurface Investigation**

**2.1. General**

A subsurface investigation was conducted on 25 and 26 October 2019 for the Preparatory School Dormitory project at the Academy. The site is located south of Cedar Drive, within the existing asphalt parking lot for the athletic fields and Milazzo Club (building 5226).

Three borings, designated as AFA19-01 through AFA19-03, were drilled and sampled for the project site based on a preliminary site plan. One of the borings was drilled to auger refusal. Disturbed soil samples were taken and logged from each boring every 2.5 feet for the first 10 feet

and every five feet thereafter, and a sample retained for geotechnical analysis from all sample intervals. Ground water information, boring depths, and sampling information are outlined in Table 1. Soil boring logs are attached to this report as Attachment 1.

Boring locations were laid out on a map by the geotechnical engineer and staked at the site by U.S. Army Corps of Engineers (USACE), Drill Crew personnel. Utility clearances and a dig permit were provided by the Academy. Locations are indicated on the Soil Boring Location Plan, Figure 1 (with aerial) and Attachment 2 (with preliminary site plan).

Drilling, soil sampling, and logging were performed by the USACE, Omaha District drill crew. Drilling was accomplished with the use of a Gus Pech 1300C drill rig equipped with 4.25-inch inside diameter, hollow-stem augers. A 4-inch diameter center bit was used to advance the boring.

**Table 1. Bore Hole Data.**

<b>Boring Number</b>	<b>Total Depth Drilled</b>	<b>Water Level First Encountered</b>	<b>Water level^</b>	<b>Collapse Depth^</b>	<b>Disturbed Samples Taken</b>
AFA19-01	20.3	NE	NE	15.5	8
AFA19-02	39.8	NE	NE	30	10
AFA19-03	20.3	NE	NE	16.5	6

All units are in feet below ground surface.

^ Level taken 24 hours after drilling.

NE = Not encountered.

## **2.2. Standard Penetration Tests**

Standard penetration tests (SPT) were taken in the borings at depth intervals of 2.5 feet for the first 10 feet and at 5 feet depth intervals thereafter. The standard penetration samples were obtained in accordance with ASTM D1586, "Penetration Test and Split-Barrel Sampling of Soils", using a 140-pound automatic trip hammer.

## **2.3. Disturbed Sampling**

Representative disturbed samples of the subsoils were taken with a 2-inch outside diameter standard steel split-spoon sampler using a 140-pound automatic trip hammer, in accordance with ASTM D1586. Samples were collected every 2.5 feet for the first 10 feet, and then at 5 feet intervals for the remaining depth. Each sample was placed in a pint jar and the lid sealed airtight with at least three wraps of electrical tape. Each jar was labeled, denoting the hole and sample number, depth, date collected, and the project name. The jars were placed in boxes that were subsequently labeled with the appropriate project information.

## **2.4. Laboratory Testing**

Samples, with transmittal sheets, were delivered to the Terracon Inc. laboratory in Omaha, Nebraska. Tests were performed to determine visual classification, Atterberg Limits, grain-size distribution, natural moisture content, sulfate ion content, soil pH, and soil resistivity. All tests were conducted in accordance with applicable ASTM standards. Laboratory test result sheets are attached to this report as Attachment 3.

Based upon the results of the testing program, the field logs were revised and supplemented as shown on the boring logs. These final logs represent an interpretation and compilation of the content of the field logs and the results of the laboratory tests of the field samples. The stratification lines shown on the boring logs represent the approximate boundaries between soil types and may be gradual. Boring logs are attached to this report as Attachment 1.

## **3. Site Conditions**

### **3.1. General Geology**

The Academy is located approximately 11 miles north of Colorado Springs, Colorado, near the western edge of the Colorado Piedmont Section of the Great Plains Physiographic Province. Precambrian Pikes Peak Granite forms the mountains of the Rampart Range at the west edge of the Academy and is separated from Paleozoic, Mesozoic, and Tertiary sedimentary rock of the foothills and plains by the Rampart Fault, a high-angle reverse fault a little steeper than 60 degrees (Scott, 1970). This fault (Geologic Map 1) was active in Quaternary time, however Holocene alluvium is undisturbed and the last activity on this fault was more than 30,000 years ago (Harza, 1985).

During Late Cretaceous - Early Tertiary time, material eroded from a recently uplifted granitic mountain mass to the west was deposited in the form of numerous alluvial fans and channel braids by streams exiting the mountains. Several stages of downcutting and alluviation have produced gravel covered bedrock at three distinct levels. Narrow finger-like mesas have been formed at two levels, with broad valleys forming a younger third level. These ridges and valleys terminate at Monument Creek, the principle drainage area which flows southward through the eastern part of the installation. East of Monument Creek is a gently rolling gravel covered surface underlain by Dawson Arkose that is trenched by southward flowing streams. The valleys contain three more sets of alluvium covered terraces and a narrow modern flood plain.

Bedrock stratigraphy in the Academy area is complex due to the numerous deposition and erosion cycles in conjunction with rapid structural changes in the Late Cretaceous - Early Tertiary time.

Bedrock in most of the area is the Dawson Arkose. This formation crops out in numerous places, but is generally mantled with alluvium, colluvium, and eolian materials. The Dawson Arkose is locally tilted to a high degree next to the fault, but flattens to the east with a dip angle of 3 to 4 degrees north or northeast. The Dawson Arkose contains two beds of andesitic

material. The lower bed is olive-gray or olive-brown andesitic claystone. The upper bed which underlies most of the Academy area is arkosic conglomerate sandstone, siltstone, and silty claystone. The two most common types of rock are a very light gray, coarse, somewhat micaceous sandstone and reddish-brown to light green sandy siltstone and claystone.

### **3.2. Site-Specific Geology**

The site is located on Pine Mesa and is capped with a formation locally called the Douglass Mesa Gravel (Varnes and Scott, 1967) which is regionally called the Verdos Alluvium (Scott and Wobus, 1973) or Piedmont Gravel two (Carroll and Crawford, 2000). For consistency, this report will refer to this mantle gravel as the Douglass Mesa Gravel.

The Douglass Mesa Gravel is a Pleistocene (~600,000 year old) (Harza, 1985) reddish-brown coarse granite-derived sand, gravel, cobbles, and boulders. The Douglass Mesa Gravel contains granite clasts which are subrounded to angular composed of Pikes Peak Granite. Shlemon (1985) reports that these clasts are highly weathered and bear paleosol-like properties to include small nodules of carbonates. Excavation and compaction are generally easy except for boulders (Scott and Wobus, 1973). The calcareous nature of the soil can also present challenges to compaction. A geological map of the site is shown in Geologic Map 2.

Many of the buildings and work areas at the Academy are built atop Douglass Mesa Gravel including the Lehmann Mesa (Cadet Academic area), Douglass Mesa (hotel, hospital, and other buildings), and the Pine Mesa.

The density of the Douglass Mesa Gravel ranges from medium dense to very dense, based on blow counts observed during drilling. The formation is mostly sand and has little to no plasticity. Roughly 10 to 30% of the Douglass Mesa Gravel is composed of gravel and there are generally about 15% or less fines in the formation observed. One exception was a small (0.5 foot) lens or layer of lean clay with sand in boring AFA19-01 at 6.2 to 6.7 feet below ground surface. The Douglass Mesa Gravel is generally dry to moist and drier near the surface. Meteoric water percolates through the Douglass Mesa Gravel into the lower Dawson Formation which is considered a local aquifer.

The capping mesa gravel is bordered on the north and south by valleys of exposed, Paleocene Dawson Formation. This arkose is white, yellowish gray, and orange comprised of siltstone, sandstone, claystone and an andesitic layer. The sands are arkose with feldspar and quartz grains.

### **3.3. Ground Water**

Ground water was not encountered in any borings during drilling operations. Collapse was reported in all borings. The presence and depth of ground water can vary depending on long-term precipitation patterns. Lenses of perched water may also be present at shallow depth. It is the responsibility of the Contractor to verify ground water conditions prior to the time of construction.

### **3.4. Seismic Evaluation**

Refer to Specification Section 01 83 00 “Structural Requirements”, paragraph 1.2.9 “Seismic Loads” of the RFP for seismic design information.

## **4. Previous Practice at the Academy**

### **4.1. General**

Soils encountered in the borings are described on the boring logs. Soils at the project site consist primarily of silty sand (SM) and sand with silt and gravel (SW-SM). Similar soil types were encountered for a subsurface investigation of the existing Airmen Dormitory, located immediately west of this site. Soil boring logs and location map for the Airmen Dormitory is attached to this report as Attachment 4.

Refusal was encountered at a depth of 5 feet in boring AFA19-03 on a suspected boulder. Cobbles and boulders were noted on the ground surface east of the parking lot and can be expected at any depth throughout the site.

It is possible that in boring AFA19-02, the augers encountered refusal at the contact with the Dawson Formation at 39.8 feet below ground surface. According to (Varnes and Scott, 1967) the thickness of the Douglass Mesa Gravel is 5 to 50 feet at the Academy.

### **4.2. Foundations**

This part of the Academy contains structures typically founded on conventional spread and/or continuous footings. However, due to the amount of fill required to establish the pre-determined finish floor and terrazzo elevations and the subsequent requirement for retaining walls, a deep foundation system may be required. Drilled piers are typically used for deep foundations at the Academy. If drilled piers bear in the Dawson Formation, the concrete should be placed soon after drilling, as some beds slake when exposed to the atmosphere.

It is the responsibility of the Contractor to determine the foundation system based on the available information and that obtained during the final investigation. Foundations shall be designed to limit total settlement of any element to not greater than 1.0 inch and differential settlement between any two adjacent elements to not greater than 0.5 inch.

### **4.3. Floor Slabs**

The Contractor is responsible for determining the suitability of slab-on-grade construction. Floor slabs shall be designed to limit vertical movement to not greater than 1.0 inch.

#### **4.4. Pavements**

Preliminary site plans indicate the re-alignment of Cedar Drive will be constructed during this project. Soils underlying pavement are predominantly silty sands (SM) and sands with silts and gravels (SW-SM). These soils have a frost design classification of F2 from Table 20-2, UFC 3-260-02, "Pavement Design for Airfields".

A concrete sidewalk section is planned to surface the terrazzo area constructed along the south side of the dormitory. Soils underlying this pavement section will be specified by the Contractor in the backfill specifications for the terrazzo retaining wall.

#### **4.5. Retaining Walls**

In the Cadet Academic area, located in the northern part of the Academy, two types of retaining walls have been built, cantilever and counterfort. It is the responsibility of the Contractor to determine the specifics of the retaining wall design after performing the following analyses: stability of the foundation materials under the imposed load, settlement under the imposed load, stability against overturning and stability against sliding.

#### **4.6. Cementing Properties**

Sulfate ion content tests were also performed on three representative samples from the borings. Test results indicated a sulfate ion content of less than 0.2 percent, as is typical of results reported at the Academy. Based on criteria outlined in ACI 201.2, "Guide to Durable Concrete", a "mild" exposure condition exists. Therefore sulfate-resistant cement will not be required, and an ASTM C150 Type I or Type II cement may be used for concrete in contact with soil or groundwater.

Due to the potential for alkali-aggregate reactivity within the boundaries of the Omaha District, cement meeting the optional chemical requirements for low alkali cement on Table 2, ASTM C150 will also be specified for all concrete. The Resource Conservation Recovery Act (RCRA) mandates, where possible, all concrete specifications will also include the option to use pozzolans as a partial replacement for Portland cement.

#### **4.7. Corrosion Potential**

Three soil resistivity tests were performed on the site soils and resulted in low resistivity values ranging from 1472 to 1848 ohm-cm. In accordance with corrosion classifications in the Department of the Army TM 5-811-7, "Electrical Design, Cathodic Protection", a "severe" corrosion potential is anticipated. Tested samples had soil pH measured between 7.7 and 8.2. Test results are included on the boring logs. The Contractor is responsible for verifying these values.

## **5.0 References**

Carroll, C.J., and Crawford, T.A., 2000, Geological Map of the Colorado Springs Quadrangle, EL Paso County, Colorado. Colorado Geological Survey Open File Report 00-3.

Harza Engineering, 1985, Air Force Academy Trench Site Geology, Report B.

Scott, G.R., 1970, Quaternary Faulting and Potential Earthquakes in East-Central Colorado, in Geological Survey Research 1970, Chapter C. United States Geological Survey Professional Paper 700-C, pages C11-C18.

Scott, G.R., and Wobus, R.A., 1973, Reconnaissance Geologic Map of Colorado Springs and Vicinity, Colorado. United States Geological Survey Miscellaneous Field Studies, Map MF-482, 2 sheets.

Shelmon, R.J., 1985, Soil-geomorphology Assessment, Ken Caryl, Reynolds Park, and Air Force Academy Trench Sites, Central Front Range, Colorado, Report D, 'in' Geotechnical Advisory Committee, Geologic and Seismotectonic Investigations, East-Central Front Range, Colorado, Third Interim Report-Part II: Denver Water Department, Denver, Colorado, 9p.

Trimble, D.E., and Machette, M.N., 1979, Geological Map of the Colorado Springs-Castle Rock Area, Front Range Urban Corridor, Colorado. United State Geological Survey Miscellaneous Investigations Series, Map 1-857-F.

Varnes, D.J. and Scott, G.R., 1967, General and Engineering Geology of the United States Air Force Academy Site, Colorado, United States Geological Survey Professional Paper 551, 93p.



# Figure 1. Soil Boring Location Plan

Preparatory School Dormitory Project  
US Air Force Academy  
Colorado Springs, Colorado

## Legend

⊙ Soil Boring Location and Designation



Google Earth

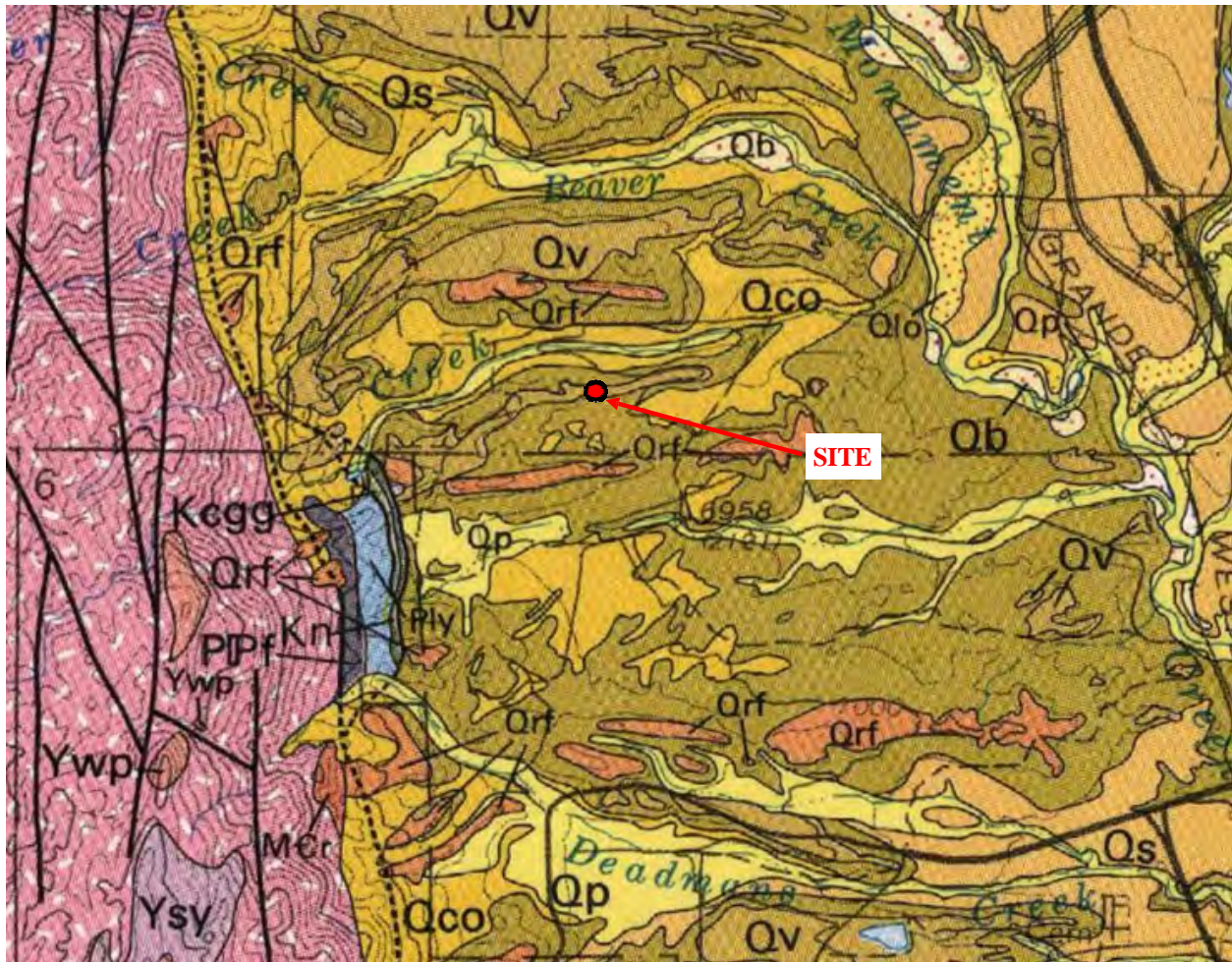
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APPENDIX E

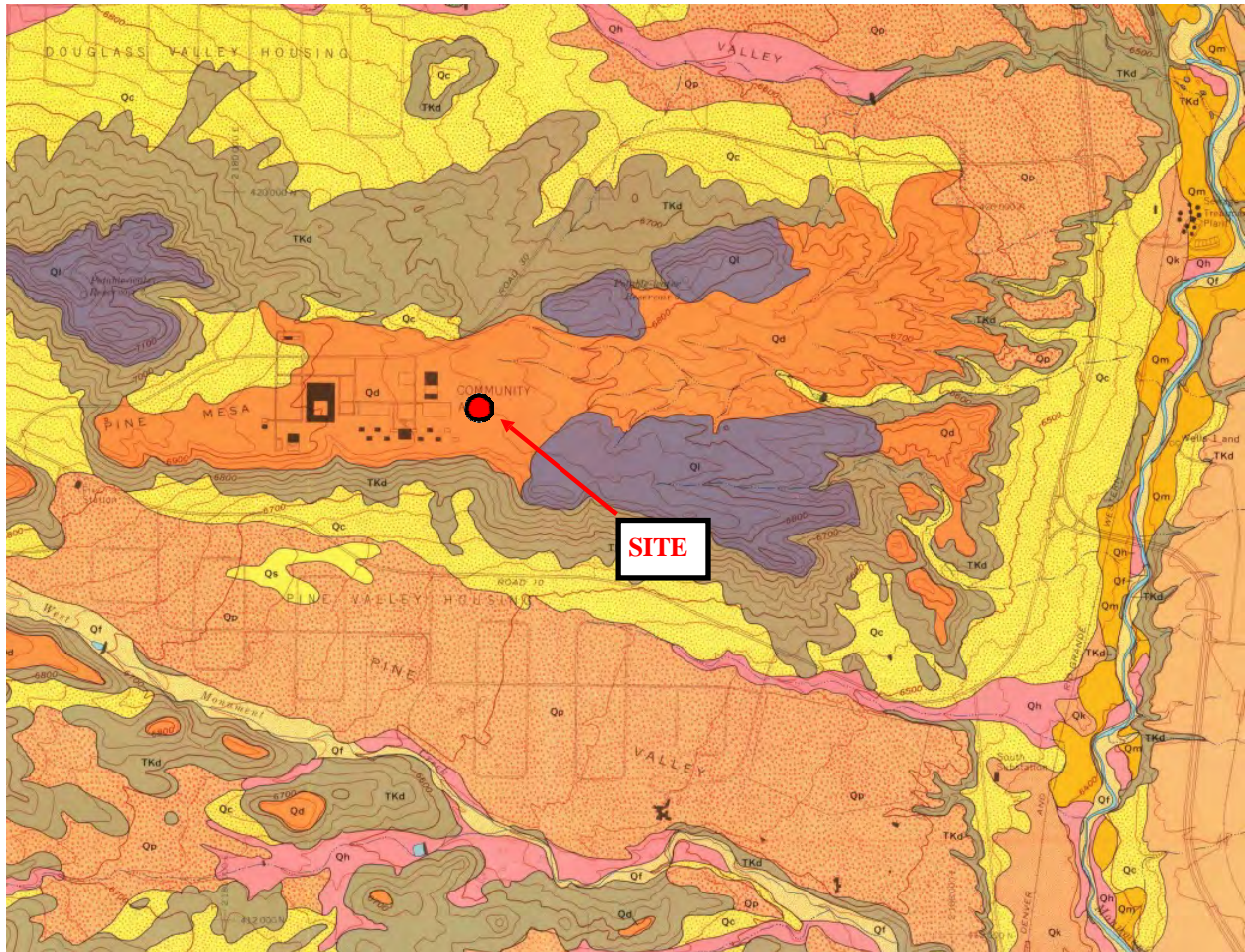
Page 8 of 35  
300 ft











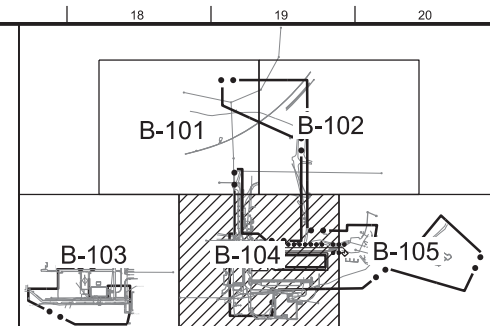
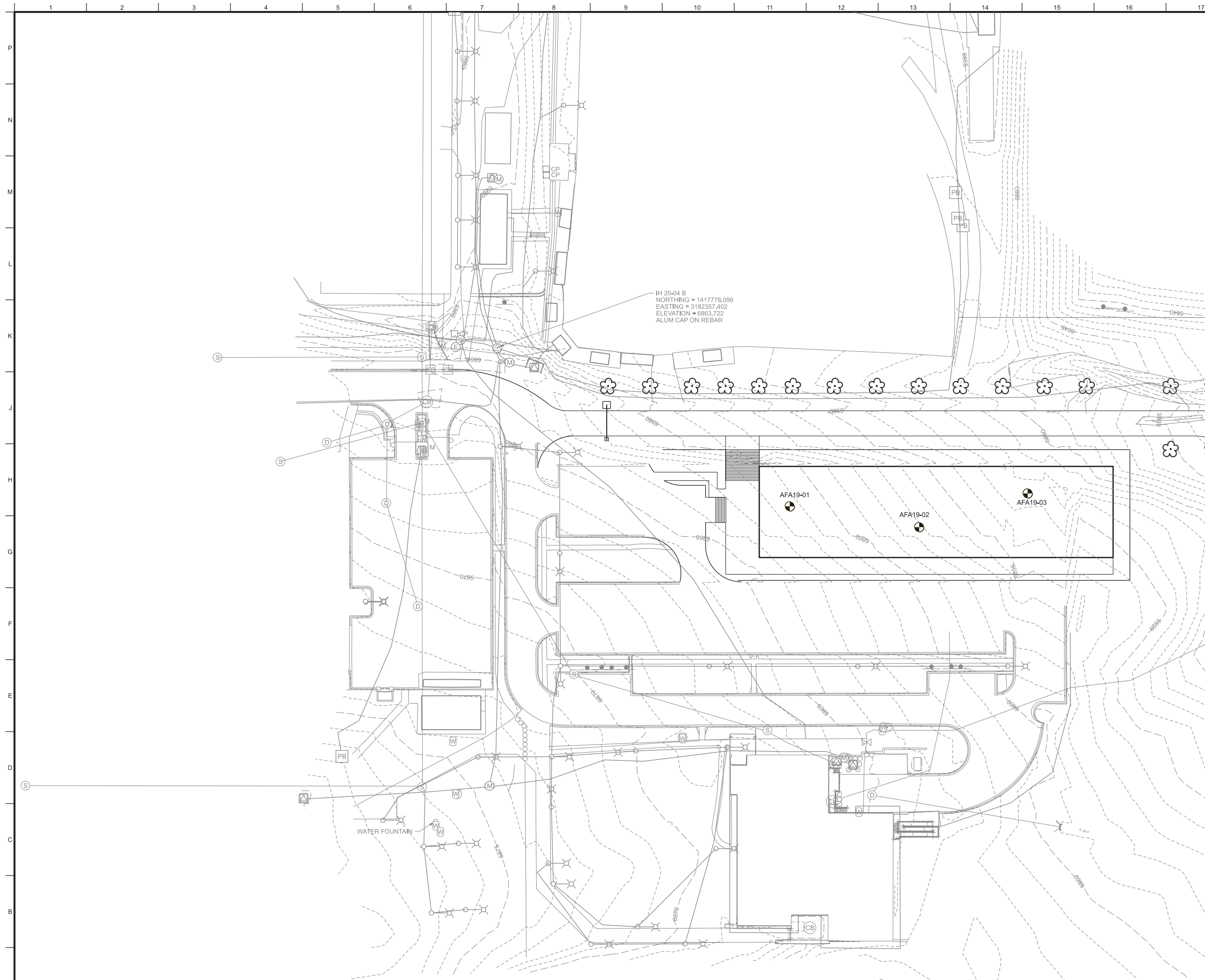
**Geologic Map 2.** A close up view of the site geology from Varnes and Scott, 1967. The site is represented by a red circle. The orange colored rock is a gravel terrace (Douglass Mesa Gravel, or Verdoso Alluvium or Piedmont Gravel two). It rests atop the Tertiary/Paleocene Dawson Formation (brown in this map) and is suspected to be approximately 40 feet thick at this location. For additional information on rock units see Varnes and Scott 1967.

## ATTACHMENT 1

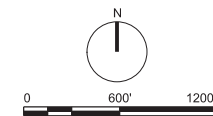


## ATTACHMENT 2






### KEY PLAN



### LEGEND

AFA19-01  SOIL BORING LOCATION AND DESIGNATION

**US Army Corps  
of Engineers®**

[illegible]

U.S. ARMY CORPS OF ENGINEERS OMAHA DISTRICT 1616 CAPITOL AVE OMAHA, NE 68102	C. FRITZ ZSCH	ISSUE DATE: JAN 2020
	DRAWN BY: C. FRITZ ZSCH	SOLICITATION NO.:
	CHECKED BY: K. HALL	CONTRACT NO.:
	SUBMITTED BY: K. HALL	FILE NUMBER:
	SIZES:	FILE NAME:
	ANSI D	A470B-04.DGN

AIR FORCE ACADEMY, COLORADO  
CONSOLIDATED PREPARATORY SCHOOL DORMITORIES

SOIL BORING LOCATION PLAN  
WITH PRELIMINARY SITE PLAN

SHEET ID

B-104

## ATTACHMENT 3

**US Air Force Academy - Preparatory School Dorm  
US Air Force Academy, CO**

**Terracon Project No. 05191378**

	Boring and Sample Nos.	Depth (ft)	Description	USCS	Sieve % Passing										Atterberg			Moisture Content	Required Tests
					3"	3/4"	1/2"	3/8"	#4	#10	#20	#40	#80	#200	LL	PL	PI	%	
	AFA19-01 D-1	0.5-2.0	7.5YR 3/3 Dark Brown Clayey Sand with Gravel	SC	100.0	91.7	89.0	82.7	67.2	49.2	36.6	28.9	20.0	13.2	27	19	8	6.3	MA, AL, MC
	D-2	3.0-4.5	5YR 5/4 Reddish Brown Well-Graded Sand with Silt and Gravel	SW-SM	100.0	97.9	89.8	85.0	69.6	49.7	34.0	25.0	17.3	11.8				4.8	MA, MC
	D-3	5.5-6.2	5YR 5/4 Reddish Brown Silty Sand with Gravel	SM	100.0	100.0	90.4	84.0	73.3	54.5	40.5	32.2	22.9	15.2				4.9	MA, MC
	D-4	6.2-6.7	7.5YR 5/4 Brown Lean Clay with Sand	CL	100.0	100.0	100.0	100.0	98.8	97.0	95.9	90.9	73.4	41	17	24	21.9	MA, AL, MC	
	D-5	6.7-7.0	Entire Sample went to chemistry testing	Similar to AFA19-01, D-1, 0.5'-2.0'													18.2	Chemistry, MC	
	D-6	8.0-9.5	5YR 5/4 Reddish Brown Well-Graded Sand with Silt and Gravel	SW-SM	100.0	94.0	85.6	82.4	70.4	48.3	33.2	25.0	17.2	11.3				4.1	MA, MC
	D-7	13.0-14.5	2.5YR 4/6 Red Well-Graded Sand with Silt and Gravel	SW-SM	100.0	100.0	93.7	88.0	75.9	50.2	30.3	20.4	13.2	8.7				5.5	MA, MC
	D-8	18.5-20.0	5YR 3/4 Dark Reddish Brown Well-Graded Sand with Silt and Gravel	SW-SM	100.0	100.0	97.0	93.6	83.4	54.3	29.6	18.5	10.9	7.0				5.5	MA, MC



**US Air Force Academy - Preparatory School Dorm  
US Air Force Academy, CO**

**Terracon Project No. 05191378**

	Boring and Sample Nos.	Depth (ft)	Description	USCS	Sieve % Passing										Atterberg			Moisture Content	Required Tests
					3"	3/4"	1/2"	3/8"	#4	#10	#20	#40	#80	#200	LL	PL	PI	%	
	AFA19-02 D-1	0.5-2.0	10YR 4/6 Dark Yellowish Brown Well-Graded Sand with Silt and Gravel	SW-SM	100.0	96.6	86.8	80.4	70.0	49.4	34.4	25.7	16.8	10.3				4.1	MA, MC
	D-2	3.0-4.5	5YR 5/2 Reddish Gray Well-Graded Sand with Silt and Gravel	SW-SM	100.0	100.0	94.4	88.2	73.4	51.3	36.1	27.0	18.2	10.8				4.8	MA, MC
	D-3	5.5-7.0	5YR 5/2 Reddish Gray Silty Sand with Gravel	SM	100.0	94.4	85.0	78.8	63.6	44.6	31.8	25.0	18.3	12.6				4.1	MA, MC
	D-4	8.0-9.5	2.5YR 4/6 Red Well-Graded Sand with Silt and Gravel	SW-SM	100.0	90.8	82.6	77.4	67.8	48.7	33.8	25.4	17.6	11.2				5.1	MA, MC
	D-5	13.0-14.5	2.5YR 4/6 Red Well-Graded Sand with Clay and Gravel	SW-SC	100.0	100.0	98.0	93.4	83.2	57.2	34.5	22.6	14.2	9.9	25	18	7	7.0	MA, AL, MC
	D-6	18.0-19.5	5YR 5/3 Reddish Brown Well-Graded Sand with Silt	SW-SM	100.0	100.0	99.1	94.9	85.2	56.4	33.1	22.4	14.2	9.3				7.8	MA, MC
	D-7	23.0-24.5	5YR 5/3 Reddish Brown Silty Sand	SM	100.0	100.0	96.4	95.5	89.2	68.2	50.8	39.0	25.8	15.9				8.9	MA, MC
	D-8	28.0-29.5	7.5YR 5/4 Brown Silty, Clayey Sand with Gravel	SC-SM	100.0	95.1	90.3	86.5	78.2	63.3	48.9	39.1	26.9	16.7	23	19	4	12.7	MA, AL, MC
	D-9	33.0-34.5	7.5YR 5/4 Brown Well-Graded Sand with Silt and Gravel	SW-SM	100.0	96.2	88.4	84.3	72.1	49.8	30.6	20.6	13.1	8.2				5.1	MA, MC
	D-10	38.0-38.7	7.5YR 5/4 Brown Silty Sand with Gravel	SM	100.0	91.3	85.7	78.7	68.4	51.0	34.5	25.8	18.0	12.0				5.1	MA, MC

US Air Force Academy - Preparatory School Dorm  
US Air Force Academy, CO

Terracon Project No. 05191378

	Boring and Sample Nos.	Depth (ft)	Description	USCS	Sieve % Passing										Atterberg			Moisture Content	Required Tests
					3"	3/4"	1/2"	3/8"	#4	#10	#20	#40	#80	#200	LL	PL	PI	%	
	AFA19-03 D-1	0.5-2.0	7.5YR 5/2 Brown Silty Sand with Gravel	SM	100.0	100.0	94.7	91.4	78.3	55.6	39.2	30.1	20.9	13.1				7.0	MA, MC
	D-2	3.0-4.5	2.5YR 5/3 Reddish Brown Well-Graded Sand with Silt and Gravel	SW-SM	100.0	100.0	97.5	89.7	75.4	50.6	33.6	25.4	17.5	11.4				4.6	MA, MC
	D-3	5.5-7.0	2.5YR 5/3 Reddish Brown Well-Graded Sand with Clay and Gravel	SW-SC	100.0	96.7	80.7	76.5	66.1	47.4	31.4	22.5	15.1	10.2	22	18	4	4.6	MA, AL, MC
	D-4	8.0-9.5	2.5YR 5/6 Red Silty Sand with Gravel	SM	100.0	100.0	96.5	90.2	77.8	60.8	43.5	32.2	21.2	13.7	20	18	2	7.4	MA, AL, MC
	D-5	13.0-14.5	2.5YR 5/6 Red Poorly-Graded Sand with Clay	SP-SC	100.0	100.0	100.0	97.6	89.0	63.2	36.7	23.2	15.5	11.6	33	13	20	9.0	MA, AL, MC
	D-6	18.5-20.0	2.5YR 5/6 Red Well-Graded Sand with Silt and Gravel	SW-SM	100.0	100.0	96.9	91.8	80.7	56.8	38.5	27.7	17.5	10.7	21	18	3	6.5	MA, AL, MC

**Terracon**

# PLASTICITY TEST REPORT

**Report Number:** 05191378.0028  
**Service Date:** 12/09/19  
**Report Date:** 12/09/19  
**Task:** 02 - Laboratory Soil / Aggregate Testing

**Terracon**  
15080 A Cir  
Omaha, NE 68144-5558  
402-330-2202

## Client

US Army Corps of Engineers  
Dam Safety Production Center, Dam Safety Section  
Attn: Carolyn Fritsch  
1616 Capitol Ave  
Omaha, NE 68102-4909

## Project

US Air Force Academy - Preparatory School Dorm  
Contract No. W9128F19D0018  
Order Number W9128F20F0027  
United States Air Force Academy, CO 80840  
Project Number: 05191378

## Material Information

**Source of Material:** On-site  
**Proposed Use:**  
**Soil Description:** 7.5YR 3/3 Dark Brown  
  
**Classification:** Clayey Sand with Gravel (SC)

## Sample Information

**Sample Location:** AFA19-01, D-1, 0.5'-2.0'

**Sampled By:** Client  
**Sample Date:**

## Laboratory Test Data

	<u>Result</u>	<u>Requirements</u>
<b>Liquid Limit:</b>	27	
<b>Plastic Limit:</b>	19	
<b>Plasticity Index:</b>	8	
<b>In-Place Moist. (%):</b>	6.3	
<b>Passing #4 (%):</b>	67.2	
<b>Passing #200 (%):</b>	13.2	

**Liquid Limit Method:** Method B  
**Sample Preparation:** Dry

## Comments:

## Services:

**Terracon Rep.:** Client

**Reported To:**

**Contractor:**

**Report Distribution:**

(1) US Army Corps of Engineers, Carolyn  
Fritsch

**Reviewed By:**

*Scott C. Gregory*

Scott C. Gregory  
Lab Manager

**Test Methods:** ASTM D422, ASTM D2216, ASTM D4318

The tests were performed in general accordance with applicable ASTM, AASHTO, or DOT test methods. This report is exclusively for the use of the client indicated above and shall not be reproduced except in full without the written consent of our company. Test results transmitted herein are only applicable to the actual samples tested at the location(s) referenced and are not necessarily indicative of the properties of other apparently similar or identical materials.

# PLASTICITY TEST REPORT

**Report Number:** 05191378.0029  
**Service Date:** 12/09/19  
**Report Date:** 12/09/19  
**Task:** 02 - Laboratory Soil / Aggregate Testing

**Terracon**  
15080 A Cir  
Omaha, NE 68144-5558  
402-330-2202

## Client

US Army Corps of Engineers  
Dam Safety Production Center, Dam Safety Section  
Attn: Carolyn Fritzsche  
1616 Capitol Ave  
Omaha, NE 68102-4909

## Project

US Air Force Academy - Preparatory School Dorm  
Contract No. W9128F19D0018  
Order Number W9128F20F0027  
United States Air Force Academy, CO 80840  
Project Number: 05191378

## Material Information

**Source of Material:** On-site  
**Proposed Use:**  
**Soil Description:** 7.5YR 5/4 Brown  
  
**Classification:** Lean Clay with Sand (CL)

## Sample Information

**Sample Location:** AFA19-01, D-4, 6.2'-6.7'

**Sampled By:** Client  
**Sample Date:**

## Laboratory Test Data

	<u>Result</u>	<u>Requirements</u>
<b>Liquid Limit:</b>	41	
<b>Plastic Limit:</b>	17	
<b>Plasticity Index:</b>	24	
<b>In-Place Moist. (%):</b>	21.9	
<b>Passing #4 (%):</b>	100.0	
<b>Passing #200 (%):</b>	73.4	

**Liquid Limit Method:** Method B  
**Sample Preparation:** Dry

## Comments:

## Services:

**Terracon Rep.:** Client

**Reported To:**

**Contractor:**

**Report Distribution:**

(1) US Army Corps of Engineers, Carolyn  
Fritzsche

**Reviewed By:**

*Scott C. Gregory*

Scott C. Gregory  
Lab Manager

**Test Methods:** ASTM D422, ASTM D2216, ASTM D4318

The tests were performed in general accordance with applicable ASTM, AASHTO, or DOT test methods. This report is exclusively for the use of the client indicated above and shall not be reproduced except in full without the written consent of our company. Test results transmitted herein are only applicable to the actual samples tested at the location(s) referenced and are not necessarily indicative of the properties of other apparently similar or identical materials.

# PLASTICITY TEST REPORT

**Report Number:** 05191378.0030  
**Service Date:** 12/09/19  
**Report Date:** 12/09/19  
**Task:** 02 - Laboratory Soil / Aggregate Testing

**Terracon**  
15080 A Cir  
Omaha, NE 68144-5558  
402-330-2202

## Client

US Army Corps of Engineers  
Dam Safety Production Center, Dam Safety Section  
Attn: Carolyn Fritzsche  
1616 Capitol Ave  
Omaha, NE 68102-4909

## Project

US Air Force Academy - Preparatory School Dorm  
Contract No. W9128F19D0018  
Order Number W9128F20F0027  
United States Air Force Academy, CO 80840  
Project Number: 05191378

## Material Information

**Source of Material:** On-site  
**Proposed Use:**  
**Soil Description:** 2.5Y 4/6 Red  
  
**Classification:** Well-Graded Sand with Clay and Gravel (SW-SC)

## Sample Information

**Sample Location:** AFA19-02, D-5, 13.0'-14.5'

**Sampled By:** Client  
**Sample Date:**

## Laboratory Test Data

	<u>Result</u>	<u>Requirements</u>
<b>Liquid Limit:</b>	25	
<b>Plastic Limit:</b>	18	
<b>Plasticity Index:</b>	7	
<b>In-Place Moist. (%):</b>	7.0	
<b>Passing #4 (%):</b>	83.2	
<b>Passing #200 (%):</b>	9.9	

**Liquid Limit Method:** Method B  
**Sample Preparation:** Dry

## Comments:

## Services:

**Terracon Rep.:** Client

**Reported To:**

**Contractor:**

**Report Distribution:**

(1) US Army Corps of Engineers, Carolyn Fritzsche

**Reviewed By:**

*Scott C. Gregory*

Scott C. Gregory  
Lab Manager

**Test Methods:** ASTM D422, ASTM D2216, ASTM D4318

The tests were performed in general accordance with applicable ASTM, AASHTO, or DOT test methods. This report is exclusively for the use of the client indicated above and shall not be reproduced except in full without the written consent of our company. Test results transmitted herein are only applicable to the actual samples tested at the location(s) referenced and are not necessarily indicative of the properties of other apparently similar or identical materials.

# PLASTICITY TEST REPORT

**Report Number:** 05191378.0031  
**Service Date:** 12/09/19  
**Report Date:** 12/09/19  
**Task:** 02 - Laboratory Soil / Aggregate Testing

**Terracon**  
15080 A Cir  
Omaha, NE 68144-5558  
402-330-2202

## Client

US Army Corps of Engineers  
Dam Safety Production Center, Dam Safety Section  
Attn: Carolyn Fritzsche  
1616 Capitol Ave  
Omaha, NE 68102-4909

## Project

US Air Force Academy - Preparatory School Dorm  
Contract No. W9128F19D0018  
Order Number W9128F20F0027  
United States Air Force Academy, CO 80840  
Project Number: 05191378

## Material Information

**Source of Material:** On-site  
**Proposed Use:**  
**Soil Description:** 7.5YR 5/4 Brown  
  
**Classification:** Silty, Clayey Sand with Gravel (SC-SM)

## Sample Information

**Sample Location:** AFA19-02, D-8, 28.0'-29.5'

**Sampled By:** Client  
**Sample Date:**

## Laboratory Test Data

	<u>Result</u>	<u>Requirements</u>
<b>Liquid Limit:</b>	23	
<b>Plastic Limit:</b>	19	
<b>Plasticity Index:</b>	4	
<b>In-Place Moist. (%):</b>	12.7	
<b>Passing #4 (%):</b>	78.2	
<b>Passing #200 (%):</b>	16.7	

**Liquid Limit Method:** Method B  
**Sample Preparation:** Dry

## Comments:

## Services:

**Terracon Rep.:** Client

**Reported To:**

**Contractor:**

**Report Distribution:**

(1) US Army Corps of Engineers, Carolyn  
Fritzsche

**Reviewed By:**

*Scott C. Gregory*

Scott C. Gregory  
Lab Manager

**Test Methods:** ASTM D422, ASTM D2216, ASTM D4318

The tests were performed in general accordance with applicable ASTM, AASHTO, or DOT test methods. This report is exclusively for the use of the client indicated above and shall not be reproduced except in full without the written consent of our company. Test results transmitted herein are only applicable to the actual samples tested at the location(s) referenced and are not necessarily indicative of the properties of other apparently similar or identical materials.

# PLASTICITY TEST REPORT

**Report Number:** 05191378.0032  
**Service Date:** 12/09/19  
**Report Date:** 12/09/19  
**Task:** 02 - Laboratory Soil / Aggregate Testing

**Terracon**  
15080 A Cir  
Omaha, NE 68144-5558  
402-330-2202

## Client

US Army Corps of Engineers  
Dam Safety Production Center, Dam Safety Section  
Attn: Carolyn Fritsch  
1616 Capitol Ave  
Omaha, NE 68102-4909

## Project

US Air Force Academy - Preparatory School Dorm  
Contract No. W9128F19D0018  
Order Number W9128F20F0027  
United States Air Force Academy, CO 80840  
Project Number: 05191378

## Material Information

**Source of Material:** On-site  
**Proposed Use:**  
**Soil Description:** 2.5YR 5/3 Reddish Brown  
  
**Classification:** Well-Graded Sand with Clay and Gravel (SW-SC)

## Sample Information

**Sample Location:** AFA19-03, D-3, 5.5'-7.0'

**Sampled By:** Client  
**Sample Date:**

## Laboratory Test Data

	<u>Result</u>	<u>Requirements</u>
<b>Liquid Limit:</b>	22	
<b>Plastic Limit:</b>	18	
<b>Plasticity Index:</b>	4	
<b>In-Place Moist. (%):</b>	4.6	
<b>Passing #4 (%):</b>	66.1	
<b>Passing #200 (%):</b>	10.2	

**Liquid Limit Method:** Method B  
**Sample Preparation:** Dry

## Comments:

## Services:

**Terracon Rep.:** Client

**Reported To:**

**Contractor:**

**Report Distribution:**

(1) US Army Corps of Engineers, Carolyn Fritsch

**Reviewed By:**

*Scott C. Gregory*

Scott C. Gregory  
Lab Manager

**Test Methods:** ASTM D422, ASTM D2216, ASTM D4318

The tests were performed in general accordance with applicable ASTM, AASHTO, or DOT test methods. This report is exclusively for the use of the client indicated above and shall not be reproduced except in full without the written consent of our company. Test results transmitted herein are only applicable to the actual samples tested at the location(s) referenced and are not necessarily indicative of the properties of other apparently similar or identical materials.

# PLASTICITY TEST REPORT

**Report Number:** 05191378.0033  
**Service Date:** 12/09/19  
**Report Date:** 12/09/19  
**Task:** 02 - Laboratory Soil / Aggregate Testing

**Terracon**  
15080 A Cir  
Omaha, NE 68144-5558  
402-330-2202

## Client

US Army Corps of Engineers  
Dam Safety Production Center, Dam Safety Section  
Attn: Carolyn Fritzsche  
1616 Capitol Ave  
Omaha, NE 68102-4909

## Project

US Air Force Academy - Preparatory School Dorm  
Contract No. W9128F19D0018  
Order Number W9128F20F0027  
United States Air Force Academy, CO 80840  
Project Number: 05191378

## Material Information

**Source of Material:** On-site  
**Proposed Use:**  
**Soil Description:** 2.5YR 5/6 Red  
  
**Classification:** Silty Sand with Gravel (SM)

## Sample Information

**Sample Location:** AFA19-03, D-4, 8.0'-9.5'

**Sampled By:** Client  
**Sample Date:**

## Laboratory Test Data

	<u>Result</u>	<u>Requirements</u>
<b>Liquid Limit:</b>	20	
<b>Plastic Limit:</b>	18	
<b>Plasticity Index:</b>	2	
<b>In-Place Moist. (%):</b>	7.4	
<b>Passing #4 (%):</b>	77.8	
<b>Passing #200 (%):</b>	13.7	

**Liquid Limit Method:** Method B  
**Sample Preparation:** Dry

## Comments:

## Services:

**Terracon Rep.:** Client

**Reported To:**

**Contractor:**

**Report Distribution:**

(1) US Army Corps of Engineers, Carolyn  
Fritzsche

**Reviewed By:**

*Scott C. Gregory*

Scott C. Gregory  
Lab Manager

**Test Methods:** ASTM D422, ASTM D2216, ASTM D4318

The tests were performed in general accordance with applicable ASTM, AASHTO, or DOT test methods. This report is exclusively for the use of the client indicated above and shall not be reproduced except in full without the written consent of our company. Test results transmitted herein are only applicable to the actual samples tested at the location(s) referenced and are not necessarily indicative of the properties of other apparently similar or identical materials.



# PLASTICITY TEST REPORT

**Report Number:** 05191378.0034  
**Service Date:** 12/09/19  
**Report Date:** 12/09/19  
**Task:** 02 - Laboratory Soil / Aggregate Testing

**Terracon**  
15080 A Cir  
Omaha, NE 68144-5558  
402-330-2202

## Client

US Army Corps of Engineers  
Dam Safety Production Center, Dam Safety Section  
Attn: Carolyn Fritsch  
1616 Capitol Ave  
Omaha, NE 68102-4909

## Project

US Air Force Academy - Preparatory School Dorm  
Contract No. W9128F19D0018  
Order Number W9128F20F0027  
United States Air Force Academy, CO 80840  
Project Number: 05191378

## Material Information

**Source of Material:** On-site  
**Proposed Use:**  
**Soil Description:** 2.5YR 5/6 Red  
  
**Classification:** Poorly-Graded Sand with Clay (SP-SC)

## Sample Information

**Sample Location:** AFA19-03, D-5, 13.0'-14.5'

**Sampled By:** Client  
**Sample Date:**

## Laboratory Test Data

	<u>Result</u>	<u>Requirements</u>
<b>Liquid Limit:</b>	33	
<b>Plastic Limit:</b>	13	
<b>Plasticity Index:</b>	20	
<b>In-Place Moist. (%):</b>	9.0	
<b>Passing #4 (%):</b>	89.0	
<b>Passing #200 (%):</b>	11.6	

**Liquid Limit Method:** Method B  
**Sample Preparation:** Dry

## Comments:

## Services:

**Terracon Rep.:** Client

**Reported To:**

**Contractor:**

**Report Distribution:**

(1) US Army Corps of Engineers, Carolyn Fritsch

**Reviewed By:**

*Scott C. Gregory*

Scott C. Gregory  
Lab Manager

**Test Methods:** ASTM D422, ASTM D2216, ASTM D4318

The tests were performed in general accordance with applicable ASTM, AASHTO, or DOT test methods. This report is exclusively for the use of the client indicated above and shall not be reproduced except in full without the written consent of our company. Test results transmitted herein are only applicable to the actual samples tested at the location(s) referenced and are not necessarily indicative of the properties of other apparently similar or identical materials.

# PLASTICITY TEST REPORT

**Report Number:** 05191378.0035  
**Service Date:** 12/09/19  
**Report Date:** 12/09/19  
**Task:** 02 - Laboratory Soil / Aggregate Testing

**Terracon**  
15080 A Cir  
Omaha, NE 68144-5558  
402-330-2202

## Client

US Army Corps of Engineers  
Dam Safety Production Center, Dam Safety Section  
Attn: Carolyn Fritzsche  
1616 Capitol Ave  
Omaha, NE 68102-4909

## Project

US Air Force Academy - Preparatory School Dorm  
Contract No. W9128F19D0018  
Order Number W9128F20F0027  
United States Air Force Academy, CO 80840  
Project Number: 05191378

## Material Information

**Source of Material:** On-site  
**Proposed Use:**  
**Soil Description:** 2.5YR 5/6 Red  
  
**Classification:** Well-Graded Sand with Silt and Gravel (SW-SM)

## Sample Information

**Sample Location:** AFA19-03, D-6, 18.5'-20.0'

**Sampled By:** Client  
**Sample Date:**

## Laboratory Test Data

	<u>Result</u>	<u>Requirements</u>
<b>Liquid Limit:</b>	21	
<b>Plastic Limit:</b>	18	
<b>Plasticity Index:</b>	3	
<b>In-Place Moist. (%):</b>	6.5	
<b>Passing #4 (%):</b>	80.7	
<b>Passing #200 (%):</b>	10.7	

**Liquid Limit Method:** Method B  
**Sample Preparation:** Dry

## Comments:

## Services:

**Terracon Rep.:** Client

**Reported To:**

**Contractor:**

**Report Distribution:**

(1) US Army Corps of Engineers, Carolyn Fritzsche

**Reviewed By:**

*Scott C. Gregory*

Scott C. Gregory  
Lab Manager

**Test Methods:** ASTM D422, ASTM D2216, ASTM D4318

The tests were performed in general accordance with applicable ASTM, AASHTO, or DOT test methods. This report is exclusively for the use of the client indicated above and shall not be reproduced except in full without the written consent of our company. Test results transmitted herein are only applicable to the actual samples tested at the location(s) referenced and are not necessarily indicative of the properties of other apparently similar or identical materials.

PARTICLE SIZE DISTRIBUTION REPORT

Report Number: 05191378.0004  
Service Date: 12/09/19  
Report Date: 12/09/19  
Task: 02 - Laboratory Soil / Aggregate Testing



15080 A Cir  
Omaha, NE 68144-5558  
402-330-2202

Client

US Army Corps of Engineers  
Dam Safety Production Center, Dam Safety Section  
Attn: Carolyn Fritzsich  
1616 Capitol Ave  
Omaha, NE 68102-4909

Project

US Air Force Academy - Preparatory School Dorm  
Contract No. W9128F19D0018  
Order Number W9128F20F0027  
United States Air Force Academy, CO 80840  
Project Number: 05191378

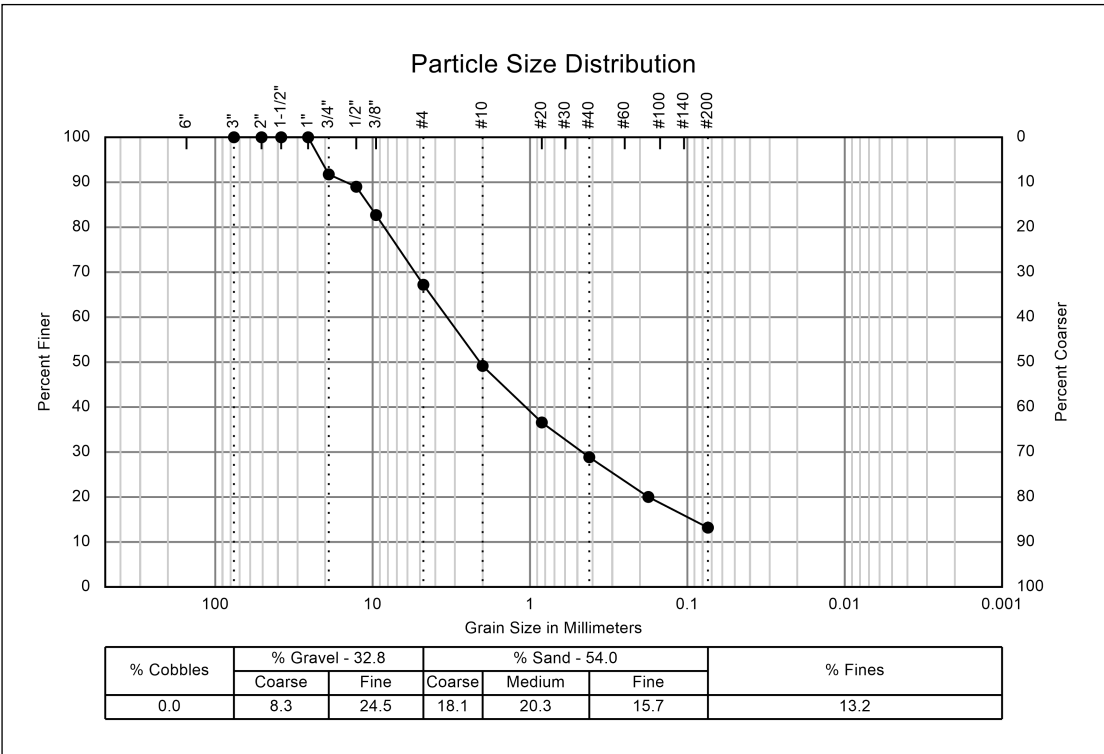
Sample Information

Sample Type: SPT  
Sample Location: AFA19-01, D-1, 0.5'-2.0'  
Sample Description: 7.5YR 3/3 Dark Brown  
USCS: Clayey sand with gravel (SC)

Laboratory Test Data

Test Method: ASTM D422  
Method: NA  
Atterberg Limits: LL - 27, PL - 19, PI - 8  
Sample Preparation: Oven Dried  
Sieving Method: Single Sieve-Set Sieving

Sieve Size	Percent Finer	Spec.*	Pass (X=Fail)
3"	100.0		
2"	100.0		
1-1/2"	100.0		
1"	100.0		
3/4"	91.7		
1/2"	89.0		
3/8"	82.7		
#4	67.2		
#10	49.2		
#20	36.6		
#40	28.9		
#80	20.0		
#200	13.2		



*	$D_{60} = 3.38$	$D_{30} = 0.47$	$D_{10} =$	$C_c =$	$C_u =$	FM =
---	-----------------	-----------------	------------	---------	---------	------

Comments:

Services:  
Terracon Rep.: Client  
Reported To:  
Contractor:  
Report Distribution:  
(1) US Army Corps of Engineers, Carolyn Fritzsich

Reviewed By:   
Scott C. Gregory  
Lab Manager

Test Methods: ASTM D4318

The tests were performed in general accordance with applicable ASTM, AASHTO, or DOT test methods. This report is exclusively for the use of the client indicated above and shall not be reproduced except in full without the written consent of our company. Test results transmitted herein are only applicable to the actual samples tested at the location(s) referenced and are not necessarily indicative of the properties of other apparently similar or identical materials.

PARTICLE SIZE DISTRIBUTION REPORT

Report Number: 05191378.0005  
Service Date: 12/09/19  
Report Date: 12/09/19  
Task: 02 - Laboratory Soil / Aggregate Testing



15080 A Cir  
Omaha, NE 68144-5558  
402-330-2202

Client

US Army Corps of Engineers  
Dam Safety Production Center, Dam Safety Section  
Attn: Carolyn Fritzsich  
1616 Capitol Ave  
Omaha, NE 68102-4909

Project

US Air Force Academy - Preparatory School Dorm  
Contract No. W9128F19D0018  
Order Number W9128F20F0027  
United States Air Force Academy, CO 80840  
Project Number: 05191378

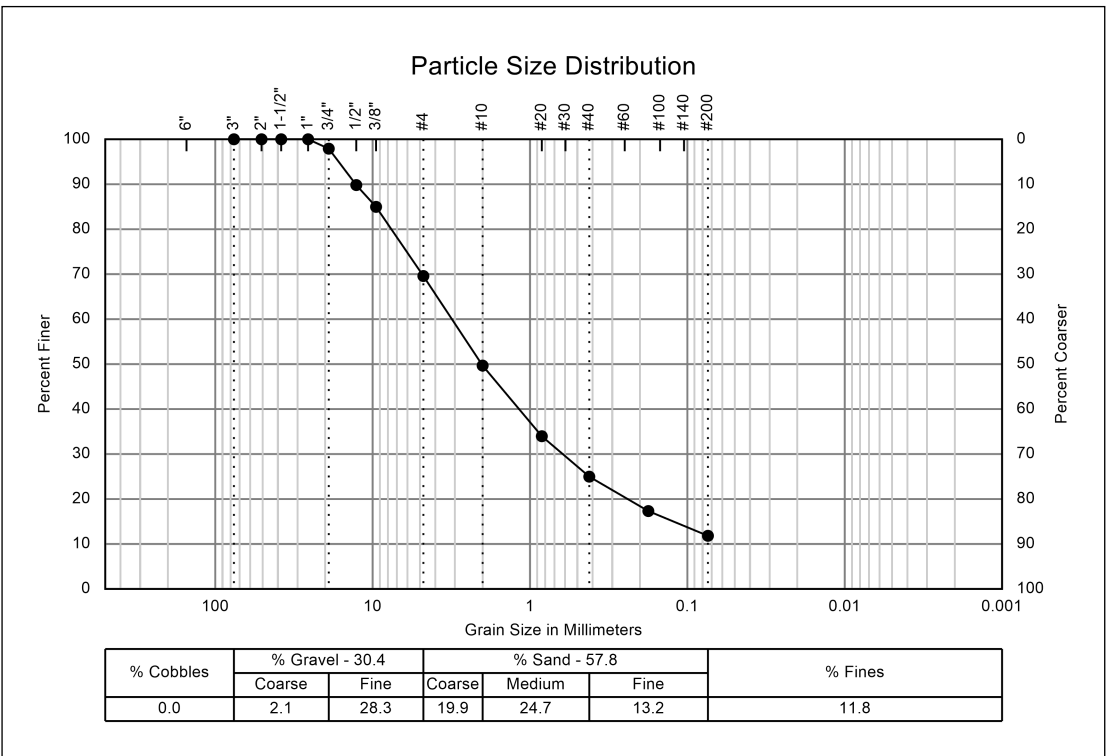
Sample Information

Sample Type: SPT  
Sample Location: AFA19-01, D-2, 3.0'-4.5'  
Sample Description: 5YR 5/4 Reddish Brown  
Well-graded sand with silt and gravel (SW-SM)

Laboratory Test Data

Test Method: ASTM D422  
Method: NA  
Atterberg Limits:  
Sample Preparation: Oven Dried  
Sieving Method: Single Sieve-Set Sieving

Sieve Size	Percent Finer	Spec.*	Pass (X=Fail)
3"	100.0		
2"	100.0		
1-1/2"	100.0		
1"	100.0		
3/4"	97.9		
1/2"	89.8		
3/8"	85.0		
#4	69.6		
#10	49.7		
#20	34.0		
#40	25.0		
#80	17.3		
#200	11.8		



*	$D_{60} = 3.14$	$D_{30} = 0.62$	$D_{10} = 0.06$ (Est.)	$C_c = 2.0$	$C_u = 52.3$	FM =
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Comments:

Services:  
Terracon Rep.: Client  
Reported To:  
Contractor:  
Report Distribution:  
(1) US Army Corps of Engineers, Carolyn Fritzsich

Reviewed By:   
Scott C. Gregory  
Lab Manager

Test Methods:

The tests were performed in general accordance with applicable ASTM, AASHTO, or DOT test methods. This report is exclusively for the use of the client indicated above and shall not be reproduced except in full without the written consent of our company. Test results transmitted herein are only applicable to the actual samples tested at the location(s) referenced and are not necessarily indicative of the properties of other apparently similar or identical materials.

PARTICLE SIZE DISTRIBUTION REPORT

Report Number: 05191378.0006  
Service Date: 12/09/19  
Report Date: 12/09/19  
Task: 02 - Laboratory Soil / Aggregate Testing



15080 A Cir  
Omaha, NE 68144-5558  
402-330-2202

Client

US Army Corps of Engineers  
Dam Safety Production Center, Dam Safety Section  
Attn: Carolyn Fritzsich  
1616 Capitol Ave  
Omaha, NE 68102-4909

Project

US Air Force Academy - Preparatory School Dorm  
Contract No. W9128F19D0018  
Order Number W9128F20F0027  
United States Air Force Academy, CO 80840  
Project Number: 05191378

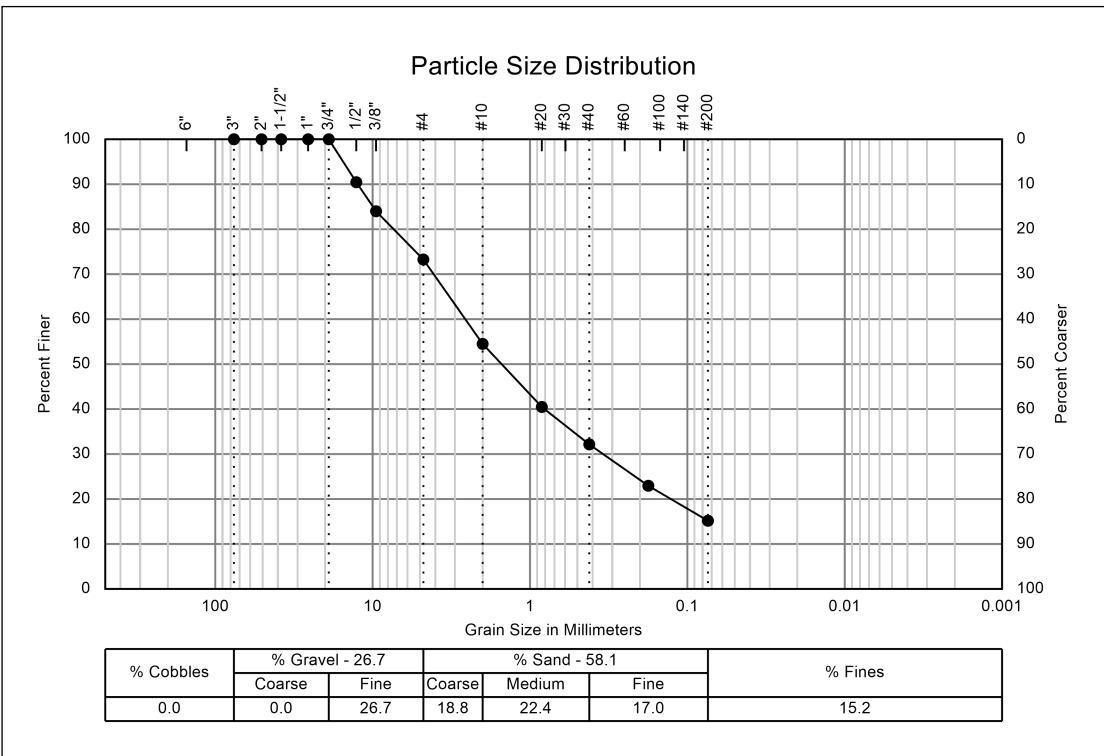
Sample Information

Sample Type: SPT  
Sample Location: AFA19-01, D-3, 5.5'-6.2'  
Sample Description: 5YR 5/4 Reddish Brown  
Silty sand with gravel (SM)

Laboratory Test Data

Test Method: ASTM D422  
Method: NA  
Atterberg Limits:  
Sample Preparation: Oven Dried  
Sieving Method: Single Sieve-Set Sieving

Sieve Size	Percent Finer	Spec.*	Pass (X=Fail)
3"	100.0		
2"	100.0		
1-1/2"	100.0		
1"	100.0		
3/4"	100.0		
1/2"	90.4		
3/8"	84.0		
#4	73.3		
#10	54.5		
#20	40.5		
#40	32.2		
#80	22.9		
#200	15.2		



*	$D_{60} = 2.58$	$D_{30} = 0.34$	$D_{10} =$	$C_c =$	$C_u =$	FM =
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Comments:

Services:  
Terracon Rep.: Client  
Reported To:  
Contractor:  
Report Distribution:  
(1) US Army Corps of Engineers, Carolyn Fritzsich

Reviewed By:   
Scott C. Gregory  
Lab Manager

Test Methods:

The tests were performed in general accordance with applicable ASTM, AASHTO, or DOT test methods. This report is exclusively for the use of the client indicated above and shall not be reproduced except in full without the written consent of our company. Test results transmitted herein are only applicable to the actual samples tested at the location(s) referenced and are not necessarily indicative of the properties of other apparently similar or identical materials.

PARTICLE SIZE DISTRIBUTION REPORT

Report Number: 05191378.0007  
Service Date: 12/09/19  
Report Date: 12/09/19  
Task: 02 - Laboratory Soil / Aggregate Testing



15080 A Cir  
Omaha, NE 68144-5558  
402-330-2202

Client

US Army Corps of Engineers  
Dam Safety Production Center, Dam Safety Section  
Attn: Carolyn Fritzsich  
1616 Capitol Ave  
Omaha, NE 68102-4909

Project

US Air Force Academy - Preparatory School Dorm  
Contract No. W9128F19D0018  
Order Number W9128F20F0027  
United States Air Force Academy, CO 80840  
Project Number: 05191378

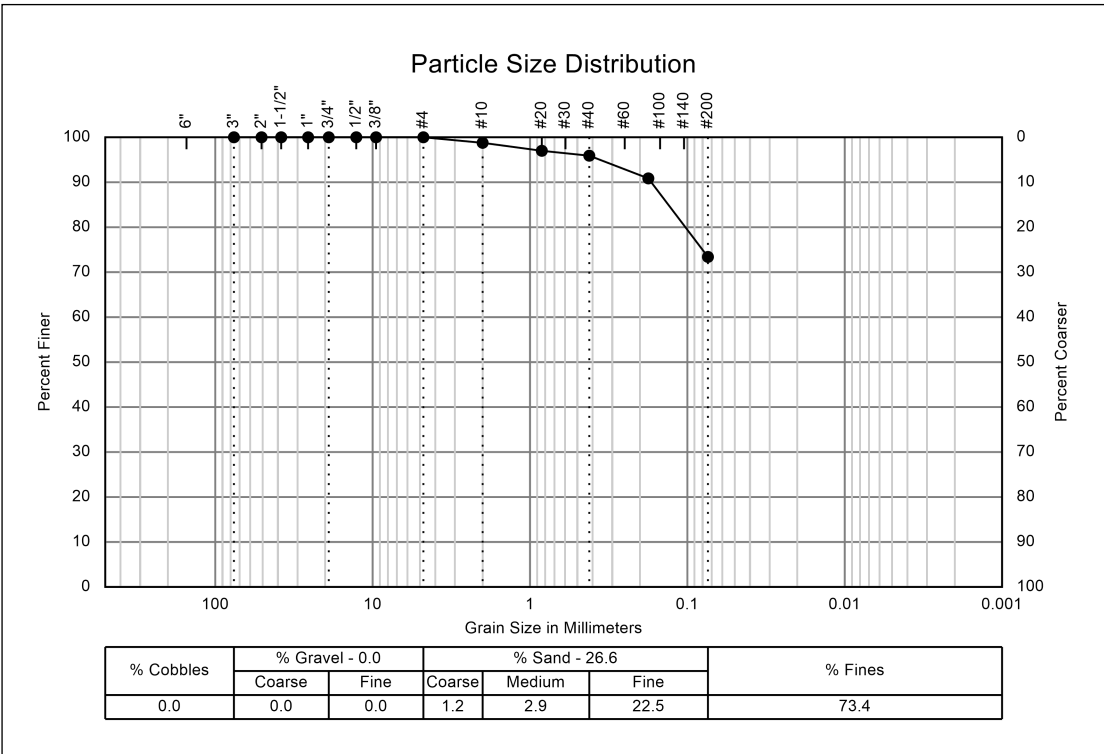
Sample Information

Sample Type: SPT  
Sample Location: AFA19-01, D-4, 6.2'-6.7'  
Sample Description: 7.5YR 5/4 Brown  
USCS: Lean clay with sand (CL)

Laboratory Test Data

Test Method: ASTM D422  
Method: NA  
Atterberg Limits: LL - 41, PL - 17, PI - 24  
Sample Preparation: Oven Dried  
Sieving Method: Single Sieve-Set Sieving

Sieve Size	Percent Finer	Spec.*	Pass (X=Fail)
3"	100.0		
2"	100.0		
1-1/2"	100.0		
1"	100.0		
3/4"	100.0		
1/2"	100.0		
3/8"	100.0		
#4	100.0		
#10	98.8		
#20	97.0		
#40	95.9		
#80	90.9		
#200	73.4		



*	D <sub>60</sub> =	D <sub>30</sub> =	D <sub>10</sub> =	C <sub>c</sub> =	C <sub>u</sub> =	FM =
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Comments:

Services:  
Terracon Rep.: Client  
Reported To:  
Contractor:  
Report Distribution:  
(1) US Army Corps of Engineers, Carolyn Fritzsich

Reviewed By: Scott C. Gregory  
Scott C. Gregory  
Lab Manager

Test Methods: ASTM D4318

The tests were performed in general accordance with applicable ASTM, AASHTO, or DOT test methods. This report is exclusively for the use of the client indicated above and shall not be reproduced except in full without the written consent of our company. Test results transmitted herein are only applicable to the actual samples tested at the location(s) referenced and are not necessarily indicative of the properties of other apparently similar or identical materials.

PARTICLE SIZE DISTRIBUTION REPORT

Report Number: 05191378.0008  
Service Date: 12/09/19  
Report Date: 12/09/19  
Task: 02 - Laboratory Soil / Aggregate Testing



15080 A Cir  
Omaha, NE 68144-5558  
402-330-2202

Client

US Army Corps of Engineers  
Dam Safety Production Center, Dam Safety Section  
Attn: Carolyn Fritzsich  
1616 Capitol Ave  
Omaha, NE 68102-4909

Project

US Air Force Academy - Preparatory School Dorm  
Contract No. W9128F19D0018  
Order Number W9128F20F0027  
United States Air Force Academy, CO 80840  
Project Number: 05191378

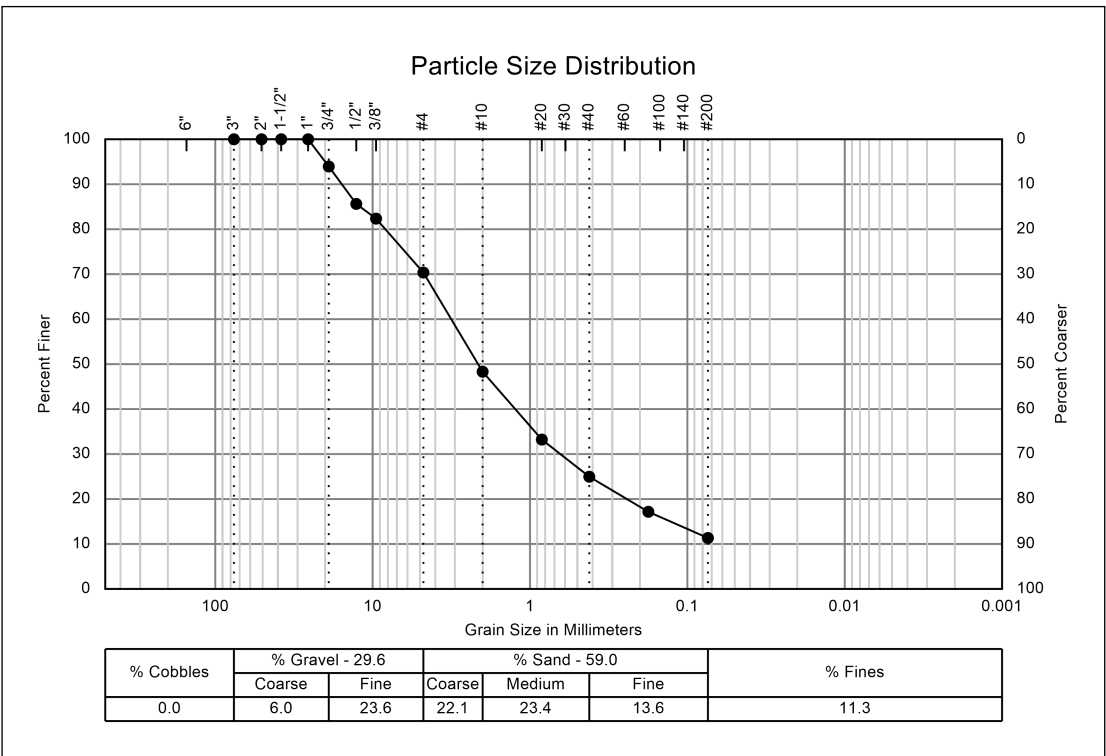
Sample Information

Sample Type: SPT  
Sample Location: AFA19-01, D-6, 8.0'-9.5'  
Sample Description: 5YR 5/4 Reddish Brown  
Well-graded sand with silt and gravel (SW-SM)

Laboratory Test Data

Test Method: ASTM D422  
Method: NA  
Atterberg Limits:  
Sample Preparation: Oven Dried  
Sieving Method: Single Sieve-Set Sieving

Sieve Size	Percent Finer	Spec.*	Pass (X=Fail)
3"	100.0		
2"	100.0		
1-1/2"	100.0		
1"	100.0		
3/4"	94.0		
1/2"	85.6		
3/8"	82.4		
#4	70.4		
#10	48.3		
#20	33.2		
#40	25.0		
#80	17.2		
#200	11.3		



*	$D_{60} = 3.16$	$D_{30} = 0.64$	$D_{10} = 0.06$ (Est.)	$C_c = 2.2$	$C_u = 52.7$	FM =
---	-----------------	-----------------	------------------------	-------------	--------------	------

Comments:

Services:  
Terracon Rep.: Client  
Reported To:  
Contractor:  
Report Distribution:  
(1) US Army Corps of Engineers, Carolyn Fritzsich

Reviewed By:   
Scott C. Gregory  
Lab Manager

Test Methods:

The tests were performed in general accordance with applicable ASTM, AASHTO, or DOT test methods. This report is exclusively for the use of the client indicated above and shall not be reproduced except in full without the written consent of our company. Test results transmitted herein are only applicable to the actual samples tested at the location(s) referenced and are not necessarily indicative of the properties of other apparently similar or identical materials.

PARTICLE SIZE DISTRIBUTION REPORT

Report Number: 05191378.0009  
Service Date: 12/09/19  
Report Date: 12/09/19  
Task: 02 - Laboratory Soil / Aggregate Testing



15080 A Cir  
Omaha, NE 68144-5558  
402-330-2202

Client

US Army Corps of Engineers  
Dam Safety Production Center, Dam Safety Section  
Attn: Carolyn Fritzsich  
1616 Capitol Ave  
Omaha, NE 68102-4909

Project

US Air Force Academy - Preparatory School Dorm  
Contract No. W9128F19D0018  
Order Number W9128F20F0027  
United States Air Force Academy, CO 80840  
Project Number: 05191378

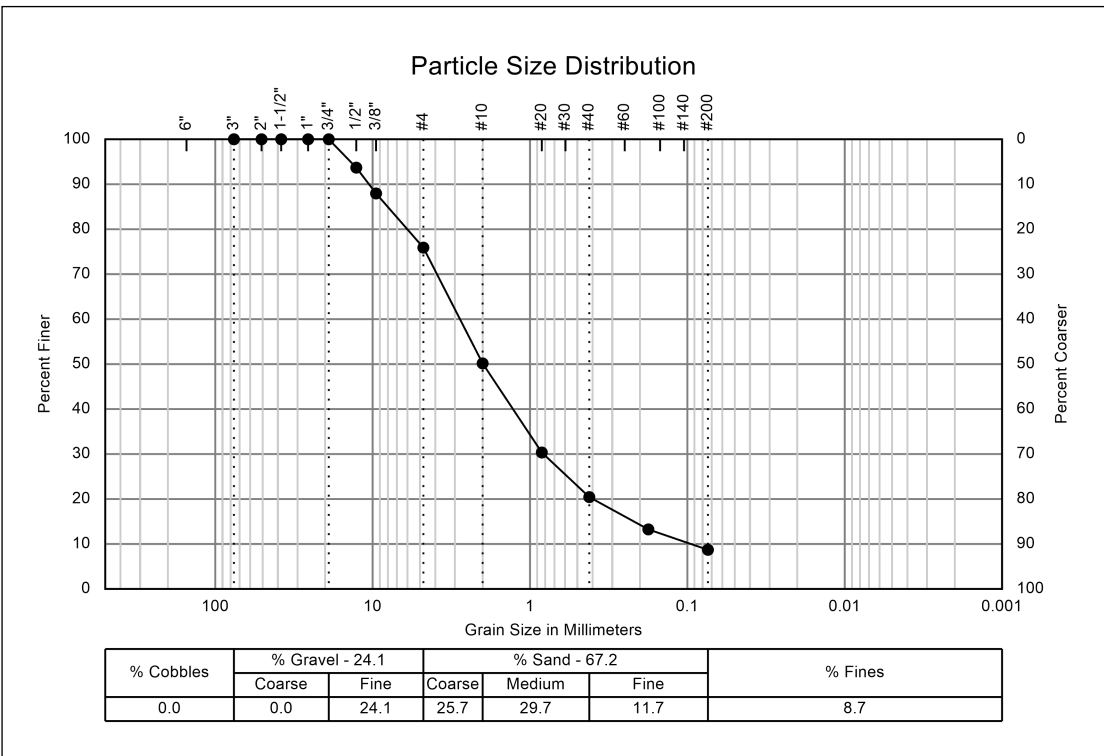
Sample Information

Sample Type: SPT  
Sample Location: AFA19-01, D-7, 13.0'-14.5'  
Sample Description: 2.5Y 4/6 Red  
Well-graded sand with silt and gravel (SW-SM)

Laboratory Test Data

Test Method: ASTM D422  
Method: NA  
Atterberg Limits:  
Sample Preparation: Oven Dried  
Sieving Method: Single Sieve-Set Sieving

Sieve Size	Percent Finer	Spec.*	Pass (X=Fail)
3"	100.0		
2"	100.0		
1-1/2"	100.0		
1"	100.0		
3/4"	100.0		
1/2"	93.7		
3/8"	88.0		
#4	75.9		
#10	50.2		
#20	30.3		
#40	20.4		
#80	13.2		
#200	8.7		



*	$D_{60} = 2.79$	$D_{30} = 0.82$	$D_{10} = 0.09$	$C_c = 2.7$	$C_u = 31.0$	FM =
---	-----------------	-----------------	-----------------	-------------	--------------	------

Comments:

Services:  
Terracon Rep.: Client  
Reported To:  
Contractor:  
Report Distribution:  
(1) US Army Corps of Engineers, Carolyn Fritzsich

Reviewed By:   
Scott C. Gregory  
Lab Manager

Test Methods:

The tests were performed in general accordance with applicable ASTM, AASHTO, or DOT test methods. This report is exclusively for the use of the client indicated above and shall not be reproduced except in full without the written consent of our company. Test results transmitted herein are only applicable to the actual samples tested at the location(s) referenced and are not necessarily indicative of the properties of other apparently similar or identical materials.



PARTICLE SIZE DISTRIBUTION REPORT

Report Number: 05191378.0010  
Service Date: 12/09/19  
Report Date: 12/09/19  
Task: 02 - Laboratory Soil / Aggregate Testing



15080 A Cir  
Omaha, NE 68144-5558  
402-330-2202

Client

US Army Corps of Engineers  
Dam Safety Production Center, Dam Safety Section  
Attn: Carolyn Fritzsich  
1616 Capitol Ave  
Omaha, NE 68102-4909

Project

US Air Force Academy - Preparatory School Dorm  
Contract No. W9128F19D0018  
Order Number W9128F20F0027  
United States Air Force Academy, CO 80840  
Project Number: 05191378

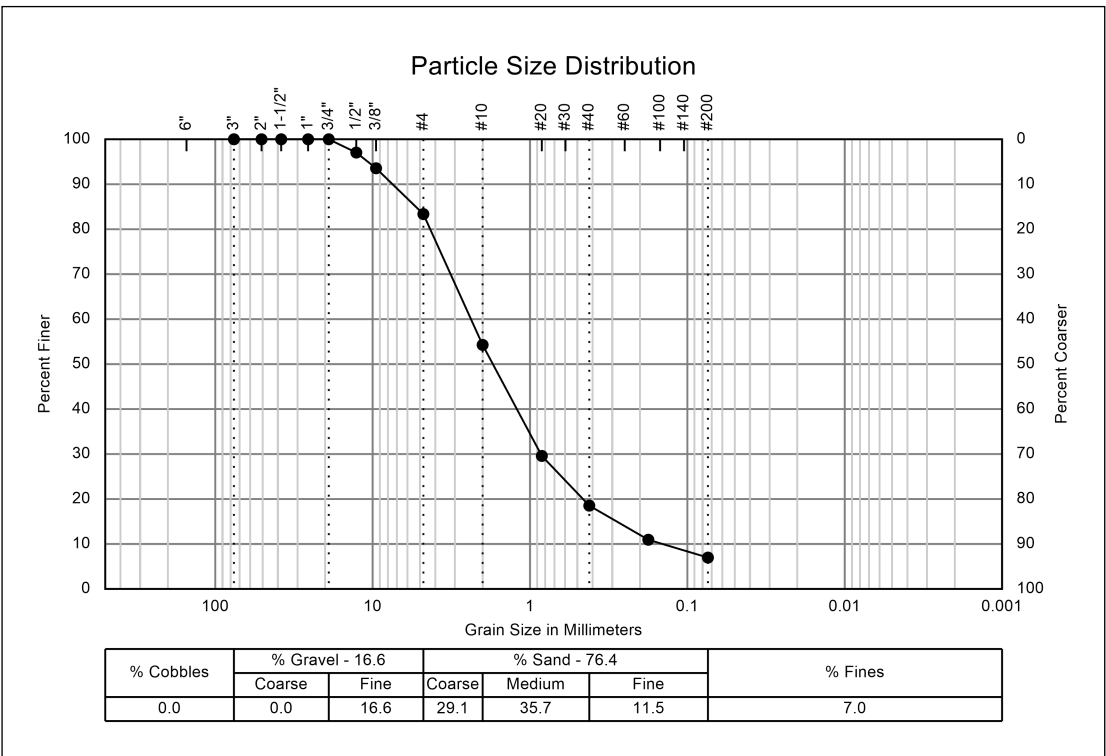
Sample Information

Sample Type: SPT  
Sample Location: AFA19-01, D-8, 18.5'-20.0'  
Sample Description: 5YR 3/4 Dark Reddish Brown  
Well-graded sand with silt and gravel (SW-SM)

Laboratory Test Data

Test Method: ASTM D422  
Method: NA  
Atterberg Limits: LL - 0, PL - 0, PI - 0  
Sample Preparation: Oven Dried  
Sieving Method: Single Sieve-Set Sieving

Sieve Size	Percent Finer	Spec.*	Pass (X=Fail)
3"	100.0		
2"	100.0		
1-1/2"	100.0		
1"	100.0		
3/4"	100.0		
1/2"	97.0		
3/8"	93.6		
#4	83.4		
#10	54.3		
#20	29.6		
#40	18.5		
#80	10.9		
#200	7.0		



*	$D_{60} = 2.37$	$D_{30} = 0.85$	$D_{10} = 0.14$	$C_c = 2.2$	$C_u = 16.9$	FM =
---	-----------------	-----------------	-----------------	-------------	--------------	------

Comments:

Services:  
Terracon Rep.: Client  
Reported To:  
Contractor:  
Report Distribution:  
(1) US Army Corps of Engineers, Carolyn Fritzsich

Reviewed By:   
Scott C. Gregory  
Lab Manager

Test Methods:

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PARTICLE SIZE DISTRIBUTION REPORT

Report Number: 05191378.0011  
Service Date: 12/09/19  
Report Date: 12/09/19  
Task: 02 - Laboratory Soil / Aggregate Testing



15080 A Cir  
Omaha, NE 68144-5558  
402-330-2202

Client

US Army Corps of Engineers  
Dam Safety Production Center, Dam Safety Section  
Attn: Carolyn Fritzsich  
1616 Capitol Ave  
Omaha, NE 68102-4909

Project

US Air Force Academy - Preparatory School Dorm  
Contract No. W9128F19D0018  
Order Number W9128F20F0027  
United States Air Force Academy, CO 80840  
Project Number: 05191378

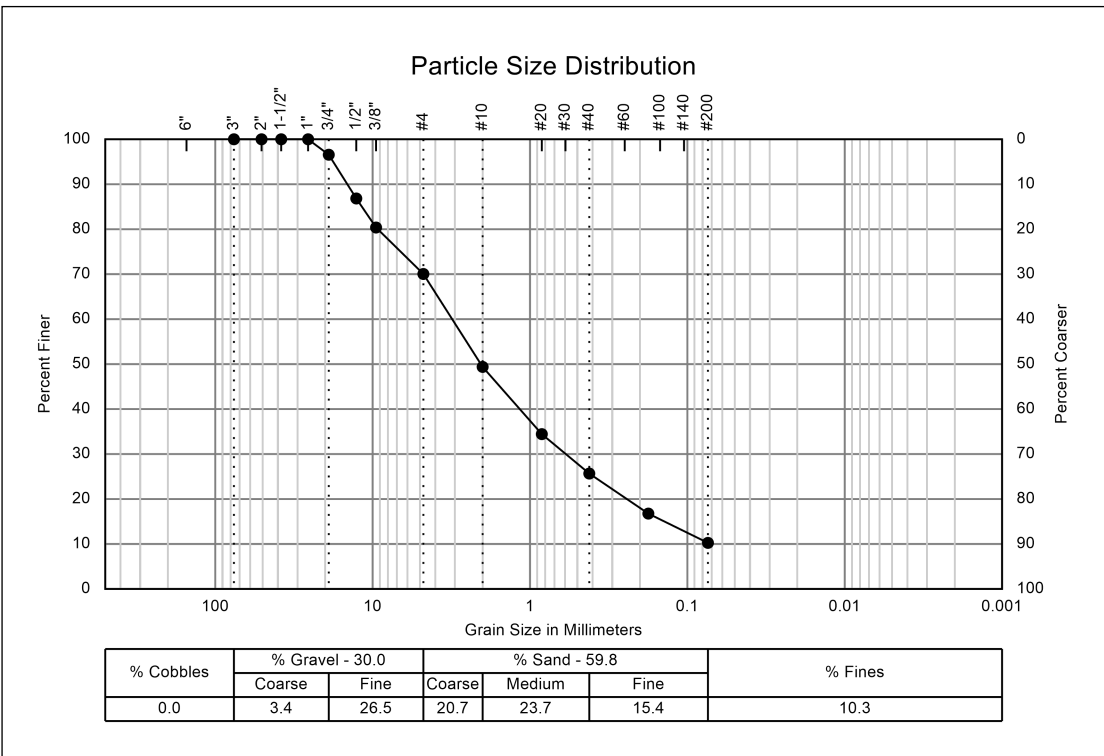
Sample Information

Sample Type: SPT  
Sample Location: AFA19-02, D-1, 0.5'-2.0'  
Sample Description: 10YR 4/6 Dark Yellowish Brown  
Well-graded sand with silt and gravel (SW-SM)

Laboratory Test Data

Test Method: ASTM D422  
Method: NA  
Atterberg Limits:  
Sample Preparation: Oven Dried  
Sieving Method: Single Sieve-Set Sieving

Sieve Size	Percent Finer	Spec.*	Pass (X=Fail)
3"	100.0		
2"	100.0		
1-1/2"	100.0		
1"	100.0		
3/4"	96.6		
1/2"	86.8		
3/8"	80.4		
#4	70.0		
#10	49.4		
#20	34.4		
#40	25.7		
#80	16.8		
#200	10.3		



*	$D_{60} = 3.12$	$D_{30} = 0.59$	$D_{10} = 0.07$ (Est.)	$C_c = 1.6$	$C_u = 44.6$	FM =
---	-----------------	-----------------	------------------------	-------------	--------------	------

Comments:

Services:  
Terracon Rep.: Client  
Reported To:  
Contractor:  
Report Distribution:  
(1) US Army Corps of Engineers, Carolyn Fritzsich

Reviewed By:   
Scott C. Gregory  
Lab Manager

Test Methods:

The tests were performed in general accordance with applicable ASTM, AASHTO, or DOT test methods. This report is exclusively for the use of the client indicated above and shall not be reproduced except in full without the written consent of our company. Test results transmitted herein are only applicable to the actual samples tested at the location(s) referenced and are not necessarily indicative of the properties of other apparently similar or identical materials.

PARTICLE SIZE DISTRIBUTION REPORT

Report Number: 05191378.0012  
Service Date: 12/09/19  
Report Date: 12/09/19  
Task: 02 - Laboratory Soil / Aggregate Testing



15080 A Cir  
Omaha, NE 68144-5558  
402-330-2202

Client

US Army Corps of Engineers  
Dam Safety Production Center, Dam Safety Section  
Attn: Carolyn Fritzsich  
1616 Capitol Ave  
Omaha, NE 68102-4909

Project

US Air Force Academy - Preparatory School Dorm  
Contract No. W9128F19D0018  
Order Number W9128F20F0027  
United States Air Force Academy, CO 80840  
Project Number: 05191378

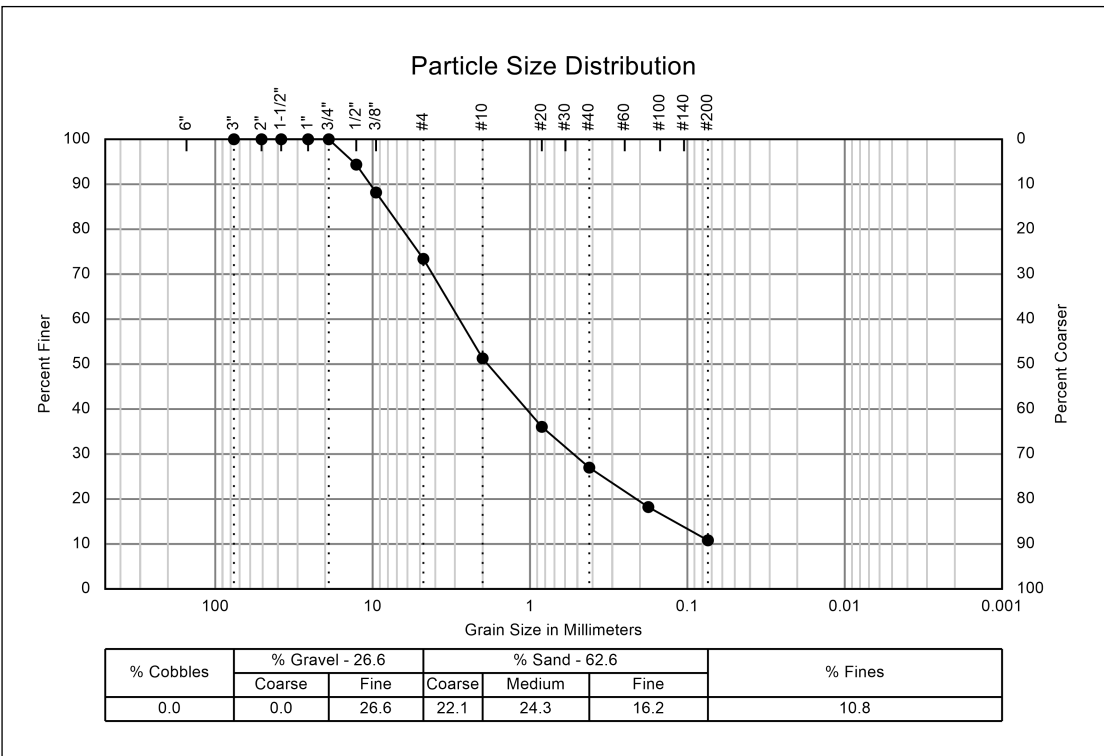
Sample Information

Sample Type: SPT  
Sample Location: AFA19-02, D-2, 3.0'-4.5'  
Sample Description: 5YR 5/2 Reddish Gray  
Well-graded sand with silt and gravel (SW-SM)

Laboratory Test Data

Test Method: ASTM D422  
Method: NA  
Atterberg Limits:  
Sample Preparation: Oven Dried  
Sieving Method: Single Sieve-Set Sieving

Sieve Size	Percent Finer	Spec.*	Pass (X=Fail)
3"	100.0		
2"	100.0		
1-1/2"	100.0		
1"	100.0		
3/4"	100.0		
1/2"	94.4		
3/8"	88.2		
#4	73.4		
#10	51.3		
#20	36.1		
#40	27.0		
#80	18.2		
#200	10.8		



*	$D_{60} = 2.82$	$D_{30} = 0.53$	$D_{10} = 0.07$ (Est.)	$C_c = 1.4$	$C_u = 40.3$	FM =
---	-----------------	-----------------	------------------------	-------------	--------------	------

Comments:

Services:  
Terracon Rep.: Client  
Reported To:  
Contractor:  
Report Distribution:  
(1) US Army Corps of Engineers, Carolyn Fritzsich

Reviewed By:   
Scott C. Gregory  
Lab Manager

Test Methods:

The tests were performed in general accordance with applicable ASTM, AASHTO, or DOT test methods. This report is exclusively for the use of the client indicated above and shall not be reproduced except in full without the written consent of our company. Test results transmitted herein are only applicable to the actual samples tested at the location(s) referenced and are not necessarily indicative of the properties of other apparently similar or identical materials.

PARTICLE SIZE DISTRIBUTION REPORT

Report Number: 05191378.0013  
Service Date: 12/09/19  
Report Date: 12/09/19  
Task: 02 - Laboratory Soil / Aggregate Testing



15080 A Cir  
Omaha, NE 68144-5558  
402-330-2202

Client

US Army Corps of Engineers  
Dam Safety Production Center, Dam Safety Section  
Attn: Carolyn Fritzsich  
1616 Capitol Ave  
Omaha, NE 68102-4909

Project

US Air Force Academy - Preparatory School Dorm  
Contract No. W9128F19D0018  
Order Number W9128F20F0027  
United States Air Force Academy, CO 80840  
Project Number: 05191378

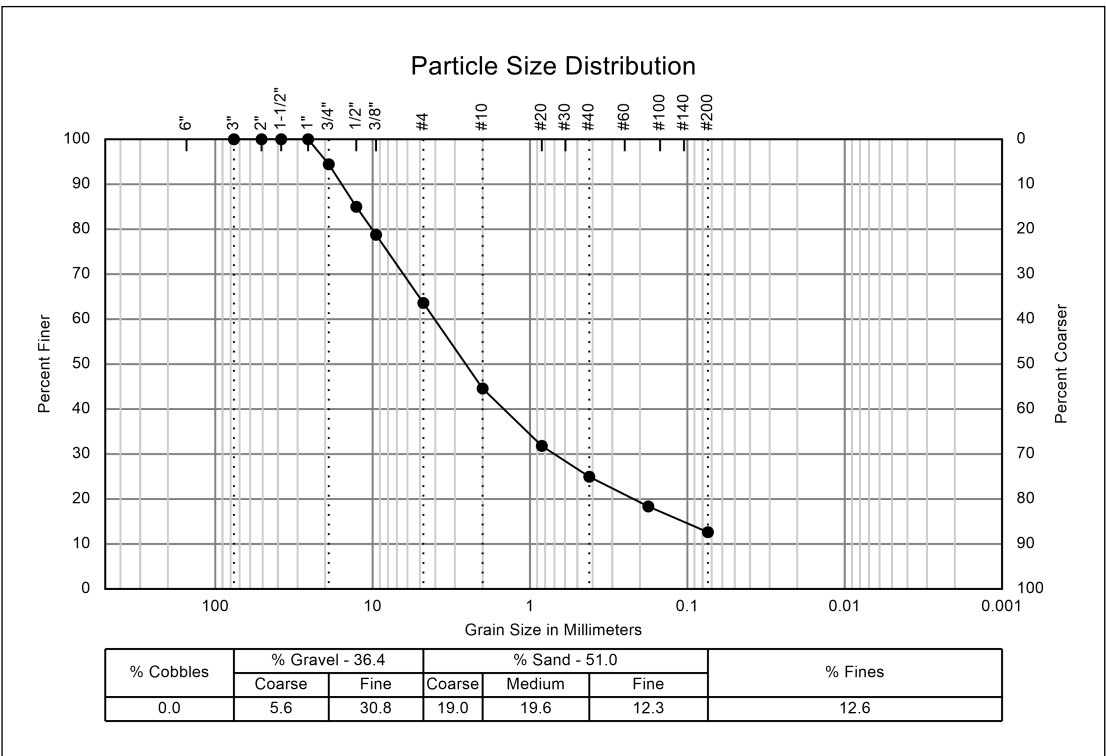
Sample Information

Sample Type: SPT  
Sample Location: AFA19-02, D-3. 5.5'-7.0'  
Sample Description: 5YR 5/2 Reddish Gray  
Silty sand with gravel (SM)

Laboratory Test Data

Test Method: ASTM D422  
Method: NA  
Atterberg Limits:  
Sample Preparation: Oven Dried  
Sieving Method: Single Sieve-Set Sieving

Sieve Size	Percent Finer	Spec.*	Pass (X=Fail)
3"	100.0		
2"	100.0		
1-1/2"	100.0		
1"	100.0		
3/4"	94.4		
1/2"	85.0		
3/8"	78.8		
#4	63.6		
#10	44.6		
#20	31.8		
#40	25.0		
#80	18.3		
#200	12.6		



*	$D_{60}=4.03$	$D_{30}=0.70$	$D_{10}=$	$C_c=$	$C_u=$	FM =
---	---------------	---------------	-----------	--------	--------	------

Comments:

Services:  
Terracon Rep.: Client  
Reported To:  
Contractor:  
Report Distribution:  
(1) US Army Corps of Engineers, Carolyn Fritzsich

Reviewed By:   
Scott C. Gregory  
Lab Manager

Test Methods:

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PARTICLE SIZE DISTRIBUTION REPORT

Report Number: 05191378.0014  
Service Date: 12/09/19  
Report Date: 12/09/19  
Task: 02 - Laboratory Soil / Aggregate Testing



15080 A Cir  
Omaha, NE 68144-5558  
402-330-2202

Client

US Army Corps of Engineers  
Dam Safety Production Center, Dam Safety Section  
Attn: Carolyn Fritzsich  
1616 Capitol Ave  
Omaha, NE 68102-4909

Project

US Air Force Academy - Preparatory School Dorm  
Contract No. W9128F19D0018  
Order Number W9128F20F0027  
United States Air Force Academy, CO 80840  
Project Number: 05191378

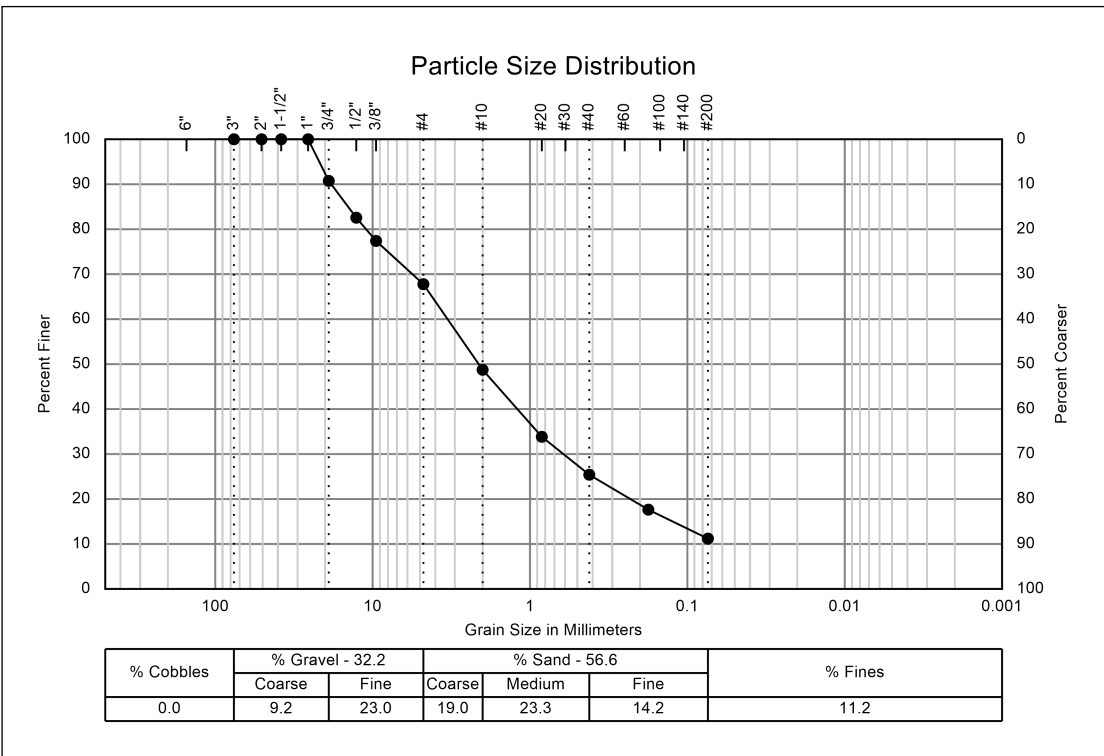
Sample Information

Sample Type: SPT  
Sample Location: AFA19-02, D-4, 8.0'-9.5'  
Sample Description: 2.5YR 4/6 Red  
Well-graded sand with silt and gravel (SW-SM)

Laboratory Test Data

Test Method: ASTM D422  
Method: NA  
Atterberg Limits:  
Sample Preparation: Oven Dried  
Sieving Method: Single Sieve-Set Sieving

Sieve Size	Percent Finer	Spec.*	Pass (X=Fail)
3"	100.0		
2"	100.0		
1-1/2"	100.0		
1"	100.0		
3/4"	90.8		
1/2"	82.6		
3/8"	77.4		
#4	67.8		
#10	48.7		
#20	33.8		
#40	25.4		
#80	17.6		
#200	11.2		



*	$D_{60} = 3.34$	$D_{30} = 0.62$	$D_{10} = 0.06$ (Est.)	$C_c = 1.9$	$C_u = 55.7$	FM =
---	-----------------	-----------------	------------------------	-------------	--------------	------

Comments:

Services:  
Terracon Rep.: Client  
Reported To:  
Contractor:  
Report Distribution:  
(1) US Army Corps of Engineers, Carolyn Fritzsich

Reviewed By:   
Scott C. Gregory  
Lab Manager

Test Methods:

The tests were performed in general accordance with applicable ASTM, AASHTO, or DOT test methods. This report is exclusively for the use of the client indicated above and shall not be reproduced except in full without the written consent of our company. Test results transmitted herein are only applicable to the actual samples tested at the location(s) referenced and are not necessarily indicative of the properties of other apparently similar or identical materials.

PARTICLE SIZE DISTRIBUTION REPORT

Report Number: 05191378.0015  
Service Date: 12/09/19  
Report Date: 12/09/19  
Task: 02 - Laboratory Soil / Aggregate Testing



15080 A Cir  
Omaha, NE 68144-5558  
402-330-2202

**Client**

US Army Corps of Engineers  
Dam Safety Production Center, Dam Safety Section  
Attn: Carolyn Fritzsich  
1616 Capitol Ave  
Omaha, NE 68102-4909

**Project**

US Air Force Academy - Preparatory School Dorm  
Contract No. W9128F19D0018  
Order Number W9128F20F0027  
United States Air Force Academy, CO 80840  
Project Number: 05191378

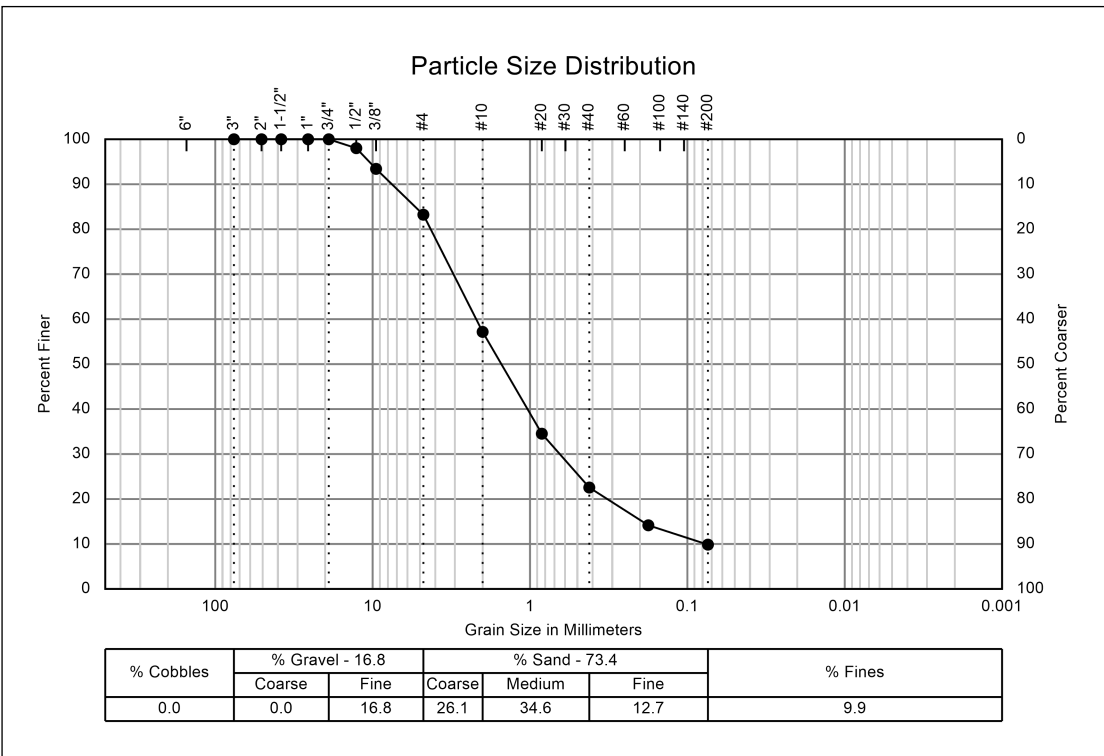
**Sample Information**

Sample Type: SPT  
Sample Location: AFA19-02, D-5, 13.0'-14.5'  
Sample Description: 2.5YR 4/6 Red  
USCS: Well-graded sand with clay and gravel (SW-SC)

**Laboratory Test Data**

Test Method: ASTM D422  
Method: NA  
Atterberg Limits: LL - 25, PL - 18, PI - 7  
Sample Preparation: Oven Dried  
Sieving Method: Single Sieve-Set Sieving

Sieve Size	Percent Finer	Spec.*	Pass (X=Fail)
3"	100.0		
2"	100.0		
1-1/2"	100.0		
1"	100.0		
3/4"	100.0		
1/2"	98.0		
3/8"	93.4		
#4	83.2		
#10	57.2		
#20	34.5		
#40	22.6		
#80	14.2		
#200	9.9		



\*  $D_{60} = 2.19$   $D_{30} = 0.64$   $D_{10} = 0.08$   $C_c = 2.3$   $C_u = 27.4$   $FM =$

Comments:

Services:  
Terracon Rep.: Client  
Reported To:  
Contractor:  
Report Distribution:  
(1) US Army Corps of Engineers, Carolyn Fritzsich

Reviewed By:   
Scott C. Gregory  
Lab Manager

Test Methods: ASTM D4318

The tests were performed in general accordance with applicable ASTM, AASHTO, or DOT test methods. This report is exclusively for the use of the client indicated above and shall not be reproduced except in full without the written consent of our company. Test results transmitted herein are only applicable to the actual samples tested at the location(s) referenced and are not necessarily indicative of the properties of other apparently similar or identical materials.

PARTICLE SIZE DISTRIBUTION REPORT

Report Number: 05191378.0016  
Service Date: 12/09/19  
Report Date: 12/09/19  
Task: 02 - Laboratory Soil / Aggregate Testing



15080 A Cir  
Omaha, NE 68144-5558  
402-330-2202

**Client**

US Army Corps of Engineers  
Dam Safety Production Center, Dam Safety Section  
Attn: Carolyn Fritzsich  
1616 Capitol Ave  
Omaha, NE 68102-4909

**Project**

US Air Force Academy - Preparatory School Dorm  
Contract No. W9128F19D0018  
Order Number W9128F20F0027  
United States Air Force Academy, CO 80840  
Project Number: 05191378

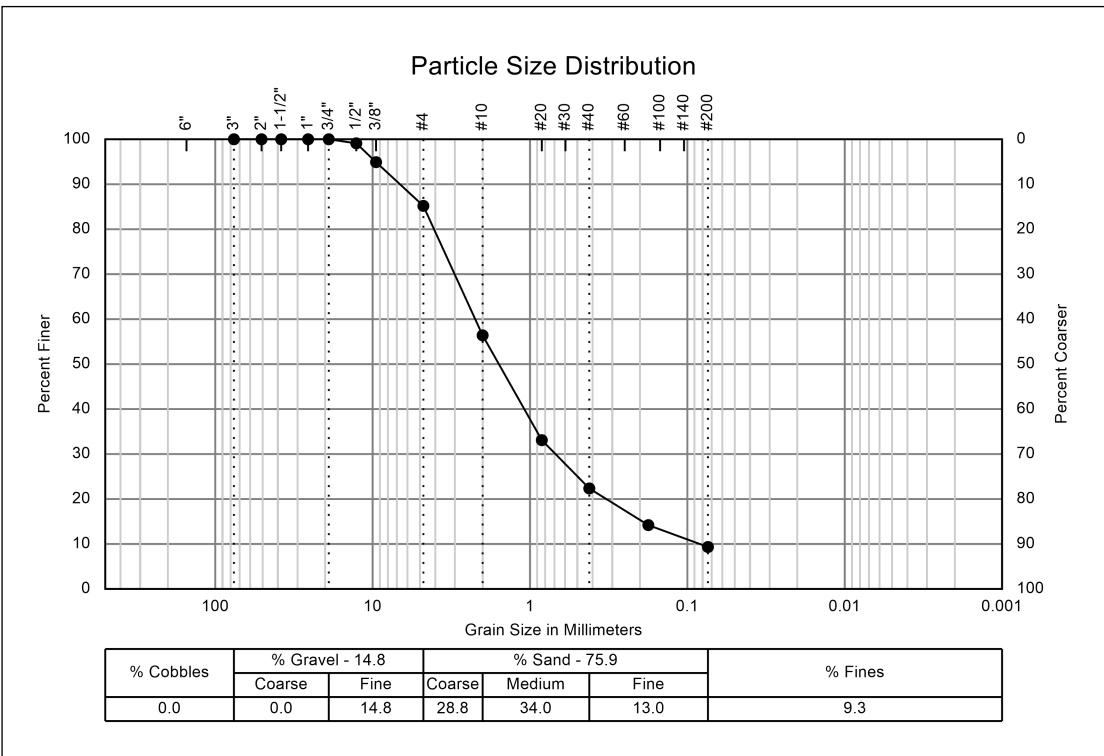
**Sample Information**

Sample Type: SPT  
Sample Location: AFA19-02, D-6, 18.0'-19.5'  
Sample Description: 5YR 5/3 Reddish Brown  
Well-graded sand with silt (SW-SM)

**Laboratory Test Data**

Test Method: ASTM D422  
Method: NA  
Atterberg Limits:  
Sample Preparation: Oven Dried  
Sieving Method: Single Sieve-Set Sieving

Sieve Size	Percent Finer	Spec.*	Pass (X=Fail)
3"	100.0		
2"	100.0		
1-1/2"	100.0		
1"	100.0		
3/4"	100.0		
1/2"	99.1		
3/8"	94.9		
#4	85.2		
#10	56.4		
#20	33.1		
#40	22.4		
#80	14.2		
#200	9.3		



\*  $D_{60} = 2.23$   $D_{30} = 0.69$   $D_{10} = 0.08$   $C_c = 2.7$   $C_u = 27.9$   $FM =$

Comments:

Services:  
Terracon Rep.: Client  
Reported To:  
Contractor:  
Report Distribution:  
(1) US Army Corps of Engineers, Carolyn Fritzsich

Reviewed By:   
Scott C. Gregory  
Lab Manager

Test Methods:

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PARTICLE SIZE DISTRIBUTION REPORT

Report Number: 05191378.0017  
Service Date: 12/09/19  
Report Date: 12/09/19  
Task: 02 - Laboratory Soil / Aggregate Testing



15080 A Cir  
Omaha, NE 68144-5558  
402-330-2202

Client

US Army Corps of Engineers  
Dam Safety Production Center, Dam Safety Section  
Attn: Carolyn Fritzsich  
1616 Capitol Ave  
Omaha, NE 68102-4909

Project

US Air Force Academy - Preparatory School Dorm  
Contract No. W9128F19D0018  
Order Number W9128F20F0027  
United States Air Force Academy, CO 80840  
Project Number: 05191378

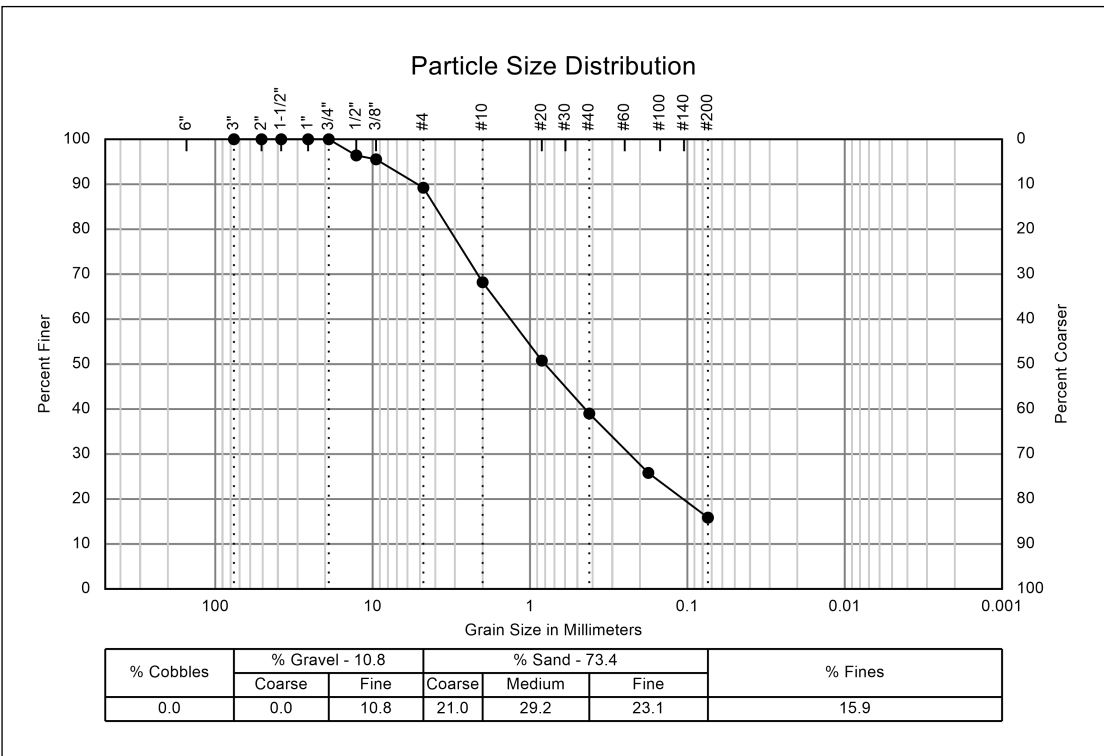
Sample Information

Sample Type: SPT  
Sample Location: AFA19-02, D-7, 23.0'-24.5'  
Sample Description: 5YR 5/3 Reddish Brown  
Silty sand (SM)

Laboratory Test Data

Test Method: ASTM D422  
Method: NA  
Atterberg Limits: LL - 0, PL - 0, PI - 0  
Sample Preparation: Oven Dried  
Sieving Method: Single Sieve-Set Sieving

Sieve Size	Percent Finer	Spec.*	Pass (X=Fail)
3"	100.0		
2"	100.0		
1-1/2"	100.0		
1"	100.0		
3/4"	100.0		
1/2"	96.4		
3/8"	95.5		
#4	89.2		
#10	68.2		
#20	50.8		
#40	39.0		
#80	25.8		
#200	15.9		



*	D <sub>60</sub> = 1.33	D <sub>30</sub> = 0.23	D <sub>10</sub> =	C <sub>c</sub> =	C <sub>u</sub> =	FM =
---	------------------------	------------------------	-------------------	------------------	------------------	------

Comments:

Services:  
Terracon Rep.: Client  
Reported To:  
Contractor:  
Report Distribution:  
(1) US Army Corps of Engineers, Carolyn Fritzsich

Reviewed By:   
Scott C. Gregory  
Lab Manager

Test Methods:

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PARTICLE SIZE DISTRIBUTION REPORT

Report Number: 05191378.0018  
Service Date: 12/09/19  
Report Date: 12/09/19  
Task: 02 - Laboratory Soil / Aggregate Testing



15080 A Cir  
Omaha, NE 68144-5558  
402-330-2202

Client

US Army Corps of Engineers  
Dam Safety Production Center, Dam Safety Section  
Attn: Carolyn Fritzsich  
1616 Capitol Ave  
Omaha, NE 68102-4909

Project

US Air Force Academy - Preparatory School Dorm  
Contract No. W9128F19D0018  
Order Number W9128F20F0027  
United States Air Force Academy, CO 80840  
Project Number: 05191378

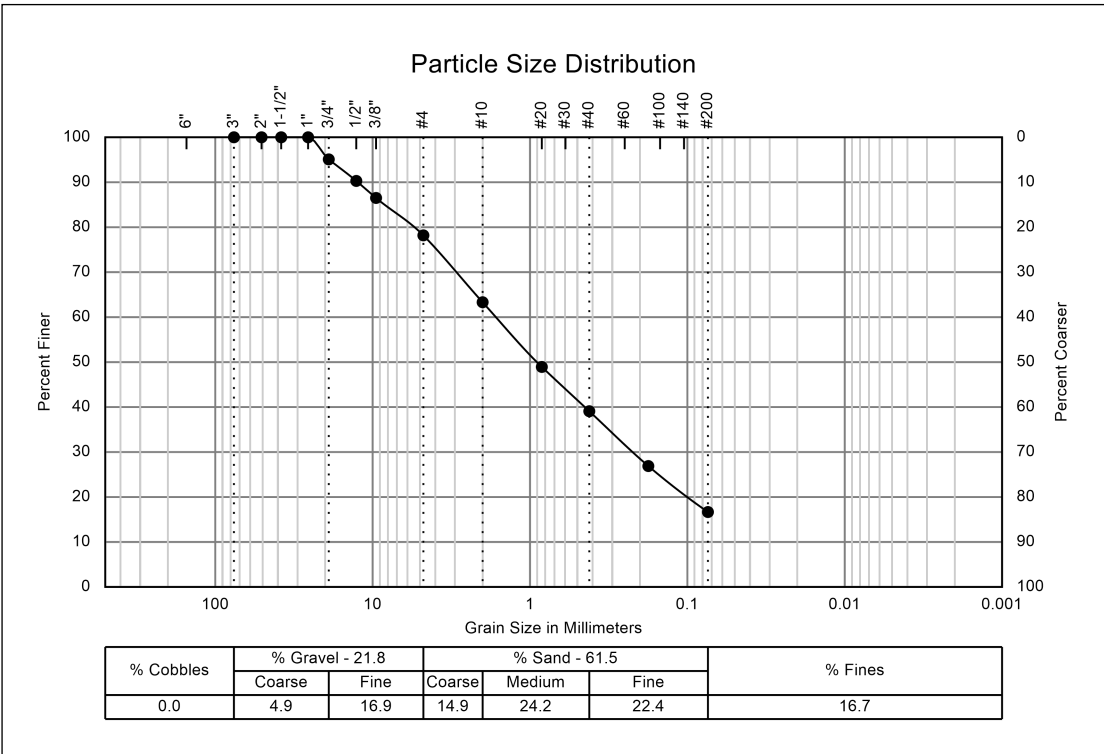
Sample Information

Sample Type: SPT  
Sample Location: AFA19-02, D-8, 28.0'-29.5'  
Sample Description: 7.5YR 5/4 Brown  
USCS: Silty, clayey sand with gravel (SC-SM)

Laboratory Test Data

Test Method: ASTM D422  
Method: NA  
Atterberg Limits: LL - 23, PL - 19, PI - 4  
Sample Preparation: Oven Dried  
Sieving Method: Single Sieve-Set Sieving

Sieve Size	Percent Finer	Spec.*	Pass (X=Fail)
3"	100.0		
2"	100.0		
1-1/2"	100.0		
1"	100.0		
3/4"	95.1		
1/2"	90.3		
3/8"	86.5		
#4	78.2		
#10	63.3		
#20	48.9		
#40	39.1		
#80	26.9		
#200	16.7		



*	$D_{60} = 1.64$	$D_{30} = 0.22$	$D_{10} =$	$C_c =$	$C_u =$	FM =
---	-----------------	-----------------	------------	---------	---------	------

Comments:

Services:  
Terracon Rep.: Client  
Reported To:  
Contractor:  
Report Distribution:  
(1) US Army Corps of Engineers, Carolyn Fritzsich

Reviewed By:   
Scott C. Gregory  
Lab Manager

Test Methods: ASTM D4318

The tests were performed in general accordance with applicable ASTM, AASHTO, or DOT test methods. This report is exclusively for the use of the client indicated above and shall not be reproduced except in full without the written consent of our company. Test results transmitted herein are only applicable to the actual samples tested at the location(s) referenced and are not necessarily indicative of the properties of other apparently similar or identical materials.

PARTICLE SIZE DISTRIBUTION REPORT

Report Number: 05191378.0019  
Service Date: 12/09/19  
Report Date: 12/09/19  
Task: 02 - Laboratory Soil / Aggregate Testing



15080 A Cir  
Omaha, NE 68144-5558  
402-330-2202

Client

US Army Corps of Engineers  
Dam Safety Production Center, Dam Safety Section  
Attn: Carolyn Fritzsich  
1616 Capitol Ave  
Omaha, NE 68102-4909

Project

US Air Force Academy - Preparatory School Dorm  
Contract No. W9128F19D0018  
Order Number W9128F20F0027  
United States Air Force Academy, CO 80840  
Project Number: 05191378

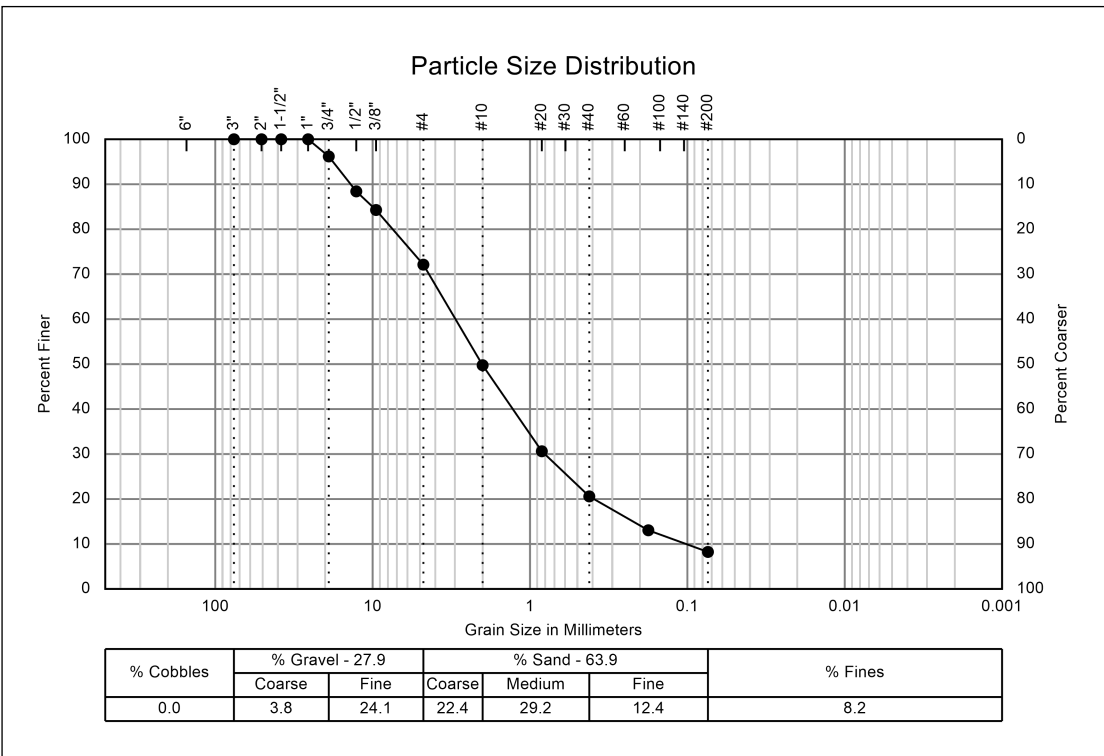
Sample Information

Sample Type: SPT  
Sample Location: AFA19-02, D-9, 33.0'-34.5'  
Sample Description: 7.5YR 5/4 Brown  
Well-graded sand with silt and gravel (SW-SM)

Laboratory Test Data

Test Method: ASTM D422  
Method: NA  
Atterberg Limits:  
Sample Preparation: Oven Dried  
Sieving Method: Single Sieve-Set Sieving

Sieve Size	Percent Finer	Spec.*	Pass (X=Fail)
3"	100.0		
2"	100.0		
1-1/2"	100.0		
1"	100.0		
3/4"	96.2		
1/2"	88.4		
3/8"	84.3		
#4	72.1		
#10	49.8		
#20	30.6		
#40	20.6		
#80	13.1		
#200	8.2		



*	$D_{60} = 2.97$	$D_{30} = 0.80$	$D_{10} = 0.10$	$C_c = 2.2$	$C_u = 29.7$	FM =
---	-----------------	-----------------	-----------------	-------------	--------------	------

Comments:

Services:  
Terracon Rep.: Client  
Reported To:  
Contractor:  
Report Distribution:  
(1) US Army Corps of Engineers, Carolyn Fritzsich

Reviewed By:   
Scott C. Gregory  
Lab Manager

Test Methods:

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PARTICLE SIZE DISTRIBUTION REPORT

Report Number: 05191378.0020  
Service Date: 12/09/19  
Report Date: 12/09/19  
Task: 02 - Laboratory Soil / Aggregate Testing



15080 A Cir  
Omaha, NE 68144-5558  
402-330-2202

Client

US Army Corps of Engineers  
Dam Safety Production Center, Dam Safety Section  
Attn: Carolyn Fritzsich  
1616 Capitol Ave  
Omaha, NE 68102-4909

Project

US Air Force Academy - Preparatory School Dorm  
Contract No. W9128F19D0018  
Order Number W9128F20F0027  
United States Air Force Academy, CO 80840  
Project Number: 05191378

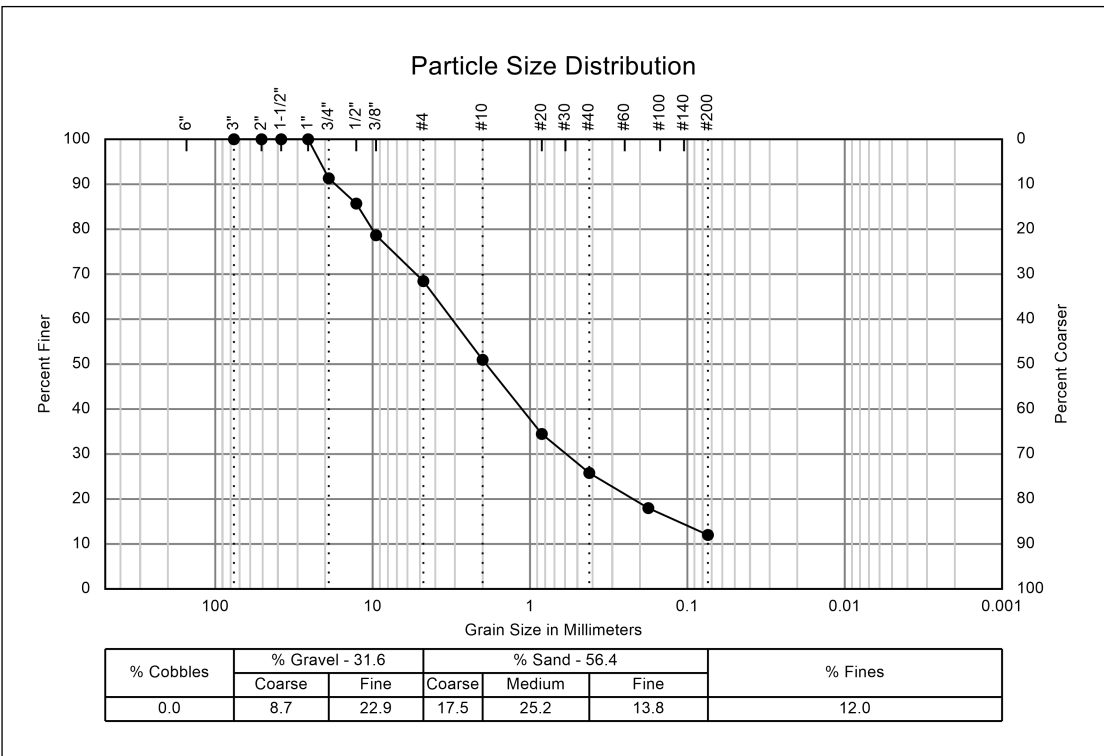
Sample Information

Sample Type: SPT  
Sample Location: AFA19-02, D-10, 38.0'-38.7'  
Sample Description: 7.5YR 5/4 Brown  
Silty sand with gravel (SM)

Laboratory Test Data

Test Method: ASTM D422  
Method: NA  
Atterberg Limits: LL - 0, PL - 0, PI - 0  
Sample Preparation: Oven Dried  
Sieving Method: Single Sieve-Set Sieving

Sieve Size	Percent Finer	Spec.*	Pass (X=Fail)
3"	100.0		
2"	100.0		
1-1/2"	100.0		
1"	100.0		
3/4"	91.3		
1/2"	85.7		
3/8"	78.7		
#4	68.4		
#10	51.0		
#20	34.5		
#40	25.8		
#80	18.0		
#200	12.0		



*	$D_{60} = 3.12$	$D_{30} = 0.59$	$D_{10} =$	$C_c =$	$C_u =$	FM =
---	-----------------	-----------------	------------	---------	---------	------

Comments:

Services:  
Terracon Rep.: Client  
Reported To:  
Contractor:  
Report Distribution:  
(1) US Army Corps of Engineers, Carolyn Fritzsich

Reviewed By:   
Scott C. Gregory  
Lab Manager

Test Methods:

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PARTICLE SIZE DISTRIBUTION REPORT

Report Number: 05191378.0021  
Service Date: 12/09/19  
Report Date: 12/09/19  
Task: 02 - Laboratory Soil / Aggregate Testing



15080 A Cir  
Omaha, NE 68144-5558  
402-330-2202

**Client**

US Army Corps of Engineers  
Dam Safety Production Center, Dam Safety Section  
Attn: Carolyn Fritzsich  
1616 Capitol Ave  
Omaha, NE 68102-4909

**Project**

US Air Force Academy - Preparatory School Dorm  
Contract No. W9128F19D0018  
Order Number W9128F20F0027  
United States Air Force Academy, CO 80840  
Project Number: 05191378

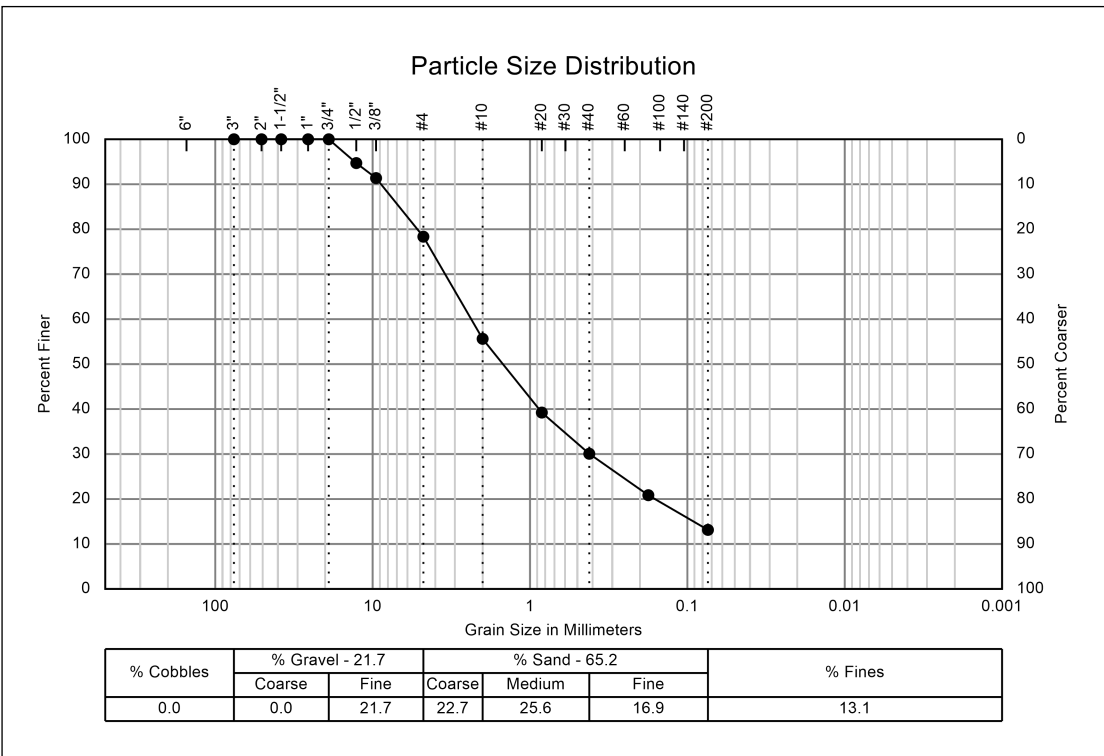
**Sample Information**

Sample Type: SPT  
Sample Location: AFA19-03, D-1, 0.5'-2.0'  
Sample Description: 7.5YR 5/2 Brown  
Silty sand with gravel (SM)

**Laboratory Test Data**

Test Method: ASTM D422  
Method: NA  
Atterberg Limits:  
Sample Preparation: Oven Dried  
Sieving Method: Single Sieve-Set Sieving

Sieve Size	Percent Finer	Spec.*	Pass (X=Fail)
3"	100.0		
2"	100.0		
1-1/2"	100.0		
1"	100.0		
3/4"	100.0		
1/2"	94.7		
3/8"	91.4		
#4	78.3		
#10	55.6		
#20	39.2		
#40	30.1		
#80	20.9		
#200	13.1		



\*  $D_{60} = 2.37$   $D_{30} = 0.42$   $D_{10} =$   $C_c =$   $C_u =$   $FM =$

Comments:

Services:  
Terracon Rep.: Client  
Reported To:  
Contractor:  
Report Distribution:  
(1) US Army Corps of Engineers, Carolyn Fritzsich

Reviewed By:   
Scott C. Gregory  
Lab Manager

Test Methods:

The tests were performed in general accordance with applicable ASTM, AASHTO, or DOT test methods. This report is exclusively for the use of the client indicated above and shall not be reproduced except in full without the written consent of our company. Test results transmitted herein are only applicable to the actual samples tested at the location(s) referenced and are not necessarily indicative of the properties of other apparently similar or identical materials.

PARTICLE SIZE DISTRIBUTION REPORT

Report Number: 05191378.0022  
Service Date: 12/09/19  
Report Date: 12/09/19  
Task: 02 - Laboratory Soil / Aggregate Testing



15080 A Cir  
Omaha, NE 68144-5558  
402-330-2202

Client

US Army Corps of Engineers  
Dam Safety Production Center, Dam Safety Section  
Attn: Carolyn Fritzsich  
1616 Capitol Ave  
Omaha, NE 68102-4909

Project

US Air Force Academy - Preparatory School Dorm  
Contract No. W9128F19D0018  
Order Number W9128F20F0027  
United States Air Force Academy, CO 80840  
Project Number: 05191378

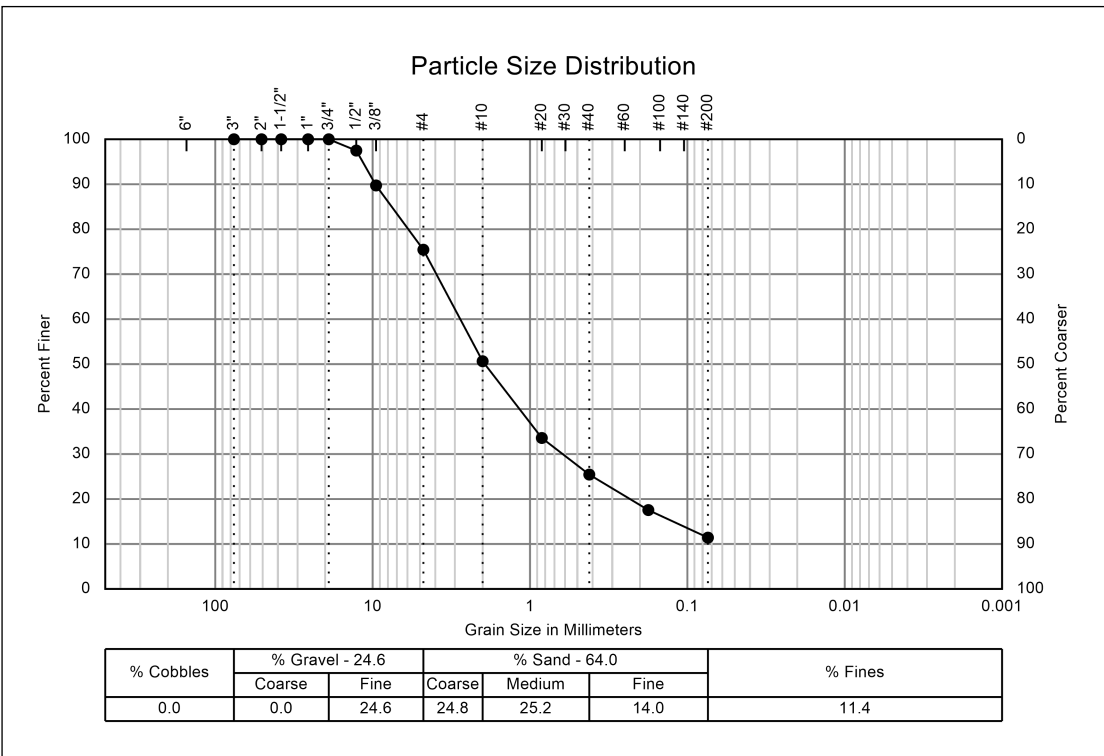
Sample Information

Sample Type: SPT  
Sample Location: AFA19-03, D-2, 3.0'-4.5'  
Sample Description: 2.5YR 5/3 Reddish Brown  
Well-graded sand with silt and gravel (SW-SM)

Laboratory Test Data

Test Method: ASTM D422  
Method: NA  
Atterberg Limits:  
Sample Preparation: Oven Dried  
Sieving Method: Single Sieve-Set Sieving

Sieve Size	Percent Finer	Spec.*	Pass (X=Fail)
3"	100.0		
2"	100.0		
1-1/2"	100.0		
1"	100.0		
3/4"	100.0		
1/2"	97.5		
3/8"	89.7		
#4	75.4		
#10	50.6		
#20	33.6		
#40	25.4		
#80	17.5		
#200	11.4		



D <sub>60</sub> = 2.78	D <sub>30</sub> = 0.62	D <sub>10</sub> = 0.06 (Est.)	C <sub>c</sub> = 2.3	C <sub>u</sub> = 46.3	FM =
------------------------	------------------------	-------------------------------	----------------------	-----------------------	------

Comments:

Services:  
Terracon Rep.: Client  
Reported To:  
Contractor:  
Report Distribution:  
(1) US Army Corps of Engineers, Carolyn Fritzsich

Reviewed By:   
Scott C. Gregory  
Lab Manager

Test Methods:

The tests were performed in general accordance with applicable ASTM, AASHTO, or DOT test methods. This report is exclusively for the use of the client indicated above and shall not be reproduced except in full without the written consent of our company. Test results transmitted herein are only applicable to the actual samples tested at the location(s) referenced and are not necessarily indicative of the properties of other apparently similar or identical materials.

PARTICLE SIZE DISTRIBUTION REPORT

Report Number: 05191378.0023  
Service Date: 12/09/19  
Report Date: 12/09/19  
Task: 02 - Laboratory Soil / Aggregate Testing



15080 A Cir  
Omaha, NE 68144-5558  
402-330-2202

Client

US Army Corps of Engineers  
Dam Safety Production Center, Dam Safety Section  
Attn: Carolyn Fritzsich  
1616 Capitol Ave  
Omaha, NE 68102-4909

Project

US Air Force Academy - Preparatory School Dorm  
Contract No. W9128F19D0018  
Order Number W9128F20F0027  
United States Air Force Academy, CO 80840  
Project Number: 05191378

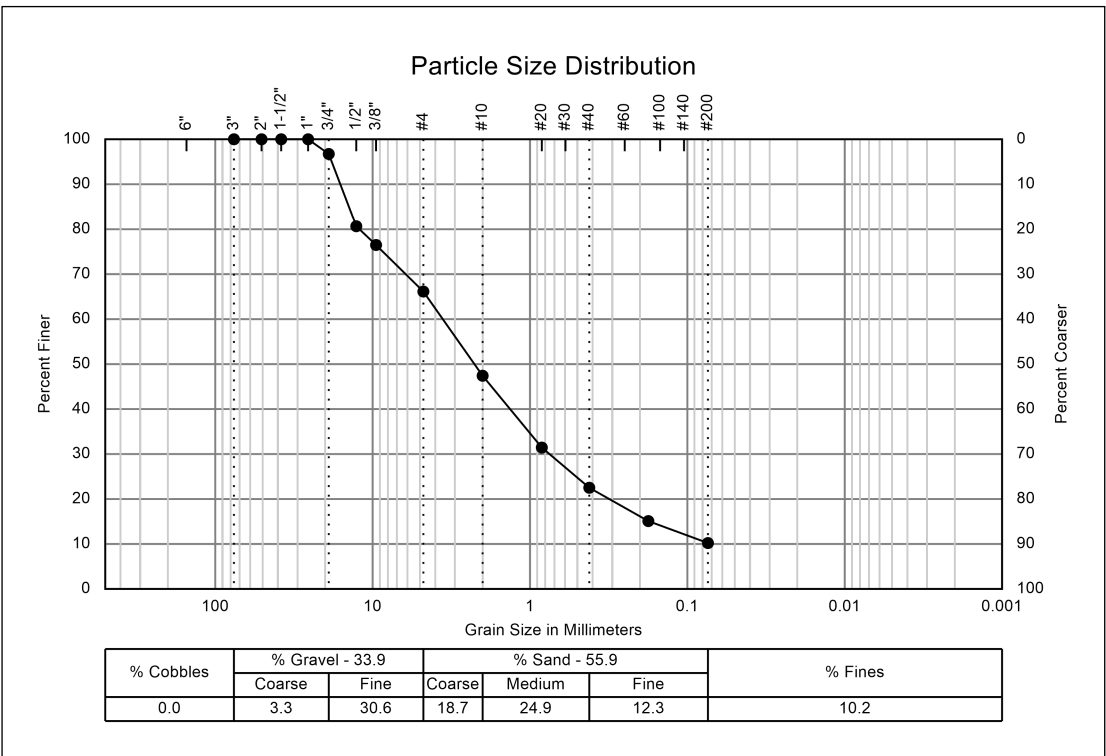
Sample Information

Sample Type: SPT  
Sample Location: AFA19-03, D-3, 5.5'-7.0'  
Sample Description: 2.5YR 5/3 Reddish Brown  
USCS: Well-graded sand with clay and gravel (SW-SC)

Laboratory Test Data

Test Method: ASTM D422  
Method: NA  
Atterberg Limits: LL - 22, PL - 18, PI - 4  
Sample Preparation: Oven Dried  
Sieving Method: Single Sieve-Set Sieving

Sieve Size	Percent Finer	Spec.*	Pass (X=Fail)
3"	100.0		
2"	100.0		
1-1/2"	100.0		
1"	100.0		
3/4"	96.7		
1/2"	80.7		
3/8"	76.5		
#4	66.1		
#10	47.4		
#20	31.4		
#40	22.5		
#80	15.1		
#200	10.2		



*	$D_{60} = 3.60$	$D_{30} = 0.75$	$D_{10} = 0.07$ (Est.)	$C_c = 2.2$	$C_u = 51.4$	FM =
---	-----------------	-----------------	------------------------	-------------	--------------	------

Comments:

Services:  
Terracon Rep.: Client  
Reported To:  
Contractor:  
Report Distribution:  
(1) US Army Corps of Engineers, Carolyn Fritzsich

Reviewed By:   
Scott C. Gregory  
Lab Manager

Test Methods: ASTM D4318

The tests were performed in general accordance with applicable ASTM, AASHTO, or DOT test methods. This report is exclusively for the use of the client indicated above and shall not be reproduced except in full without the written consent of our company. Test results transmitted herein are only applicable to the actual samples tested at the location(s) referenced and are not necessarily indicative of the properties of other apparently similar or identical materials.

PARTICLE SIZE DISTRIBUTION REPORT

Report Number: 05191378.0024  
Service Date: 12/09/19  
Report Date: 12/09/19  
Task: 02 - Laboratory Soil / Aggregate Testing



15080 A Cir  
Omaha, NE 68144-5558  
402-330-2202

**Client**

US Army Corps of Engineers  
Dam Safety Production Center, Dam Safety Section  
Attn: Carolyn Fritzsich  
1616 Capitol Ave  
Omaha, NE 68102-4909

**Project**

US Air Force Academy - Preparatory School Dorm  
Contract No. W9128F19D0018  
Order Number W9128F20F0027  
United States Air Force Academy, CO 80840  
Project Number: 05191378

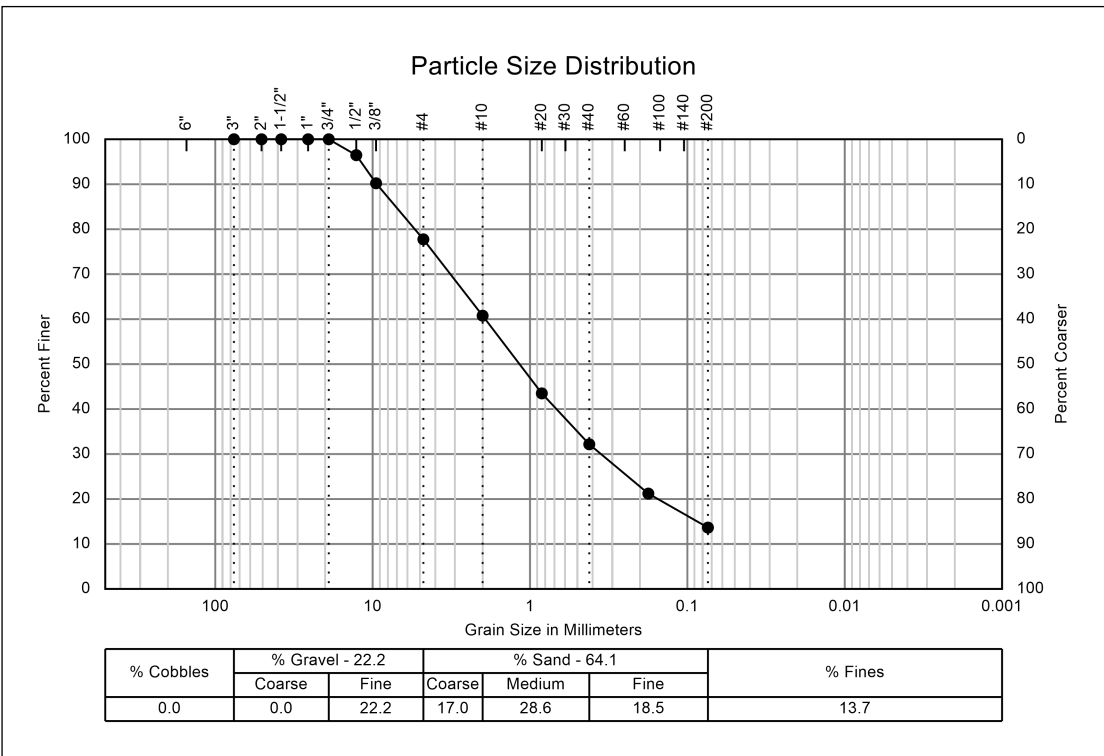
**Sample Information**

Sample Type: SPT  
Sample Location: AFA19-03, D-4, 8.0'-9.5'  
Sample Description: 2.5YR 5/6 Red  
USCS: Silty sand with gravel (SM)

**Laboratory Test Data**

Test Method: ASTM D422  
Method: NA  
Atterberg Limits: LL - 20, PL - 18, PI - 2  
Sample Preparation: Oven Dried  
Sieving Method: Single Sieve-Set Sieving

Sieve Size	Percent Finer	Spec.*	Pass (X=Fail)
3"	100.0		
2"	100.0		
1-1/2"	100.0		
1"	100.0		
3/4"	100.0		
1/2"	96.5		
3/8"	90.2		
#4	77.8		
#10	60.8		
#20	43.5		
#40	32.2		
#80	21.2		
#200	13.7		



\*  $D_{60} = 1.93$   $D_{30} = 0.35$   $D_{10} =$   $C_c =$   $C_u =$   $FM =$

Comments:

Services:  
Terracon Rep.: Client  
Reported To:  
Contractor:  
Report Distribution:  
(1) US Army Corps of Engineers, Carolyn Fritzsich

Reviewed By:   
Scott C. Gregory  
Lab Manager

Test Methods: ASTM D4318

The tests were performed in general accordance with applicable ASTM, AASHTO, or DOT test methods. This report is exclusively for the use of the client indicated above and shall not be reproduced except in full without the written consent of our company. Test results transmitted herein are only applicable to the actual samples tested at the location(s) referenced and are not necessarily indicative of the properties of other apparently similar or identical materials.



PARTICLE SIZE DISTRIBUTION REPORT

Report Number: 05191378.0025  
Service Date: 12/09/19  
Report Date: 12/09/19  
Task: 02 - Laboratory Soil / Aggregate Testing



15080 A Cir  
Omaha, NE 68144-5558  
402-330-2202

Client

US Army Corps of Engineers  
Dam Safety Production Center, Dam Safety Section  
Attn: Carolyn Fritzsich  
1616 Capitol Ave  
Omaha, NE 68102-4909

Project

US Air Force Academy - Preparatory School Dorm  
Contract No. W9128F19D0018  
Order Number W9128F20F0027  
United States Air Force Academy, CO 80840  
Project Number: 05191378

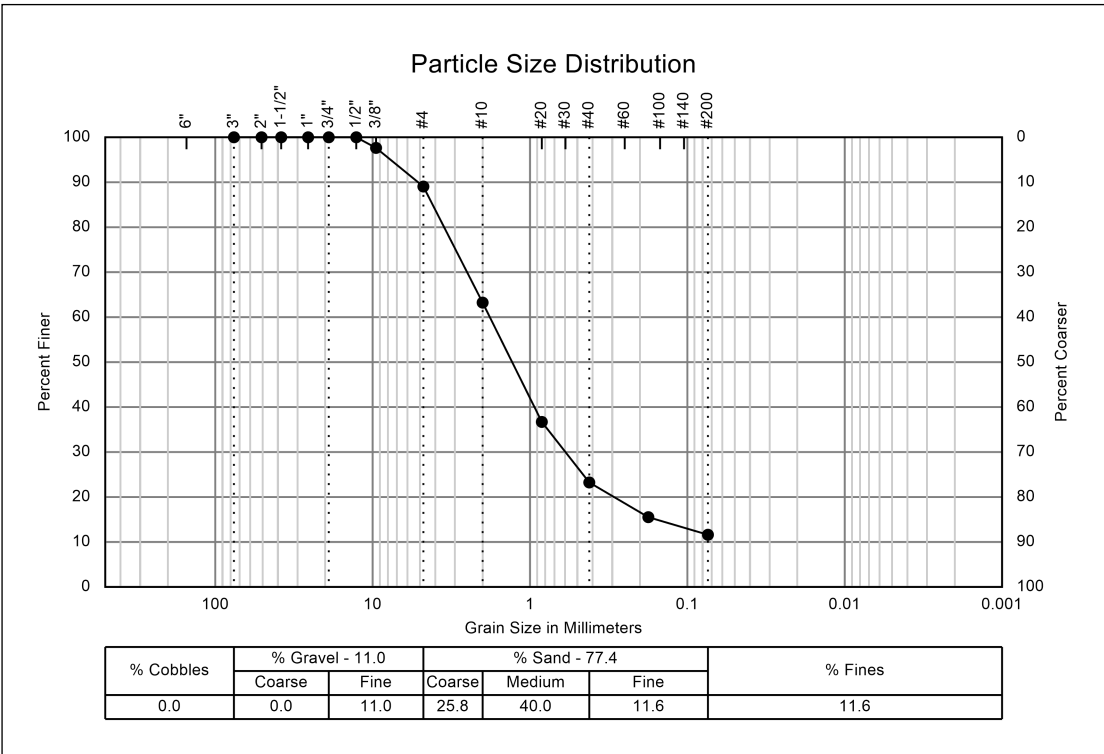
Sample Information

Sample Type: SPT  
Sample Location: AFA19-03, D-5, 13.0'-14.5'  
Sample Description: 2.5YR 5/6 Red  
USCS: Poorly-graded sand with clay (SP-SC)

Laboratory Test Data

Test Method: ASTM D422  
Method: NA  
Atterberg Limits: LL - 33, PL - 13, PI - 20  
Sample Preparation: Oven Dried  
Sieving Method: Single Sieve-Set Sieving

Sieve Size	Percent Finer	Spec.*	Pass (X=Fail)
3"	100.0		
2"	100.0		
1-1/2"	100.0		
1"	100.0		
3/4"	100.0		
1/2"	100.0		
3/8"	97.6		
#4	89.0		
#10	63.2		
#20	36.7		
#40	23.2		
#80	15.5		
#200	11.6		



*	$D_{60} = 1.80$	$D_{30} = 0.60$	$D_{10} = 0.05$ (Est.)	$C_c = 4.0$	$C_u = 36.0$	FM =
---	-----------------	-----------------	------------------------	-------------	--------------	------

Comments:

Services:  
Terracon Rep.: Client  
Reported To:  
Contractor:  
Report Distribution:  
(1) US Army Corps of Engineers, Carolyn Fritzsich

Reviewed By:   
Scott C. Gregory  
Lab Manager

Test Methods: ASTM D4318

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PARTICLE SIZE DISTRIBUTION REPORT

Report Number: 05191378.0026  
Service Date: 12/09/19  
Report Date: 12/09/19  
Task: 02 - Laboratory Soil / Aggregate Testing



15080 A Cir  
Omaha, NE 68144-5558  
402-330-2202

Client

US Army Corps of Engineers  
Dam Safety Production Center, Dam Safety Section  
Attn: Carolyn Fritzsich  
1616 Capitol Ave  
Omaha, NE 68102-4909

Project

US Air Force Academy - Preparatory School Dorm  
Contract No. W9128F19D0018  
Order Number W9128F20F0027  
United States Air Force Academy, CO 80840  
Project Number: 05191378

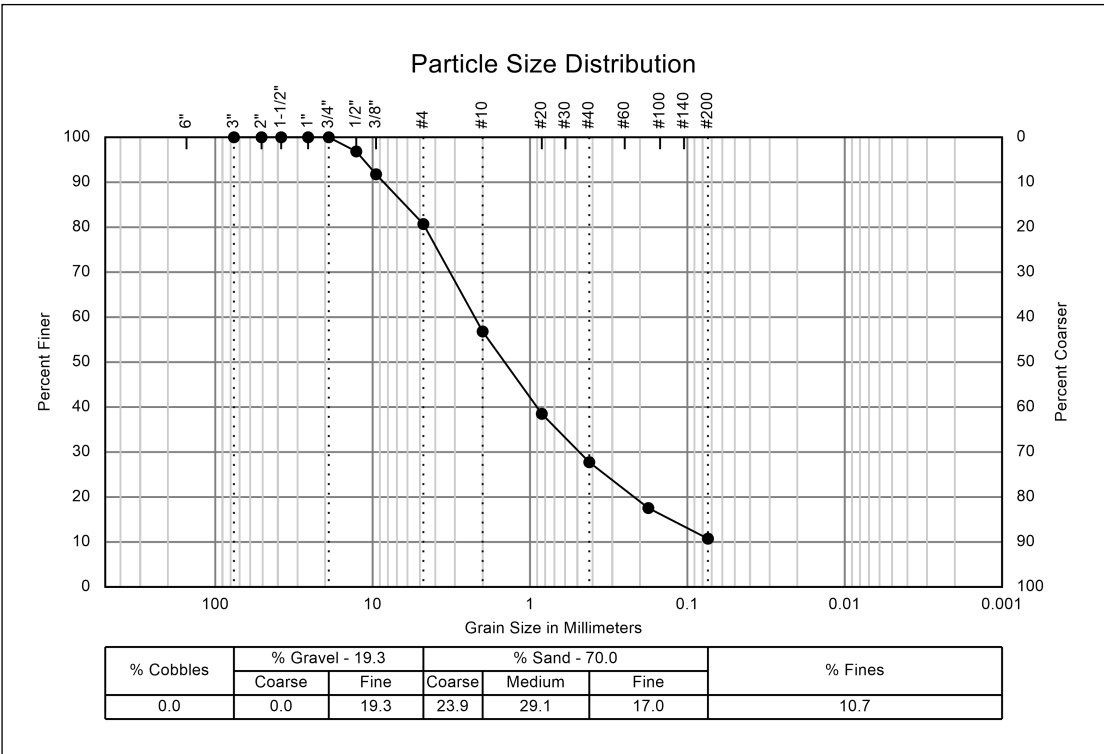
Sample Information

Sample Type: SPT  
Sample Location: AFA19-03, D-6, 18.5'-20.0'  
Sample Description: 2.5YR 5/6 Red  
USCS: Well-graded sand with silt and gravel (SW-SM)

Laboratory Test Data

Test Method: ASTM D422  
Method: NA  
Atterberg Limits: LL - 21, PL - 18, PI - 3  
Sample Preparation: Oven Dried  
Sieving Method: Single Sieve-Set Sieving

Sieve Size	Percent Finer	Spec.*	Pass (X=Fail)
3"	100.0		
2"	100.0		
1-1/2"	100.0		
1"	100.0		
3/4"	100.0		
1/2"	96.9		
3/8"	91.8		
#4	80.7		
#10	56.8		
#20	38.5		
#40	27.7		
#80	17.5		
#200	10.7		



*	$D_{60} = 2.24$	$D_{30} = 0.49$	$D_{10} = 0.07$ (Est.)	$C_c = 1.5$	$C_u = 32.0$	FM =
---	-----------------	-----------------	------------------------	-------------	--------------	------

Comments:

Services:  
Terracon Rep.: Client  
Reported To:  
Contractor:  
Report Distribution:  
(1) US Army Corps of Engineers, Carolyn Fritzsich

Reviewed By:   
Scott C. Gregory  
Lab Manager

Test Methods: ASTM D4318

The tests were performed in general accordance with applicable ASTM, AASHTO, or DOT test methods. This report is exclusively for the use of the client indicated above and shall not be reproduced except in full without the written consent of our company. Test results transmitted herein are only applicable to the actual samples tested at the location(s) referenced and are not necessarily indicative of the properties of other apparently similar or identical materials.

## Moisture Content D 2216

## Terracon

Job Name: US Air Force Academy - Preparatory School Dorm  
Job Number: 05191378

Boring:	AFA19-01	AFA19-01	AFA19-01	AFA19-01	AFA19-01	AFA19-01	AFA19-01
Sample:	D-1	D-2	D-3	D-4	D-5	D-6	D-7
Depth:	0.5'-2.0'	3.0'-4.5'	5.5'-6.2'	6.2'-6.7'	6.7'-7.0'	8.0'-9.5'	13.0'-14.5'
Tare No.	1	4	13	21	48	5	33
Wet Soil	37.41	33.05	21.65	13.48	5.47	33.79	36.55
Dry Soil	35.27	31.60	20.70	11.29	4.82	32.51	34.71
Tare	1.29	1.29	1.30	1.30	1.25	1.26	1.27
% H2O	6.3	4.8	4.9	21.9	18.2	4.1	5.5

Boring:	AFA19-01	AFA19-02	AFA19-02	AFA19-02	AFA19-02	AFA19-02
Sample:	D-8	D-1	D-2	D-3	D-4	D-5
Depth:	18.5'-20.0'	0.5'-2.0'	3.0'-4.5'	5.5'-7.0'	8.0'-9.5'	13.0'-14.5'
Tare No.	36	35	30	90	28	32
Wet Soil	35.83	30.72	30.90	28.45	32.08	39.59
Dry Soil	34.03	29.57	29.53	27.39	30.59	37.07
Tare	1.27	1.27	1.27	1.28	1.30	1.27
% H2O	5.5	4.1	4.8	4.1	5.1	7.0

Boring:	AFA19-02	AFA19-02	AFA19-02	AFA19-02	AFA19-02
Sample:	D-6	D-7	D-8	D-9	D-10
Depth:	18.0'-19.5'	23.0'-24.5'	28.0'-29.5'	33.0'-34.5'	38.0'-38.7'
Tare No.	39	42	37	40	41
Wet Soil	42.39	37.02	40.04	41.40	39.64
Dry Soil	39.41	34.11	35.66	39.47	37.77
Tare	1.26	1.25	1.25	1.26	1.25
% H2O	7.8	8.9	12.7	5.1	5.1

Boring:	AFA19-03	AFA19-03	AFA19-03	AFA19-03	AFA19-03	AFA19-03
Sample:	D-1	D-2	D-3	D-4	D-5	D-6
Depth:	0.5'-2.0'	3.0'-4.5'	5.5'-7.0'	8.0'-9.5'	13.0'-14.5'	18.5'-20.0'
Tare No.	39	64	05	27	15	84
Wet Soil	36.99	35.05	27.59	33.15	35.84	35.05
Dry Soil	34.65	33.55	26.42	30.95	32.98	33.00
Tare	1.25	1.24	1.25	1.23	1.22	1.25
% H2O	7.0	4.6	4.6	7.4	9.0	6.5

**19-338-4025**REPORT DATE  
**Dec 04, 2019**RECEIVED DATE  
**Nov 27, 2019**SEND TO  
**12985****PAGE 1/4**ISSUE DATE  
**Dec 04, 2019**

**TERRACON INC  
SCOTT GREGORY  
15080 A CIR  
OMAHA NE 68144-**

**REPORT OF ANALYSIS**

For: (12985) TERRACON INC  
US Air Force Academy - Preparatory School Dorm  
United States Air Force Academy, Colorado  
05191378

Analysis	Level Found	Reporting			Analyst- Date	Verified- Date
	As Received	Units	Limit	Method		
Sample ID: <b>AFA19-01, D-5, 6.7</b> Lab Number: <b>8700347</b> Date Sampled: <b>2019-10-25</b>						
Sulfate	21	mg/L	5	EPA 300.0	mgn8-2019/12/02	jdb5-2019/12/04
Resistivity	1848	ohm-cm	0.1	SM 2510 B-(1997)	jdb5-2019/12/03	jdb5-2019/12/03
pH	7.71	S.U.	0.10	SM 4500-H+ B-(2011)	jsa6-2019/12/02	jdb5-2019/12/03
Conductivity	541	µS/cm	2	SM 2510 B-(1997)	jsa6-2019/12/02	jdb5-2019/12/03
Sample ID: <b>AFA19-02, D-6, 18.0</b> Lab Number: <b>8700348</b> Date Sampled: <b>2019-10-24</b>						
Sulfate	27	mg/L	5	EPA 300.0	mgn8-2019/12/02	jdb5-2019/12/04
Resistivity	1472	ohm-cm	0.1	SM 2510 B-(1997)	jdb5-2019/12/03	jdb5-2019/12/03
pH	8.07	S.U.	0.10	SM 4500-H+ B-(2011)	jsa6-2019/12/02	jdb5-2019/12/03
Conductivity	679	µS/cm	2	SM 2510 B-(1997)	jsa6-2019/12/02	jdb5-2019/12/03
Sample ID: <b>AFA19-03, D-5, 13.0</b> Lab Number: <b>8700349</b> Date Sampled: <b>2019-10-25</b>						
Sulfate	15	mg/L	5	EPA 300.0	mgn8-2019/12/02	jdb5-2019/12/04
Resistivity	1563	ohm-cm	0.1	SM 2510 B-(1997)	jdb5-2019/12/03	jdb5-2019/12/03
pH	8.24	S.U.	0.10	SM 4500-H+ B-(2011)	jsa6-2019/12/02	jdb5-2019/12/03
Conductivity	640	µS/cm	2	SM 2510 B-(1997)	jsa6-2019/12/02	jdb5-2019/12/03

The result(s) issued on this report only reflect the analysis of the sample(s) submitted.

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**19-338-4025**REPORT DATE  
**Dec 04, 2019**RECEIVED DATE  
**Nov 27, 2019**SEND TO  
**12985**13611 B Street • Omaha, Nebraska 68144-3693 • (402) 334-7770  
www.midwestlabs.com**PAGE 2/4**ISSUE DATE  
**Dec 04, 2019****TERRACON INC  
SCOTT GREGORY  
15080 A CIR  
OMAHA NE 68144-****REPORT OF ANALYSIS****For: (12985) TERRACON INC  
US Air Force Academy - Preparatory School Dorm  
United States Air Force Academy, Colorado  
05191378**

Analysis	Level Found	Units	Reporting		Method	Analyst-	Verified-
	As Received		Limit			Date	Date

All results are reported on an AS RECEIVED basis.

For questions please contact:

Heather Ramig  
Account Manager  
hramig@midwestlabs.com (402)829-9891

The result(s) issued on this report only reflect the analysis of the sample(s) submitted.

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**19-338-4025**REPORT DATE  
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**12985****PAGE 3/4**ISSUE DATE  
**Dec 04, 2019****TERRACON INC  
SCOTT GREGORY  
15080 A CIR  
OMAHA NE 68144-****REPORT OF ANALYSIS**

For: (12985) TERRACON INC  
US Air Force Academy - Preparatory School Dorm  
United States Air Force Academy, Colorado  
05191378

**Detailed Method Description(s)****EPA 300.0 ion chromatography**

Analysis follows MWL ENV 001 which follows EPA 300.0. Aqueous samples or aqueous extracts are injected into the IC instrument where the ions are separated by a column. As the ions elute from the column, they are measured by a conductivity detector and reported.

**Specific Conductance**

Sample analysis follows MWL EN 002 which is based on Standard Methods (SM) 2510 B. Aqueous samples or slurries are placed in a small vessel and allowed to equilibrate. A self-contained conductivity meter and probe is calibrated and the probe used to measure the electrical conductivity of the sample.

**pH**

Sample analysis follows MWL EN 003 which is based on Standard Methods (SM) 4500-H B. Aqueous samples (>20% volume) are allowed to equilibrate at room temperature. A pH meter and probe is calibrated and used to measure the hydronium concentration (pH) of the solution.

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## ATTACHMENT 4



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**APPENDIX F – LIMITED ACM SURVEY,  
LIMITED LBP INSPECTION, AND HAZARDOUS  
MATERIAL SURVEY - BLDGS 5210, 5212, AND  
5214**



**CONSOLIDATE PREP SCHOOL DORMITORIES**

**PNXQPZ104002**

**US AIR FORCE ACADEMY, COLORADO**



US ARMY CORPS OF ENGINEERS  
OMAHA DISTRICT

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**LIMITED ASBESTOS CONTAINING MATERIAL SURVEY,  
LIMITED LEAD-BASED PAINT INSPECTION,  
AND HAZARDOUS MATERIAL SURVEY**

**BUILDINGS 5210, 5212, AND 5214  
PREPARATORY SCHOOL  
UNITED STATES AIR FORCE ACADEMY  
COLORADO SPRINGS, COLORADO**

Prepared for:  
URS Corporation  
9960 Federal Drive, Suite 300  
Colorado Springs, Colorado 80921

Prepared by:



December 28, 2010



URS Corporation  
9960 Federal Drive, Suite 300  
Colorado Springs, CO 80921

Attn.: Mr. Ron Olson, PE

**Re: Limited Asbestos Containing Material Survey,  
Lead-Based Paint Inspection, and  
Hazardous Material Survey  
Buildings 5210, 5212 and 5214 Preparatory School  
United States Air Force Academy  
Colorado Springs, CO  
Empirical Project No. 3010128**

Dear Mr. Olson:

The purpose of this report is to present the results of the asbestos containing material survey, the lead-based paint inspection, and the hazardous material survey performed on November 26, 27, December 2 and 7, 2010 at the above referenced location. These surveys were conducted in accordance with our Proposal dated August 2, 2010.

These surveys were conducted prior to demolition activities to identify asbestos containing materials and hazardous materials and locate potential lead-based paint at the subject site.

Empirical appreciates the opportunity to be of service to URS. If you have any questions, please do not hesitate to contact us at 719-749-2068.

Sincerely,  
**Empirical Environmental, LLC**

A handwritten signature in black ink that reads "Fay L. Ward".

Fay L. Ward  
Lead Risk Assessor

A handwritten signature in blue ink that reads "Sheila D. Sealander".

Sheila D. Sealander  
IAQ Manager

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## EXECUTIVE SUMMARY

A limited asbestos containing material (ACM) survey, lead-based paint (LBP) inspection, and hazardous material survey were performed at Buildings 5210, 5212, and 5214 at the Preparatory School at the United States Air Force Academy prior to proposed demolition activities at the site.

ACMs were not reported in Buildings 5210 and 5212. ACM was reported in the pipe flashing cement on the roof of Building 5214. LBP was not reported in the interiors of the buildings but was reported on the white vertical beams on the exteriors of the buildings. Mercury was observed in several thermostats within the buildings. Transformers were dry type transformers, therefore would not normally contain PCB oils. Transformers were not opened or investigated other than visually, due to the fact they were in service. Ballasts were labeled as "No PCBs" with the exception of one (1) ballast in Building 5212. This ballast should be considered as containing PCBs. Light bulbs were fluorescent type lights that should be recycled prior to demolition. Should the contractor determine not to recycle the fluorescent bulbs, then the removal, handling and disposal of the estimated quantity should be accomplished in accordance with the applicable local, state, and federal waste disposal regulations. Emergency lights contained Ni-Cad batteries.

**LIMITED ASBESTOS CONTAINING MATERIAL SURVEY,  
LEAD-BASED PAINT INSPECTION,  
AND HAZARDOUS MATERIAL SURVEY**

**BUILDINGS 5210, 5212 and 5214 USAFA  
COLORADO SPRINGS, COLORADO**

**Empirical Project No. 3010128**

## **1.0 INTRODUCTION**

The following report presents the results from the limited survey for asbestos containing materials (ACM), the limited lead-based paint (LBP) inspection, and the limited hazardous material inspection at Buildings 5210, 5212, and 5214 located at the Preparatory School at the United States Air Force Academy (USAFA) in Colorado Springs, Colorado. The ACM survey endeavored to sample ACM using the Asbestos Hazard Emergency Response Act (AHERA) sampling protocol for suspect ACM. This survey was performed in general conformance with the U.S. Environmental Protection Agency's (EPAs) asbestos regulation (40 CFR 763) and Colorado's Regulation No. 8, Part B, Asbestos. The LBP inspection was performed in accordance with the U.S. Department of Housing and Urban Development's (HUD's) *Guidelines for the Evaluation and Control of Lead-Based Paint Hazard's in Housing*, Chapter 7, dated June 1995, revised 1997 and the State of Colorado's Department of Public Health and Environment Regulation 19. The hazardous material inspection included a review of items such as, but not limited to, mercury, Polychlorinated biphenyls (PCBs), batteries, and oils which would be common to these types and uses of the buildings.

## **2.0 ASBESTOS SURVEY**

A visual survey and select bulk sample collection for ACMs was performed by Mrs. Fay Ward Colorado Asbestos Building Inspector Certification Number 15931. A copy of the Inspector's certification is presented in Appendix A. Additionally, a copy of Empirical Environmental's Asbestos Firm certification is also presented in Appendix A. A visual survey and limited sampling for suspect materials were completed on November 26, 27, and December 2, 2010. Sample nomenclature is as follows: XXXX-YY-ZZ where XXXX indicates the building number; YY indicates the homogeneous area number; and ZZ indicates the consecutive sample number for that building. Specific Tables, Laboratory Reports, and Figures are presented as follows: Building 5210, Appendix B; Building 5212, Appendix C; and Building 5214, Appendix D.

Bulk samples were collected from homogeneous areas at the subject sites. Lists of these homogeneous areas along with the type of ACM for Buildings 5210, 5212, and 5214 are

included in Appendices B, C and D, Tab 1, respectively. The bulk samples were submitted to EMSL Analytical, Inc., located in Centennial, Colorado for analysis of asbestos utilizing Polarized Light Microscopy (PLM). The laboratory results are presented in Appendices B, C and D, Tab 2. This report is based on the bulk sample analysis results. EMSL Analytical, Inc. is an accredited laboratory for the analysis of bulk asbestos samples and is a member of the National Voluntary Laboratory Accreditation Program (NVLAP #200828-0). EMSL's NVLAP certification is presented in Appendix A. Suspect materials are considered positive for asbestos if the material contains greater than 1% asbestos. Site diagrams depicting the subject sites are presented in Appendices B, C and D, Tab 3.

## **2.1 Scope of Services**

The limited ACM survey included a visual inspection of suspected ACM, bulk sample collection of suspect ACM in readily accessible areas, and sample analysis of collected bulk samples. The purpose of this survey is to identify ACMs prior to demolition of the building. It should be noted the building is currently occupied and demolition was not scheduled at the time of this survey. Therefore, un-sampled materials could be located in walls, voids, and other concealed areas. After the building is vacant, and prior to demolition, walls should be breached in an attempt to locate other possible ACM's.

## **2.2 Building Descriptions**

Buildings 5210, 5212 and 5214 are three-story buildings with approximately 15,200 square feet each. The buildings were reportedly constructed in 1959. These buildings consist of dorm rooms, hallways, restrooms, stairways, storage rooms, offices, electrical rooms, and mechanical rooms. These buildings were reportedly renovated in 1972. Site diagrams depicting the subject sites are presented in Appendices B, C and D, Tab 3.

## **2.3 Sample Collection and Results**

After a visual inspection, samples were collected in general accordance with the sampling protocols outlined in the Environmental Protection Agency's (EPA's) regulation 40 CFR 763, Asbestos Hazard Emergency Response Act (AHERA). Since Buildings 5210, 5212, and 5214 are currently occupied a modified (non-random) AHERA protocol was used for sampling homogeneous areas. A homogeneous area is defined by Colorado Regulation 8 as "an area of surfacing material, thermal system insulation material, or miscellaneous material that is uniform in color and texture." In Building 5210, 67 samples were collected from 21 homogeneous areas of suspect ACM. In Building 5212, 70 samples were collected from 22 homogenous areas of suspect ACM, and in Building 5214, 85 samples were collected from 27 areas of suspect ACM. Lists of homogeneous areas along with the type of ACM are located in Table 1, Appendices B, C and D, Tab 1.



Building materials identified as glass, concrete, wood, rubber, fiberglass or metal are not considered suspect ACM.

### **2.3.1 Building 5210**

#### **2.3.1.1 Interior**

The ceiling areas of the subject site appeared to be composed of drywall and/or a suspended grid systems with drop-in ceiling tiles. One (1) type of drop-in ceiling tile was observed in the Day Rooms and Laundry Rooms. These tiles were sampled (5210-10-32, 5210-10-33 and 5210-10-34). These ceiling tiles were reported as not containing asbestos. The laboratory report for Building 5210 is presented in Appendix B, Tab 2.

The interior walls appeared to be constructed of drywall. One (1) apparent homogeneous drywall system was observed and sampled. The drywall system consisted of texture, drywall, tape, and joint compound and was observed throughout the building. This drywall system was sampled (sample numbers 5210-01-01, 5210-01-02, 5210-01-03, 5210-01-04, 5210-01-05, 5210-01-06, and 5210-01-07). These samples were reported as not containing asbestos.

Ceramic tile mastic with green board was observed on the walls in the restrooms. The mastic and green board behind the tiles were sampled (samples numbers 5210-08-26, 5216-08-27, and 5210-08-28). These samples were reported as not containing asbestos.

One (1) type of base cove was observed in the building. This base cove was black with tan mastic (sample numbers 5210-03-11, 5210-03-12, and 5210-03-13). These samples were reported as not containing asbestos.

Windows were observed on the outer walls of 5210. Black caulk was observed around some of these windows. This caulk was sampled (sample numbers 5210-14-44, 5210-14-45, and 5210-14-46). These samples were reported as not containing asbestos.

White caulk was observed in the Day Rooms around the block windows. This caulk was sampled (sample numbers 5210-15-47, 5210-15-48, and 5210-15-49). These samples were reported as not containing asbestos.

The flooring in the building appeared to consist of concrete overlaid by vinyl floor tile, linoleum, ceramic floor tile, and/or carpet. Two (2) types of vinyl floor tiles were observed in the Hallways, Broom Closets, and Storage Rooms. The floor tiles were black speckled with tan mastic (sample numbers 5210-02-08, 5210-02-09, and 5210-02-10), and white floor tile with yellow

**ACM, LBP, and HM Surveys  
Building 5210, 5212, 5214  
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mastic (sample numbers 5210-05-17, 5210-05-18, and 5210-05-19). These samples were reported as not containing asbestos.

Tan linoleum with tan mastic was observed in the Laundry Rooms and sampled (sample numbers 5210-19-59, 5210-19-60, and 5210-19-61). These samples were reported as not containing asbestos.

Blue carpeting with mastic was observed and sampled (sample numbers 5210-06-20, 5210-06-21, and 5210-06-22). These samples were reported as not containing asbestos.

Two (2) types of ceramic tile with grout were observed in foyer and landings of Stairway 1 and the Restrooms. The Stairway contained dark grey grout (sample numbers 5210-16-50, 5210-16-51, and 5210-16-52), and the Restrooms contained grey grout (sample numbers 5210-09-29, 5210-09-30, and 5210-09-31). These samples were reported as not containing asbestos.

Spray-on sink insulation was observed in the Restrooms. This insulation was sampled (sample numbers 5210-07-23, 5210-07-24, and 5210-07-25). These samples were reported as not containing asbestos.

Yellow pipe putty was observed in the Restrooms. This putty was sampled (sample numbers 5210-17-53, 5210-17-54, and 5210-17-55). This putty was reported as not containing asbestos.

Shiny white pipe putty was observed on the piping and sampled (sample numbers 5210-04-14, 5210-04-15 and 5210-14-16). White pipe putty was observed on the pipes in the Day Room (sample numbers 5210-11-35, 5210-11-36, and 5210-11-37). These samples were reported as not containing asbestos.

Pipe wrapping was observed and sampled (sample numbers 5210-12-38, 5210-12-39, and 5210-12-40). These samples were reported as not containing asbestos.

Silver duct wrapping was observed and sampled (sample numbers 5210-13-41, 5210-13-42, and 5210-13-43). These samples were reported as not containing asbestos.

Fire doors were observed throughout the building. Door handles were removed from a representative sample of these doors to view the interior material. The doors had wood cores or Styrofoam cores.

### **2.3.1.2 Exterior**

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The exterior of Building 5210 appeared to be constructed of brick and glass with aluminum panels beneath the windows. Two (2) types of caulking were observed and sampled: beige/white (sample numbers 5210-20-62, 5210-20-63 and 5210-20-64) and black (sample numbers 5210-21-65, 5210-21-66, and 5210-21-67). These samples were reported as not containing asbestos.

The roof appeared to be a built-up roof with a modified cap sheet that was sampled on December 2, 2010. The roof cap (shingle), tar, insulation, and felt were sampled (sample numbers 5210-100-01, 5210-100-02, and 5210-100-03). These samples were reported as not containing asbestos. Pipe flashing cement was observed and sampled (sample numbers 5210-101-10, 5210-101-11, and 5210-101-12) and was reported as not containing asbestos. Laboratory results and chain-of-custody are presented in Appendix B, Tab 2. Site diagrams are presented in Appendix B, Tab 3.

## **2.3.2 Building 5212**

### **2.3.2.1 Interior**

The ceiling areas of the subject site appeared to be composed of drywall and/or a suspended grid systems with drop-in ceiling tiles. One (1) type of drop-in ceiling tile was observed in the Day Rooms and Laundry Rooms. These tiles were sampled (5212-03-11, 5212-03-12, and 5212-03-13). These ceiling tiles were reported as not containing asbestos. The laboratory report is presented in Appendix C, Tab 2.

The interior walls appeared to be constructed of drywall. One (1) apparent homogeneous drywall system was observed and sampled. The drywall system consisted of texture, drywall, tape, and joint compound and was observed throughout the building. This drywall system was sampled (sample numbers 5212-01-01, 5212-01-02, 5212-01-03, 5212-01-04, 5212-01-05, 5212-01-06, and 5212-01-07). These samples were reported as not containing asbestos.

Ceramic tile mastic with green drywall board was observed on the walls in the restrooms. The mastic and green board behind the tile was sampled (samples numbers 5212-07-23, 5212-07-24, and 5212-07-25). These samples were reported as not containing asbestos.

One (1) type of base cove was observed in the building. This base cove was black with yellow mastic (sample numbers 5212-11-35, 5212-11-36, and 5212-11-37). These samples were reported as not containing asbestos.

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Preparatory School, USAFA  
December 28, 2010**

Windows were observed on the outer walls of Building 5212. Black caulk was observed around some of these windows. This caulk was sampled (sample numbers 5212-15-47, 5212-15-48, 5212-15-49). These samples were reported as not containing asbestos.

White caulk was observed in the Day Rooms and Storage Rooms around the block windows. This caulk was sampled (sample numbers 5212-05-17, 5212-05-18, 5212-05-19). These samples were reported as not containing asbestos.

The flooring in the building appeared to consist of concrete overlaid by vinyl floor tile, linoleum, ceramic floor tile, and/or carpet. Two (2) types of vinyl floor tiles were observed in the Hallways, Broom Closets, and Storage Rooms. The floor tiles were black tile with yellow mastic (sample numbers 5212-12-38, 5212-12-39, and 5212-12-40), and white floor tile with yellow mastic (sample numbers 5212-16-50, 5212-16-51, and 5212-16-52). These samples were reported as not containing asbestos.

Brown linoleum with yellow mastic was observed in the Laundry Rooms and sampled (sample numbers 5212-20-62, 5212-20-63, and 5212-20-64). These samples were reported as not containing asbestos.

Blue carpeting with mastic was observed and sampled (sample numbers 5212-14-44, 5212-14-45, and 5212-14-46). These samples were reported as not containing asbestos.

Two (2) types of ceramic tile with grout were observed in foyer, the landings of Stairway 1, and the Restrooms. The Stairway contained dark grey grout (sample numbers 5212-02-08, 5212-02-09, and 5212-02-10), and the Restrooms contained grey grout (sample numbers 5212-08-26, 5212-08-27, and 5212-08-28). These samples were reported as not containing asbestos.

Spray-on sink insulation was observed in the Restrooms. This insulation was sampled (sample numbers 5212-06-20, 5212-06-21, and 5212-06-22). These samples were reported as not containing asbestos.

Yellow sink putty was observed in the Restrooms. This putty was sampled (sample numbers 5212-19-59, 5212-19-60, and 5212-19-61). This putty was reported as not containing asbestos.

Soft white pipe putty was observed on the piping in the Day Rooms and Laundry Room and sampled (sample numbers 5212-04-14, 5212-04-15, and 5212-04-16). White putty was observed on piping (sample numbers 5212-13-41, 5212-13-42, and 5212-13-43). These samples were reported as not containing asbestos.

Pipe wrapping was observed and sampled (sample numbers 5212-09-29, 5212-09-30, and 5212-09-31) and was reported as not containing asbestos.

Silver duct wrapping was observed and sampled (sample numbers 5212-10-32, 5212-10-33, and 5212-10-34). These samples were reported as not containing asbestos.

Fire doors were observed throughout the building. Door handles were removed from a representative sample of these doors to view the interior material. The doors had wood cores or Styrofoam cores.

### **2.3.2.2 Exterior**

The exterior of Building 5212 appeared to be constructed of brick and glass with aluminum panels beneath the windows. Four (4) types of caulking were observed: beige (sample numbers 5212-17-53, 5212-17-54, and 5212-17-55); black (sample numbers 5212-18-56, 5212-18-57, and 5212-18-58); white (sample numbers 5212-21-65, 5212-21-66, and 5212-21-67); and clear (sample numbers 5212-22-68, 5212-22-69, and 5212-22-70). These samples were reported as not containing asbestos.

The roof appeared to be a built-up roof with a modified cap sheet that was sampled on December 2, 2010. The roof cap (shingle), tar, insulation, and felt were sampled (sample numbers 5212-100-04, 5212-100-05, and 5212-100-06). These samples were reported as not containing asbestos. Pipe flashing cement was observed and sampled (sample numbers 5212-101-13, 5212-101-14, and 5212-101-15) and was reported as not containing asbestos. Laboratory results and the chain-of-custody are presented in Appendix C, Tab 2. Site diagrams are presented in Appendix C, Tab 3.

## **2.3.3 Building 5214**

### **2.3.3.1 Interior**

The ceiling areas of the subject site appeared to be composed of drywall and/or a suspended grid systems with drop-in ceiling tiles. One (1) type of drop-in ceiling tile was observed in the Day Rooms and Laundry Rooms. These tiles were sampled (5214-03-11, 5214-03-12, and 5214-03-13). These ceiling tiles were reported as not containing asbestos. The laboratory report is presented in Appendix D, Tab 2.

The interior walls appeared to be constructed of drywall. One (1) apparent homogeneous drywall system was observed and sampled. The drywall system consisted of texture, drywall, tape, and joint compound and was observed throughout the building. This drywall system was

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sampled (sample numbers 5214-01-01, 5214-01-02, 5214-01-03, 5214-01-04, 5214-01-05, 5214-01-06, and 5214-01-07). These samples were reported as not containing asbestos.

Ceramic tile mastic with green drywall board was observed on the walls in the restrooms. The mastic and green board behind the tiles were sampled (samples numbers 5214-11-35, 5214-11-36, and 5214-11-37). These samples were reported as not containing asbestos.

One (1) type of base cove was observed in the building. This base cove was black with yellow mastic (sample numbers 5214-06-20, 5214-06-21, and 5214-06-22). These samples were reported as not containing asbestos.

Windows were observed on the outer walls of 5214. Black caulk was observed around some of these windows. This caulk was sampled (sample numbers 5214-15-47, 5214-15-48, 5214-15-49). These samples were reported as not containing asbestos.

Two (2) types of white caulk were observed in the building. White caulk was observed in the Day Rooms and Storage Rooms around the block windows. This caulk was sampled (sample numbers 5214-04-14, 5214-04-15, 5214-04-16). These samples were reported as not containing asbestos. White caulk was also observed on the piping system (samples numbers 5214-19-59, 5214-19-60, and 5214-19-61). These samples were reported as not containing asbestos.

The flooring in the building appeared to consist of concrete overlaid by vinyl floor tile, linoleum, ceramic floor tile, and/or carpet. Three (3) types of vinyl floor tiles were observed in the Hallways, Broom Closets, and Storage Rooms. The floor tiles were: black tile with yellow mastic (sample numbers 5214-14-44, 5214-14-45, and 5214-14-46); white floor tile with tan mastic (sample numbers 5214-16-50, 5214-16-51, 5214-16-52); and white tile with grey specks and tan mastic (sample numbers 5214-20-62, 5214-20-63, and 5214-20-64). The floor tiles and mastics were reported as not containing asbestos.

One (1) type of linoleum was observed in the Laundry Rooms. The brown linoleum with tan mastic was sampled (sample numbers 5214-21-65, 5214-21-66, and 5214-21-67) and reported as not containing asbestos.

Blue carpeting with yellow mastic was observed and sampled (sample numbers 5214-05-17, 5214-05-18, and 5214-05-19). These samples were reported as not containing asbestos.

Two (2) types of ceramic tile with grout were observed in foyer, landings of Stairway 1, and the Restrooms. The foyer and Stairway contained dark grey grout (sample numbers 5214-02-08, 5214-02-09, and 5214-02-10), and the Restrooms contained grey grout (sample numbers 5214-

12-38, 5212-12-39, and 5214-12-40). These samples were reported as not containing asbestos.

Spray-on sink insulation was observed in the Restrooms. This insulation was sampled (sample numbers 5214-09-29, 5214-09-30, and 5214-09-31). These samples were reported as not containing asbestos.

Yellow sink putty was observed in the Restrooms. This putty was sample numbers (5214-10-32, 5214-10-33, and 5214-10-34). This putty was reported as not containing asbestos.

Three (3) types of white putty were observed and sampled. These were: soft white pipe putty (sample numbers 5214-18-56, 5214-18-57, 5214-18-58); white putty (sample numbers 5214-08-26, 5214-08-27, 5214-08-28); and grey putty (sample numbers 5214-22-68, 5214-22-69, and 5214-22-70). These samples were reported as not containing asbestos.

Pipe wrapping was observed and sampled (sample numbers 5214-13-41, 5214-13-42, and 5214-13-43) and was reported as not containing asbestos.

Silver duct wrapping was observed and sampled (sample numbers 5214-17-53, 5214-17-54, 5214-17-55). These samples were reported as not containing asbestos.

Yellow foam insulation was observed in the Electrical room (sample numbers 5214-07-23, 5214-07-24, and 5214-07-25). These samples were reported as not containing asbestos.

Fire doors were observed throughout the building. Door handles were removed from a representative sample of these doors to view the interior material. The doors had wood cores or Styrofoam cores.

### **2.3.3.2 Exterior**

The exterior of Building 5214 appeared to be constructed of brick and glass with aluminum panels beneath the windows. Four (4) types of caulking were observed: black (sample numbers 5214-23-71, 5214-23-72, and 5214-23-73); beige (sample numbers 5214-24-74, 5214-24-75, and 5214-24-76); white (sample numbers 5214-25-77, 5214-25-78, and 5214-25-79); and clear (sample numbers 5214-26-80, 5214-26-81, and 5214-26-82). These samples were reported as not containing asbestos.

Pipe tape was observed on the piping on the exterior of the building. This pipe tape was sampled (sample numbers 5214-27-83, 5214-27-84, and 5214-27-85). These samples were reported as not containing asbestos.

The roof appeared to be a built-up roof with a modified cap sheet that was sampled on December 2, 2010. The roof cap (shingle), tar, insulation, and felt were sampled (sample numbers 5214-100-07, 5214-100-08, and 5214-100-09). These samples were reported as not containing asbestos. Pipe flashing cement was observed and sampled (sample numbers 5214-101-16, 5214-101-17, and 5214-101-18) and was reported as containing 4% Chrysotile asbestos. A photograph of this flashing cement is presented in Appendix D, Tab 4. Laboratory results and the chain-of-custody are presented in Appendix D, Tab 2. Site diagrams are presented in Appendix D, Tab 3.

## **2.4 Sample Results Summary**

Upon completion of the Limited Asbestos Survey and review of the sample results, it appears asbestos containing materials (ACMs) were not reported at Buildings 5210 or 5212. Building 5214 was reported as having Chrysotile asbestos in the pipe flashing cement on the roof. This material is not considered friable. Furthermore, according to Regulation 8, III.S.4 "tar impregnated roofing felts, asphalt roofing tiles, roofing asphalts, roofing mastics, and asphaltic pipeline coatings that are nonfriable and will remain nonfriable during abatement are exempt from this regulation."

Field sketches of the building were prepared by Empirical to show the relative locations of the samples collected. These field sketches should not be considered either accurate or scaled and are provided for illustration purposes only. These field sketches, or figures, with sample locations are included in Appendices B, C and D, Tab 3.

## **2.5 Regulatory Review**

In the state of Colorado, asbestos activities are regulated by the Colorado Department of Public Health and Environment (CDPHE) under Regulation No. 8, Control of Hazardous Air Pollutants, Colorado Air Quality Control Division, Section III, Part 6. Regulation 8 requires that any asbestos related activity conducted in a public or commercial building be performed by certified personnel. Friable ACM must be removed prior to renovation or demolition activities with will disturb the material. Friable is defined by Regulation 8 as "that material, when dry, may be crumbled, pulverized, or reduced to powder by hand pressure, and includes previously nonfriable material after such previously nonfriable material becomes damaged to the extent that when dry it may be crumbled, pulverized, or reduced to powder by hand pressure." If the amount of removed ACMs exceeds 260 linear feet on pipes, or more than 160 square feet on other materials, or a volume equivalent to a 55-gallon drum, the owner or operator must provide CDPHE with written notification of planned removal activities at least 10 working days prior to the start of abatement activities. Abatement activities must be conducted by a Colorado



certified General Abatement Contractor (GAC). Air clearances must be conducted by a certified Air Monitoring Specialist independent of the GAC.

A demolition permit must be obtained from CDPHE prior to demolition activities even if asbestos is not found in a building. A demolition permit typically takes 10 working days and must be signed by the asbestos building inspector.

### **3.0 LIMITED LEAD-BASED PAINT INSPECTION**

This limited LBP inspection was performed on November 27, 28, and December 7, 2010 at Buildings 5210, 5212 and 5214 at the Preparatory School at the USAFA in Colorado Springs, Colorado, (subject site) by Mrs. Fay L. Ward of Empirical (Colorado Lead Risk Assessor Certification number 10327).

This inspection was performed in accordance with the U.S. Department of Housing and Urban Development's (HUD's) *Guidelines for the Evaluation and Control of Lead-Based Paint Hazard's in Housing*, Chapter 7, dated June 1995, revised 1997 and the State of Colorado's Department of Public Health and Environment Regulation 19. LBP is defined by the U.S. Environmental Protection Agency (EPA) as paint, varnish, shellac, or other coatings on surfaces that contain more than 1.0 mg/cm<sup>2</sup> (milligrams per square centimeter) of lead or more than 0.5 percent lead by weight. Lead can be present in paint at lower levels and not be defined as lead-based paint. Generally, "leaded paint" or "paint containing lead" is present if surfaces contain more than 0.06 percent lead by weight, but less than 0.5 percent lead by weight. For this type of measurement, percent lead by weight, paint chip sampling is required. Paint chip sampling is usually destructive and performed only at the client's request.

Paint conditions have been included and are defined by HUD as: (1) Intact: Entire surface area is intact; (2) Fair: Less than or equal to 10 percent of the total painted surface area of the component is deteriorated; or less than or equal to 2 square feet of the total surface area has deteriorated paint; or less than or equal to 20 square feet of the total surface area on large exterior surfaces and (3) Poor: More than 10 percent of the total painted surface area of the component is deteriorated; or more than 2 square feet of the total surface area has deteriorated paint; or more than 20 square feet of the total surface area on large exterior surfaces. LBP with a "fair" condition should be repaired and/or monitored, but is not considered to be a lead-based paint hazard as defined by Residential Lead-Based Paint Hazard Reduction Act (also known as Title X). LBP surfaces in "poor" condition are considered to be "lead-based paint hazards" as defined by Title X and should be addressed through abatement or interim controls.

Sampling was performed using a Niton XLi-702a Series Lead Analyzer (Serial Number 14719) that utilizes X-Ray Fluorescence (XRF) technology. The XRF's testing mode was set at K & L

Spectra Mode during this inspection and the assay (source) date was April 1, 2007. This type of sampling is non-destructive. Empirical calibrated the XRF according to manufacturer's directions prior to, during, and at the end of the inspection. Substrate correction is not recommended for this XRF instrument.

The subject sites consisted of a three (3) three-story buildings. This inspection was performed as a multi-family housing inspection in accordance with HUD and included 45 dorm rooms and common areas within the buildings. Surfaces included in this inspection were walls, door jambs, doors, and other painted surfaces. A list of testing components for each specific room equivalent is located in Appendix E, Table 1. The observed painted surfaces at the subject site appeared to be in intact or fair condition. Paint conditions for tested surfaces are listed in Tables 2, 3 and 4 in Appendix E. Untested surface conditions are not included in this report. One thousand two hundred and seventy-seven XRF readings were taken for this survey; 54 were for calibration purposes, 72 were null or incomplete readings, and one thousand one hundred and fifty-one were at selected locations at the subject sites.

### **3.1 XRF Sampling**

#### **3.1.1 Building 5210**

Fourteen dorm rooms and common areas were tested in Building 5210. The dorm rooms tested in Building 5210 were 104, 106, 107, 109, 112, 101, 202, 211, 213, 303, 304, 307, 308, and 310. Common areas tested within the building included day rooms, restrooms, laundry rooms, hallways and stairways.

Three hundred and fifty-three XRF readings were taken on the interior of the building. These XRF readings registered below 1.0 mg/cm<sup>2</sup> and would not be considered LBP as defined by the EPA.

Thirty-six XRF readings were taken on the exterior of the building. Thirty-one of these XRF readings registered below 1.0 mg/cm<sup>2</sup> and would not be considered LBP as defined by the EPA. Five (5) of these XRF readings registered above 1.0 mg/cm<sup>2</sup> and would be considered LBP by the EPA. These readings were located on the white vertical beams on the northwest and southwest corners of the building. Areas and components not specifically surveyed may contain LBP. The XRF readings, locations, and paint conditions are enclosed in Table 2, Appendix E. A site diagram is enclosed as Figures 1, 2, and 3 in Appendix F, Tab 1. The Lead Risk Assessor's certification and Empirical's Lead Firm certification are included in Appendix A.

#### **3.1.2 Building 5212**

**ACM, LBP, and HM Surveys  
Building 5210, 5212, 5214  
Preparatory School, USAFA  
December 28, 2010**

Sixteen dorm rooms and common areas were tested in Building 5212. The dorm rooms tested were 101, 106, 111, 113, 203, 204, 205, 206, 207, 208, 213, 301, 307, 308, 311, and 313. Common areas tested within the building included day rooms, restrooms, laundry rooms, hallways and stairways.

Three hundred and sixty-two XRF readings were taken on the interior of the building. These XRF readings registered below  $1.0 \text{ mg/cm}^2$  and would not be considered LBP as defined by EPA.

Nineteen XRF readings were taken on the exterior of the building. Seventeen of these XRF readings registered below  $1.0 \text{ mg/cm}^2$  and would not be considered LBP as defined by the EPA. Two (2) of these XRF readings registered above  $1.0 \text{ mg/cm}^2$  and would be considered LBP by the EPA. These readings were located on the white vertical beams on the northwest and southwest corners of the building. Areas and components not specifically surveyed may contain LBP. The XRF readings, locations, and paint conditions are enclosed in Table 3, Appendix E. A site diagram is enclosed as Figures 1, 2, and 3 in Appendix F, Tab 2. The Lead Risk Assessor's certification and Empirical's Lead Firm certification are included in Appendix A.

### **3.1.3 Building 5214**

Fifteen dorm rooms and common areas were tested in Building 5214. The dorm rooms tested were 102, 104, 108, 110, 111, 112, 203, 204, 205, 206, 209, 212, 214, 303, and 314. Common areas tested within the building included day rooms, restrooms, laundry rooms, hallways and stairways.

Three hundred and sixty XRF readings were taken on the interior of the building. These XRF readings registered below  $1.0 \text{ mg/cm}^2$  and would not be considered LBP as defined by EPA.

Twenty-one XRF readings were taken on the exterior of the building. Nineteen of these XRF readings registered below  $1.0 \text{ mg/cm}^2$  and would not be considered LBP as defined by the EPA. Two (2) of these XRF readings registered above  $1.0 \text{ mg/cm}^2$  and would be considered LBP by the EPA. These readings were located on white vertical beams on the northeast and southeast corners of the building. Areas and components not specifically surveyed may contain LBP. The XRF readings, locations, and paint conditions are enclosed in Table 4, Appendix E. A site diagram is enclosed as Figures 1, 2, and 3 in Appendix F, Tab 3. The Lead Risk Assessor's certification and Empirical's Lead Firm certification are included in Appendix A.

## **3.2 Summary of XRF Results**

The results of this inspection indicate that lead in amounts greater than or equal to 1.0 mg/cm<sup>2</sup> in paint were not found on the interiors of Buildings 5210, 5212, and 5214. LBP was found on the exterior white vertical beams on the corners of the buildings. The untested exterior white paint should be assumed to be LBP.

### **3.3 Regulatory Review**

The Occupational Safety and Health Administration's (OSHA's) regulation for lead in construction is 29 CFR 1926.62 and applies to construction work where an employee may be occupationally exposed to lead. OSHA does not recognize lead levels in paint, but focuses on lead levels in the ambient air during construction. Therefore, OSHA applies during construction activities that impact lead-containing paint as well as lead-based paint. When impacting leaded paint, OSHA requires an exposure assessment be performed during the work at which time the employer must assume the employees will be exposed to 10 times the permissible exposure limit (PEL) of 50 micrograms of lead per cubic meter of air ( $\mu\text{g}/\text{m}^3$ ) averaged over an 8-hour period, and provide the necessary personal protection equipment (PPE). The employer must have a written compliance program and must implement a respiratory protection program in accordance with 29 CFR 1910.134.

## **4.0 HAZARDOUS MATERIALS SURVEY**

A Hazardous Material Survey (HMS) was conducted in Buildings 5210, 5212, and 5214 at the U.S. Air Force Academy (USAFA) 26 November 2010 in accordance with the terms and conditions specified in the contract between URS and Empirical Environmental. The HMS was conducted to identify hazardous material that may be encountered during the demolition of the building. The HMS was conducted by performing a visual assessment of accessible spaces within the building in an effort to identify potentially hazardous materials which would need to be addressed prior to demolition. The survey included a review of items such as, but not limited to, mercury, Polychlorinated biphenyls (PCBs), batteries, and oils which would be common to the types and uses of the buildings. Buildings 5210, 5212, and 5216 had transformers within them that appeared to be dry transformers. The transformers were in use and no attempt was made to access the cabinets of these transformers. The survey identified items of concern within the areas accessible at the time of the survey.

Fluorescent type bulbs surveyed were predominantly "Green Tip" type bulbs. These types of bulbs (Green Tip) may contain small amounts of mercury and should be recycled to preclude the introduction of potentially hazardous materials to landfills. Environmental regulations require special handling of fluorescent bulbs during operations that involve complete replacement and/or the complete removal of bulbs for the entire building. Prior to the removal of the fluorescent bulbs, contact should be made with a recycling firm who may provide the

necessary containers for the bulbs to be placed and subsequently picked up and removed for recycling.

Batteries containing lead acid and Nickel Cadmium (Ni-Cad) should be properly handled and recycled/disposed of in accordance with all applicable laws and regulations.

Should the cooling systems contain Freon's or other compressed gases used for cooling a certified refrigeration recapturing system should be utilized to capture the gases prior to demolition. Cooling units were not accessible at the time of the assessment.

#### **4.1 Results of HMS**

##### **4.1.1 Building 5210**

Rooms were surveyed for the potential of mercury contained within the thermostat and PCB ballasts within the florescent light fixtures. A random sampling of the light fixtures was conducted.

Rooms that were not accessible during the survey were the third floor Telecom room # 317 and the storage room # 318.

##### **4.1.1.1 Fluorescent Light Fixtures**

Dorm rooms each contained two (2) ballasts per light fixture and three (3) T-8 type bulbs. There were two (2) light fixtures per room. A total of 123 T-8 fluorescent bulbs and 82 ballasts were identified during the survey. The ballasts reviewed each contained markings/labels as "No PCBs". The ballasts were predominantly Motorola M1-RN-T8-1LL-D-277 and Magnetek B232R277HP type ballasts.

The Dayrooms contained a total of six (6) fixtures each with one (1) ballast and three (3) fluorescent T-8 type bulbs. The total number bulbs were 18 and 6 ballasts. No ballasts were identified as containing PCBs .

Each hallway contained fluorescent lighting. Each hall contained an average of 18 light fixtures. Each fixture contained two (2) bulbs and one (1) ballast per fixture. The bulbs were T-8 type bulbs and the ballasts were marked/labeled as "No PCBs". There were two (2) halls per floor and a total of three (3) floors. The hallways within the building contained approximately 216 fluorescent bulbs and 108 ballasts.

Restroom areas contained fluorescent fixtures each with two (2) bulbs and a single ballast. There were a total of 28 fixtures in the restrooms within the building. The total number of fluorescent bulbs was 48 and 28 ballasts. Ballasts surveyed were marked/labeled as “No PCBs”.

Small recessed fluorescent lighting, Sylvana Dulux DE 26W four pin lamps, were identified throughout the building in such areas as, but not limited to, Dayroom 118, bathrooms, stairwells and corridors 122, 222, and 322. There were approximately 52 small recessed type lights in the building.

#### **4.1.1.2 Mercury**

Thermostats were surveyed for the potential of mercury. Thermostats were predominantly White – Rogers Brand type thermostats. The following bedrooms were identified as having thermostats with mercury:

- First floor: 101, 103, 104, 106, 107, 108, 111, 112, 113, hallway outside room 107, and first floor stairwell identified as stair 124
- Second Floor: 201, 203, 205, 206, 211, 212
- Third Floor: 303, 304, 305, 306, 308, 310, 311, 312, 313, 314

#### **4.1.1.3 Batteries**

Four (4) lead acid type batteries were identified in the electric room #117. Emergency lights each contained a small lead acid type battery. There were 16 emergency lights identified within the building.

Exit signs each contained Ni-Cad type batteries as backup battery power. Each exit sign contained a 4.8 volt Ni-Cad battery. There were a total of 18 exit signs identified during the survey of the building.

#### **4.1.2 Building 5212**

Rooms were surveyed for the potential of mercury contained within the thermostat and PCB ballasts within the florescent light fixtures. A random sampling of the light fixtures was conducted.

##### **4.1.2.1 Fluorescent Light Fixtures**

Dorm rooms each contained two (2) ballasts per light fixture and three (3) T-8 type bulbs. There were two (2) light fixtures per room. A total of 123 T-8 fluorescent bulbs and 82 ballasts were

**ACM, LBP, and HM Surveys  
Building 5210, 5212, 5214  
Preparatory School, USAFA  
December 28, 2010**

identified during the survey. The ballast reviewed each contained markings/labels as "No PCBs". The ballasts were predominantly Motorola M1-RN-T8-1LL-D-277 and Magnetek B232R277HP type ballasts.

The Dayrooms contained a total of six (6) fixtures each with one (1) ballast and three (3) fluorescent T-8 type bulbs. The total number of bulbs was 18 and six (6) ballasts. No ballasts were identified as containing PCBs.

The hallways contained fluorescent lighting. Each hall contained an average of 18 light fixtures. Each fixture contained two (2) bulbs and one (1) ballast per fixture. The bulbs were T-8 type bulbs and the ballasts were marked/labeled as "No PCBs". There were two (2) halls per floor with a total of three (3) floors. The hallways within the building contained approximately 216 fluorescent bulbs and 108 ballasts.

Restroom areas contained fluorescent fixtures each with two (2) bulbs and a single ballast. There were a total of 28 fixtures in the restrooms within the building. The total number of fluorescent bulbs was 46 with 27 ballasts. The fluorescent ballasts surveyed were marked/labeled as "No PCBs". One (1) ballast on the first floor in the Restroom # 115 over the sink area was not marked and/or labeled as "No PCBs". The ballast was labeled as "Ultra Max GE Ballast" "GE 232 Max". This ballast should be considered and handled/disposed of as PCB waste in accordance with all applicable environmental laws and regulations.

Small recessed fluorescent lighting, Sylvana Dulux DE 26W four pin lamps, were identified throughout the building in such areas as, but not limited to, Dayroom 118, bathrooms, stairwells and corridors 122, 222, and 322. There were approximately 52 small recessed type lights in the building.

#### **4.1.2.2 Mercury**

Thermostats were surveyed for the potential of mercury. Thermostats were predominantly White – Rogers Brand type thermostats. The following Dorm rooms were identified as having thermostats with mercury:

- First floor: 102, 106, 109, 110, hallway outside room 114 and outside room 107
- Second Floor: 203, 205, 207, 208, 209, 212, 213, 214
- Third Floor: 301, 302, 304, 305, 307, 308, 310, 311, 313, 314

#### **4.1.2.3 Batteries**

Four (4) lead acid type batteries were identified in the electric room #117. Emergency lights each contained a small lead acid type battery. There were 16 emergency lights identified within the building.

Exit signs each contained Ni-Cad type batteries as backup battery power. Each exit sign contained a 4.8 volt Ni-Cad battery. There were a total of 18 exit signs identified during the survey with the building.

#### **4.1.3 Building 5214**

Rooms were surveyed for the potential of mercury contained within the thermostat and PCB ballasts within the florescent light fixtures. A random sampling of the light fixtures was conducted. Rooms 305, 308, 317, and 318 were not accessible during the survey.

##### **4.1.3.1 Fluorescent Light Fixtures**

Dorm rooms each contained two (2) ballasts per light fixture and three (3) T-8 type bulbs. There were two (2) light fixtures per room. A total of 123 T-8 fluorescent bulbs and 82 ballasts were identified during the survey. The ballast reviewed each contained markings/labels stating “No PCB’s”. The ballasts were predominantly Motorola M1-RN-T8-1LL-D-277 and Magnetek B232R277HP type ballasts.

The Dayrooms had a total of six (6) fixtures each with one (1) ballast and three (3) fluorescent T-8 type bulbs. The total number of bulbs was 18 with six (6) ballasts. Ballasts were not identified as containing PCBs .

Each hallway contained fluorescent lighting. Each hall contained an average of 18 light fixtures. Each fixture contained two (2) bulbs and one (1) ballast per fixture. The bulbs were T-8 type



bulbs and the ballasts were marked/labeled as “No PCBs”. There were two (2) halls per floor with a total of three (3) floors. The hallways within the building contained approximately 216 fluorescent bulbs and 108 ballasts.

Restroom areas contained fluorescent fixtures each with two (2) bulbs and a single ballast. There were a total of 28 fixtures in the restrooms in the building. There were a total of 48 fluorescent bulbs and 28 ballasts. Ballasts surveyed were marked/labeled as “No PCBs”.

Small recessed fluorescent lighting, Sylvana Dulux DE 26W four pin lamps, were identified throughout the building in such areas as, but not limited to, Dayroom 118, bathrooms, stairwells and corridors 122, 222, and 322. There were approximately 52 small recessed type lights in the building.

#### **4.1.3.2 Mercury**

Thermostats were surveyed for the potential of mercury. Thermostats were predominantly White – Rogers Brand type thermostats. The following bedrooms were identified as having thermostats with mercury:

- First floor: 101, 103, 106, 107, 108, 109, 111, hallway outside room 107
- Second Floor: 201, 203, 204, 206, 214
- Third Floor: 301, 304, 307, 309, 310, 312, 313, 314

#### **4.1.3.3 Batteries**

Four (4) lead acid type batteries were identified in the electric room #117. Emergency lights each contained a small lead acid type battery. There were 16 emergency lights identified within the building.

Exit signs each contained Ni-Cad type batteries as backup battery power. Each exit sign contained a 4.8 volt Ni-Cad battery. There were a total of 18 exit signs identified during the survey with the building.

### **5.0 CONCLUSIONS**

After reviewing the ACM results, it appears that asbestos containing materials were not reported in Building 5210 and 5212. Asbestos was reported in the pipe cement of the roof of Building 5214. The LBP results show LBP was found on the exterior white vertical beams. LBP was not found on the interior of the buildings. PCBs were not reported in the buildings with the exception of one (1) ballast in Building 5212 which was not labeled as “No PCBs”. It should be assumed this ballast contains PCBs. Mercury was reported several of the thermostats in the

buildings. Batteries within the exit signs should be removed and properly disposed of prior to demolition activities. Fluorescent bulbs should be removed, containerized and recycled.

The analyses and opinions expressed in this report are based upon data collected along with other information described in this report. This report does not reflect variation, which may occur across the site.

## **6.0 LIMITATIONS**

Empirical has performed a limited ACM survey, LBP inspection, and a limited Hazardous Material survey at Buildings 5210, 5212, and 5214, located at the Preparatory School at the United States Air Force Academy. Empirical has endeavored to assess the existing conditions at the subject building using that degree of care and skill ordinarily exercised, under similar circumstances, by consultants practicing in this, or similar locality. Results presented in this report are based on analytical data obtained for specific sampling locations at the time of this survey. Other sampling data at a different time or location may provide different results. Empirical used analytical results to assess whether ACMs were present in the building and XRF results to assess where LBP was located.

The ACM survey was conducted following a modified AHERA criteria. This, however, is not a guarantee that ACMs are limited to those areas where identified in this survey. The limitations of this limited survey should be recognized as conclusions are formulated on the environmental risks associated with this property. Empirical does not warrant the work of regulatory agencies or other third parties supplying information which may have been used during the preparation of this report.

This report was prepared for the exclusive use of URS for specific application to the subject property. No warranties, either expressed or implied, are made or intended. The material contained herein shall not, in whole or in part, be disseminated or conveyed to any other party or be used or relied upon by any other party without Empirical's written consent. In the event that any changes in the nature or location of suspected ACM, LBP, or HM as outlined in this report are observed, the conclusion and recommendations contained in this report shall not be valid unless these changes are reviewed and the opinions of this report are modified or verified in writing by Empirical.

**APPENDIX A**

**CERTIFICATIONS**



# STATE OF COLORADO

## ASBESTOS CERTIFICATION\*

Colorado Department of Public Health  
and Environment  
Air Pollution Control Division

This certifies that

**Fay L. Ward**

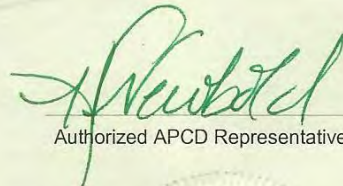
**Certification No: 15931**

has met the requirements of 25-7-507, C.R.S. and Air Quality Control  
Commission Regulation No. 8, Part B, and is hereby certified by the  
state of Colorado in the following discipline:

**Building Inspector\***

**Issued: 11/18/2010**

**Expires on: 11/18/2011**

  
Authorized APCD Representative

*\* This certificate is valid only with the possession of a current Division-approved training course  
certification in the discipline specified above.*

SEAL



# STATE OF COLORADO

## ASBESTOS CONSULTING FIRM

Colorado Department of Public Health  
and Environment  
Air Pollution Control Division

This certifies that

**Empirical Environmental, LLC**

**Registration No. ACF - 15924**

has met the registration requirements of 25-7-507, C.R.S. and the Air Quality Control Commission Regulation No. 8, Part B, and is hereby authorized to perform asbestos consulting activities as required under Regulation No 8, Part B, in the state of Colorado.

Issued: October 17, 2010

Expires: October 17, 2011

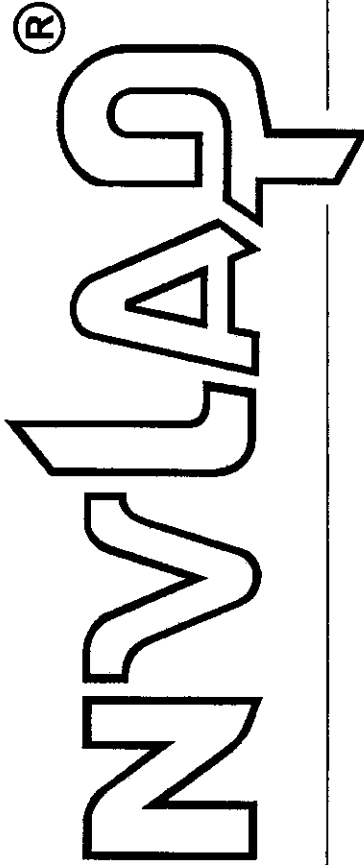


Authorized APCD Representative

SEAL



United States Department of Commerce  
National Institute of Standards and Technology



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## Certificate of Accreditation to ISO/IEC 17025:2005

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NVLAP LAB CODE: 200828-0

**EMSL Analytical, Inc.**  
Centennial, CO

is accredited by the National Voluntary Laboratory Accreditation Program for specific services,  
listed on the Scope of Accreditation, for:

### **BULK ASBESTOS FIBER ANALYSIS**

*This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005.  
This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality  
management system (refer to joint ISO-ILAC-IAF Communiqué dated January 2009).*

2010-04-01 through 2011-03-31

Effective dates



*Sally A. Bruce*  
For the National Institute of Standards and Technology



# STATE OF COLORADO

## LEAD-BASED PAINT CERTIFICATION\*

Colorado Department of Public Health  
and Environment  
Air Pollution Control Division

This certifies that

**Fay Ward**

**Certification No: 10327**

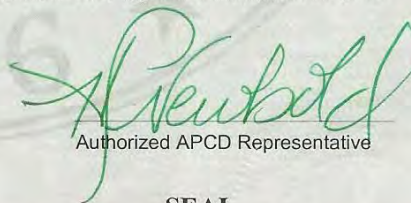
has met the requirements of 25-7-1104, C.R.S. and Air Quality Control  
Commission Regulation No. 19, and is hereby certified by the state of  
Colorado in the following discipline:

**Risk Assessor\***

**Issued: 2/3/2010**

**Expires on: 2/3/2012**

*\* This certificate is valid only with the possession of a valid lead-based paint training certificate in the discipline specified above, issued by either a Colorado approved training provider, an EPA approved training provider, or a training provider approved by another EPA authorized program.*

  
Authorized APCD Representative

SEAL



# STATE OF COLORADO

Colorado Department of Public Health  
and Environment  
Air Pollution Control Division

## Lead Evaluation Firm Certificate

This certifies that

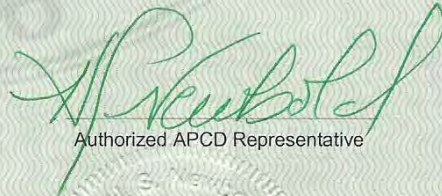
**Empirical Environmental, LLC**

**LEF No. : 10665**

has met the requirements of 25-7-1104, C.R.S. and Air Quality  
Control Commission Regulation No. 19, and is hereby certified by  
the state of Colorado to perform lead-based paint evaluation  
activities in the state of Colorado.

**Issued: 9/3/2010**

**Expires on: 9/3/2011**



Authorized APCD Representative

SEAL



## **APPENDIX B**

### **ASBESTOS – BUILDING 5210**

**TAB 1**

**HOMOGENEOUS AREAS**

Table 1  
**ASBESTOS INVENTORY SURVEY**  
 Building 5210, Preparatory School, USAFA  
 Colorado Springs, Colorado  
 December 2010

**Homogeneous Areas in the Building 5210**

NUMBER	DESCRIPTION	MATERIAL TYPE	ASBESTOS	LOCATION
1	Texture, Drywall, Joint Compound and Tape	Miscellaneous	NO	Throughout Building
2	Black Floor Tile with Mastic	Miscellaneous	NO	Broom Closets
3	Black Base Cove with Mastic	Miscellaneous	NO	Broom and Janitor's Closets
4	White Pipe Wrap Putty	TSI	NO	Throughout Building Piping System
5	White Floor Tile with Mastic	Miscellaneous	NO	Hallways
6	Blue Speck Carpet with Yellow Mastic	Miscellaneous	NO	Throughout Building
7	Sink Insulation	Surfacing	NO	Restrooms
8	Mastic with Green Drywall	Miscellaneous	NO	Restrooms
9	Grey Grout	Surfacing	NO	Restrooms
10	2 X 2 Drop Ceiling Tile	Miscellaneous	NO	Day Rooms, Laundry Room
11	White Pipe Putty	TSI	NO	Day Room Piping System
12	Pipe Wrap Insulation	TSI	NO	Mechanical Room and Pipe Chase
13	Silver HVAC Wrap	TSI	NO	Mechanical Room and Pipe Chase
14	Black Caulk	Surfacing	NO	Windows Throughout Building
15	White Caulk	Surfacing	NO	Stairway 1, Day Rooms and Storage Rooms,
16	Dark Grey Grout	Miscellaneous	NO	Stairway 1
17	Yellow Pipe Putty	TSI	NO	Restrooms
18	No Sample Submitted	N/A	N/A	N/A

Table 1  
**ASBESTOS INVENTORY SURVEY**  
 Building 5210, Preparatory School, USAFA  
 Colorado Springs, Colorado  
 December 2010

**Homogeneous Areas in the Building 5210**

<b>NUMBER</b>	<b>DESCRIPTION</b>	<b>MATERIAL TYPE</b>	<b>ASBESTOS</b>	<b>LOCATION</b>
19	Brown Linoleum Tile Mastic	Miscellaneous	NO	Storage Rooms, Laundry Rooms
20	Exterior Beige/White Caulk	Miscellaneous	NO	Exterior
21	Exterior Black Caulk	Miscellaneous	NO	Exterior
22 (100)	Roof Cap (Shingle), Tar, Insulation and Felt	Miscellaneous	NO	Roof
23 (101)	Pipe Flashing Cement	Surfacing	NO	Roof

**TAB 2**

**LABORATORY REPORTS AND CHAIN OF CUSTODY**

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EMSL Order: 221002297

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Project: **3010128 / Bldg 5210**

EMSL Proj:  
Analysis Date: 12/2/2010

### Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5210-01-01-Texture 221002297-0001	Drywall, Jnt Cmp & Tape & Texture	White Non-Fibrous Heterogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5210-01-01-Tape 221002297-0001A	Drywall, Jnt Cmp & Tape & Texture	White Fibrous Homogeneous	100% Cellulose	0% Non-fibrous (other)	<b>None Detected</b>
5210-01-01-Joint Compound 221002297-0001B	Drywall, Jnt Cmp & Tape & Texture	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5210-01-01-Drywall 221002297-0001C	Drywall, Jnt Cmp & Tape & Texture	Brown/White Fibrous Heterogeneous	10% Cellulose 5% Glass	85% Non-fibrous (other)	<b>None Detected</b>
5210-01-02-Texture 221002297-0002	Drywall, Jnt Cmp & Tape & Texture	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5210-01-02-Tape 221002297-0002A	Drywall, Jnt Cmp & Tape & Texture	White Fibrous Homogeneous	100% Cellulose	0% Non-fibrous (other)	<b>None Detected</b>

Initial report from 12/02/2010 10:33:18

Analyst(s)

DeCavallas Michael (86)

Molly Walker (19)

  
Erin Orthun, Laboratory Manager  
or other approved signatory

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## Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5210-01-02-Joint Compound 221002297-0002B	Drywall, Jnt Cmp & Tape & Texture	White Non-Fibrous  Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5210-01-02-Drywall 221002297-0002C	Drywall, Jnt Cmp & Tape & Texture	Brown/White Fibrous Heterogeneous	10% Cellulose 5% Glass	85% Non-fibrous (other)	<b>None Detected</b>
5210-01-03-Texture 221002297-0003	Drywall, Jnt Cmp & Tape & Texture	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5210-01-03-Tape 221002297-0003A	Drywall, Jnt Cmp & Tape & Texture	White Fibrous Homogeneous	100% Cellulose	0% Non-fibrous (other)	<b>None Detected</b>
5210-01-03-Joint Compound 221002297-0003B	Drywall, Jnt Cmp & Tape & Texture	White Non-Fibrous  Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5210-01-03-Drywall 221002297-0003C	Drywall, Jnt Cmp & Tape & Texture	Brown/White Fibrous Heterogeneous	10% Cellulose 5% Glass	85% Non-fibrous (other)	<b>None Detected</b>

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EMSL Proj:  
Analysis Date: 12/2/2010

### Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5210-01-04-Texture 221002297-0004	Drywall, Jnt Cmp & Tape & Texture	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5210-01-04-Tape 221002297-0004A	Drywall, Jnt Cmp & Tape & Texture	White Fibrous Homogeneous	100% Cellulose	0% Non-fibrous (other)	<b>None Detected</b>
5210-01-04-Joint Compound 221002297-0004B	Drywall, Jnt Cmp & Tape & Texture	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5210-01-04-Drywall 221002297-0004C	Drywall, Jnt Cmp & Tape & Texture	Brown/White Fibrous Heterogeneous	10% Cellulose 5% Glass	85% Non-fibrous (other)	<b>None Detected</b>
5210-01-05-Texture 221002297-0005	Drywall, Jnt Cmp & Tape & Texture	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5210-01-05-Tape 221002297-0005A	Drywall, Jnt Cmp & Tape & Texture	White Fibrous Homogeneous	100% Cellulose	0% Non-fibrous (other)	<b>None Detected</b>

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Analysis Date: 12/2/2010

### Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5210-01-05-Joint Compound 221002297-0005B	Drywall, Jnt Cmp & Tape & Texture	White Non-Fibrous  Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5210-01-05-Drywall 221002297-0005C	Drywall, Jnt Cmp & Tape & Texture	Brown/White Fibrous Heterogeneous	10% Cellulose 5% Glass	85% Non-fibrous (other)	<b>None Detected</b>
5210-01-06-Texture 221002297-0006	Drywall, Jnt Cmp & Tape & Texture	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5210-01-06-Tape 221002297-0006A	Drywall, Jnt Cmp & Tape & Texture	White Fibrous Homogeneous	100% Cellulose	0% Non-fibrous (other)	<b>None Detected</b>
5210-01-06-Joint Compound 221002297-0006B	Drywall, Jnt Cmp & Tape & Texture	White Non-Fibrous  Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5210-01-06-Drywall 221002297-0006C	Drywall, Jnt Cmp & Tape & Texture	Brown/White Fibrous Heterogeneous	10% Cellulose 5% Glass	85% Non-fibrous (other)	<b>None Detected</b>

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EMSL Proj:  
 Analysis Date: 12/2/2010

## Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy


Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5210-01-07-Texture 221002297-0007	Drywall, Jnt Cmp & Tape & Texture	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5210-01-07-Tape 221002297-0007A	Drywall, Jnt Cmp & Tape & Texture	White Fibrous Homogeneous	100% Cellulose	0% Non-fibrous (other)	<b>None Detected</b>
5210-01-07-Joint Compound 221002297-0007B	Drywall, Jnt Cmp & Tape & Texture	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5210-01-07-Drywall 221002297-0007C	Drywall, Jnt Cmp & Tape & Texture	Brown/White Fibrous Heterogeneous	10% Cellulose 5% Glass	85% Non-fibrous (other)	<b>None Detected</b>
5210-02-08-Floor Tile 221002297-0008	Black Fleck Tile W/Black Mastic	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
		Mastic present is tan			
5210-02-08-Mastic 221002297-0008A	Black Fleck Tile W/Black Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
		Mastic present is tan			

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Analysis Date: 12/2/2010

### Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5210-02-09-Floor Tile 221002297-0009	Black Fleck Tile W/Black Mastic	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5210-02-09-Mastic 221002297-0009A	Black Fleck Tile W/Black Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5210-02-10-Floor Tile 221002297-0010	Black Fleck Tile W/Black Mastic	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5210-02-10-Mastic 221002297-0010A	Black Fleck Tile W/Black Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5210-03-11-Base Cove 221002297-0011	Black Base Cove W/Mastic	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5210-03-11-Mastic 221002297-0011A	Black Base Cove W/Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected

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Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5210-03-12-Base Cove 221002297-0012	Black Base Cove W/Mastic	Black Non-Fibrous  Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5210-03-12-Mastic 221002297-0012A	Black Base Cove W/Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5210-03-13-Base Cove 221002297-0013	Black Base Cove W/Mastic	Black Non-Fibrous  Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5210-03-13-Mastic 221002297-0013A	Black Base Cove W/Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5210-04-14 221002297-0014	White Pipe Wrap Putty Shiny	Gray/White Non-Fibrous Heterogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5210-04-15 221002297-0015	White Pipe Wrap Putty	Gray/White Non-Fibrous Heterogeneous		100% Non-fibrous (other)	<b>None Detected</b>

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### Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
5210-04-16 221002297-0016	White Pipe Wrap Putty	Gray/White Non-Fibrous Heterogeneous		100% Non-fibrous (other)	None Detected
5210-05-17-Floor Tile 221002297-0017	White Floor Tile W/Yellow Mastic	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5210-05-17-Mastic 221002297-0017A	White Floor Tile W/Yellow Mastic	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5210-05-18-Floor Tile 221002297-0018	White Floor Tile W/Yellow Mastic	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5210-05-18-Mastic 221002297-0018A	White Floor Tile W/Yellow Mastic	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5210-05-19-Floor Tile 221002297-0019	White Floor Tile W/Yellow Mastic	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected

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Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5210-05-19-Mastic 221002297-0019A	White Floor Tile W/Yellow Mastic	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5210-06-20-Carpet 221002297-0020	Blue Speck Carpet W/Yellow Mastic	Various Fibrous Heterogeneous	70% Synthetic	30% Non-fibrous (other)	<b>None Detected</b>
5210-06-20-Mastic 221002297-0020A	Blue Speck Carpet W/Yellow Mastic	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5210-06-21-Carpet 221002297-0021	Blue Speck Carpet W/Yellow Mastic	Various Fibrous Heterogeneous	75% Synthetic	25% Non-fibrous (other)	<b>None Detected</b>
5210-06-21-Mastic 221002297-0021A	Blue Speck Carpet W/Yellow Mastic	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5210-06-22-Carpet 221002297-0022	Blue Speck Carpet W/Yellow Mastic	Various Fibrous Heterogeneous	75% Synthetic	25% Non-fibrous (other)	<b>None Detected</b>
5210-06-22-Mastic 221002297-0022A	Blue Speck Carpet W/Yellow Mastic	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>

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Analyst(s)

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*Molly Walker (19)*

  
Erin Orthun, Laboratory Manager  
or other approved signatory

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 Project: **3010128 / Bldg 5210**

EMSL Proj:  
 Analysis Date: 12/2/2010

### Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5210-07-23 221002297-0023	Sink Insulation	Black Non-Fibrous Homogeneous	2% Cellulose	98% Non-fibrous (other)	None Detected
5210-07-24 221002297-0024	Sink Insulation	Black Non-Fibrous Homogeneous	2% Cellulose	98% Non-fibrous (other)	None Detected
5210-07-25 221002297-0025	Sink Insulation	Black Non-Fibrous Homogeneous	2% Cellulose	98% Non-fibrous (other)	None Detected
5210-08-26-Mastic 221002297-0026	White Ceramic Tile Mastic W/Green Drywall BD	Tan Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
Sample contained no ceramic tile.					
5210-08-26-Fiber Board 221002297-0026A	White Ceramic Tile Mastic W/Green Drywall BD	Brown/Green Fibrous Homogeneous	90% Cellulose	10% Non-fibrous (other)	None Detected
5210-08-26-Drywall 221002297-0026B	White Ceramic Tile Mastic W/Green Drywall BD	Brown/White Fibrous Heterogeneous	10% Cellulose 5% Glass	85% Non-fibrous (other)	None Detected

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## Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5210-08-27-Mastic 221002297-0027	White Ceramic Tile Mastic W/Green Drywall BA	Tan Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
Sample Contained no Drywall or Ceramic Tile					
5210-08-27-Fiber Board 221002297-0027A	White Ceramic Tile Mastic W/Green Drywall BA	Brown/Green Fibrous Homogeneous	90% Cellulose	10% Non-fibrous (other)	<b>None Detected</b>
Sample Contained no Drywall or Ceramic Tile					
5210-08-28-Mastic 221002297-0028	White Ceramic Tile Mastic W/Green Drywall	Tan Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
Sample Contained No Ceramic Tile					
5210-08-28-Fiber Board 221002297-0028A	White Ceramic Tile Mastic W/Green Drywall	Brown/Green Fibrous Homogeneous	90% Cellulose	10% Non-fibrous (other)	<b>None Detected</b>
Sample Contained No Ceramic Tile					
5210-08-28-Drywall 221002297-0028B	White Ceramic Tile Mastic W/Green Drywall	Brown/White Fibrous Heterogeneous	10% Cellulose 5% Glass	85% Non-fibrous (other)	<b>None Detected</b>
Sample Contained No Ceramic Tile					

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### Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy


Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
5210-09-29 221002297-0029	Grey Grout (2"x2" Tile Under Floor Tile)	Gray Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5210-09-30 221002297-0030	Grey Grout (2"x2" Tile Under Floor Tile)	Gray Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5210-09-31 221002297-0031	Grey Grout (2"x2" Tile Under Floor Tile)	Gray Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5210-10-32 221002297-0032	Drop Ceiling Tile	Tan/White Fibrous Heterogeneous	40% Cellulose 40% Min. Wool	10% Non-fibrous (other) 10% Perlite	None Detected
5210-10-33 221002297-0033	Drop Ceiling Tile	Non-Fibrous Heterogeneous	40% Cellulose 40% Min. Wool	10% Non-fibrous (other) 10% Perlite	None Detected
5210-10-34 221002297-0034	Drop Ceiling Tile	Tan/White Fibrous Heterogeneous	40% Cellulose 40% Min. Wool	10% Non-fibrous (other) 10% Perlite	None Detected
5210-11-35 221002297-0035	White Pipe Putty (Soft)	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected

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EMSL Proj:  
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## Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5210-11-36 221002297-0036	White Pipe Putty (Soft)	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5210-11-37 221002297-0037	White Pipe Putty (Soft)	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5210-12-38 221002297-0038	Pipe Wrap Insulation	White/Silver Fibrous Heterogeneous	50% Cellulose	50% Non-fibrous (other)	<b>None Detected</b>
5210-12-39 221002297-0039	Pipe Wrap Insulation	White/Silver Fibrous Heterogeneous	50% Cellulose	50% Non-fibrous (other)	<b>None Detected</b>
5210-12-40 221002297-0040	Pipe Wrap Insulation	White/Silver Fibrous Heterogeneous	50% Cellulose	50% Non-fibrous (other)	<b>None Detected</b>
5210-13-41 221002297-0041	Silver HVAC Wrap	White/Silver Fibrous Heterogeneous	70% Cellulose	30% Non-fibrous (other)	<b>None Detected</b>
5210-13-42 221002297-0042	Silver HVAC Wrap	White/Silver Fibrous Heterogeneous	70% Cellulose	30% Non-fibrous (other)	<b>None Detected</b>

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## Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5210-13-43 221002297-0043	Silver HVAC Wrap	White/Silver Fibrous Heterogeneous	70% Cellulose	30% Non-fibrous (other)	<b>None Detected</b>
5210-14-44 221002297-0044	Black Caulk (Window)	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5210-14-45 221002297-0045	Black Caulk (Window)	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5210-14-46 221002297-0046	Black Caulk (Window)	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5210-15-47 221002297-0047	White Caulk Glass Block Windows	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5210-15-48 221002297-0048	White Caulk Glass Block Windows	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5210-15-49 221002297-0049	White Caulk Glass Block Windows	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>

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### Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5210-16-50 221002297-0050	Dk Grey Grout (Foyer)	Gray Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5210-16-51 221002297-0051	Dk Grey Grout (Landing)	Gray Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5210-16-52 221002297-0052	Dk Grey Grout (Landing)	Gray Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5210-17-53 221002297-0053	Yellow Pipe Putty	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5210-17-54 221002297-0054	Yellow Pipe Putty	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5210-17-55 221002297-0055	Yellow Pipe Putty	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5210-18-56 221002297-0056	No #18				<b>Not Submitted</b>

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### Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy


Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
5210-18-57 221002297-0057	No #18				Not Submitted
5210-18-58 221002297-0058	No #18				Not Submitted
5210-19-59-Floor Tile 221002297-0059	Brown Linoleum Tile Mastic	Brown Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5210-19-59-Mastic 221002297-0059A	Brown Linoleum Tile Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5210-19-60-Floor Tile 221002297-0060	Brown Linoleum Tile Mastic	Brown Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5210-19-60-Mastic 221002297-0060A	Brown Linoleum Tile Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected

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## Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
5210-19-61-Floor Tile 221002297-0061	Brown Linoleum Tile Mastic	Brown Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5210-19-61-Mastic 221002297-0061A	Brown Linoleum Tile Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5210-20-62 221002297-0062	Exterior Beige/White Caulk	Tan Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5210-20-63 221002297-0063	Exterior Beige/White Caulk	Tan Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5210-20-64 221002297-0064	Exterior Beige/White Caulk	Tan Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5210-21-65 221002297-0065	Exterior Black Caulk	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5210-21-66 221002297-0066	Exterior Black Caulk	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected

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Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5210-21-67 221002297-0067	Exterior Black Caulk	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected

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Samples analyzed by EMSL Analytical, Inc. 7330 S. Alton Way Building 12 Suite A, Centennial CO NVLAP Lab Code 200828-0

**EMSL Analytical, Inc.**

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Customer ID: EMPR78  
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Project: **3010128**

EMSL Proj:  
Analysis Date: 12/7/2010

### Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
5210-100-01-Roofing 221002320-0001	Bldg 5210, Roof Shingle, Tar, Insulation, Felt	Black Fibrous Heterogeneous	30% Glass 10% Cellulose	60% Non-fibrous (other)	None Detected
5210-100-01-Foam 221002320-0001A	Bldg 5210, Roof Shingle, Tar, Insulation, Felt	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5210-100-01-Insulation 221002320-0001B	Bldg 5210, Roof Shingle, Tar, Insulation, Felt	Brown Fibrous Homogeneous	85% Cellulose	15% Non-fibrous (other)	None Detected
5210-100-01-Tar Paper 221002320-0001C	Bldg 5210, Roof Shingle, Tar, Insulation, Felt	Black Fibrous Homogeneous	75% Cellulose	25% Non-fibrous (other)	None Detected
5210-100-01-Tar 221002320-0001D	Bldg 5210, Roof Shingle, Tar, Insulation, Felt	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5210-100-02-Roofing 221002320-0002	Bldg 5210, Roof Shingle, Tar, Insulation, Felt	Black Fibrous Heterogeneous	30% Glass 10% Cellulose	60% Non-fibrous (other)	None Detected

Initial report from 12/07/2010 15:19:46

Analyst(s)

DeCavallas Michael (50)

Erin Orthun, Laboratory Manager  
or other approved signatory

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EMSL Proj:  
Analysis Date: 12/7/2010

### Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
5210-100-02-Foam 221002320-0002A	Bldg 5210, Roof Shingle, Tar, Insulation, Felt	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5210-100-02-Insulation 221002320-0002B	Bldg 5210, Roof Shingle, Tar, Insulation, Felt	Brown Fibrous Homogeneous	85% Cellulose	15% Non-fibrous (other)	None Detected
5210-100-02-Tar Paper 221002320-0002C	Bldg 5210, Roof Shingle, Tar, Insulation, Felt	Black Fibrous Homogeneous	75% Cellulose	25% Non-fibrous (other)	None Detected
5210-100-02-Tar 221002320-0002D	Bldg 5210, Roof Shingle, Tar, Insulation, Felt	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5210-100-03-Shingle 221002320-0003	Bldg 5210, Roof Shingle, Flashing, Tar & Curbing	White/Black Fibrous Heterogeneous	20% Glass	80% Non-fibrous (other)	None Detected
Unable to distinguish curbing and flashing					
5210-100-03-Tar Felt 221002320-0003A	Bldg 5210, Roof Shingle, Flashing, Tar & Curbing	Black Fibrous Heterogeneous	35% Glass	65% Non-fibrous (other)	None Detected

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Project: **3010128**

EMSL Proj:  
Analysis Date: 12/7/2010


### Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5210-100-03-Tar 221002320-0003B	Bldg 5210, Roof Shingle, Flashing, Tar & Curbing	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-100-04-Roofing 221002320-0004	Bldg 5212, Roof Shingle, Tar, Insulation, Felt	Black Fibrous  Heterogeneous	30% Glass 10% Cellulose	60% Non-fibrous (other)	<b>None Detected</b>
5212-100-04-Foam 221002320-0004A	Bldg 5212, Roof Shingle, Tar, Insulation, Felt	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-100-04-Insulation 221002320-0004B	Bldg 5212, Roof Shingle, Tar, Insulation, Felt	Brown Fibrous  Homogeneous	85% Cellulose	15% Non-fibrous (other)	<b>None Detected</b>
5212-100-04-Tar Paper 221002320-0004C	Bldg 5212, Roof Shingle, Tar, Insulation, Felt	Black Fibrous  Heterogeneous	75% Cellulose	25% Non-fibrous (other)	<b>None Detected</b>
5212-100-04-Tar 221002320-0004D	Bldg 5212, Roof Shingle, Tar, Insulation, Felt	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>

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Analyst(s)

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Erin Orthun, Laboratory Manager  
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Project: **3010128**

EMSL Proj:  
Analysis Date: 12/7/2010

### Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
5212-100-05-Roofing 221002320-0005	Bldg 5212, Roof Shingle, Tar, Insulation, Felt	White/Black Fibrous Heterogeneous	30% Cellulose 10% Glass	60% Non-fibrous (other)	None Detected
5212-100-05-Foam 221002320-0005A	Bldg 5212, Roof Shingle, Tar, Insulation, Felt	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5212-100-05-Insulation 221002320-0005B	Bldg 5212, Roof Shingle, Tar, Insulation, Felt	Brown Fibrous Homogeneous	85% Cellulose	15% Non-fibrous (other)	None Detected
5212-100-05-Tar Paper 221002320-0005C	Bldg 5212, Roof Shingle, Tar, Insulation, Felt	Black Fibrous Homogeneous	75% Cellulose	25% Non-fibrous (other)	None Detected
5212-100-05-Tar 221002320-0005D	Bldg 5212, Roof Shingle, Tar, Insulation, Felt	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5212-100-06-Shingle 221002320-0006	Bldg 5212, Roof Shingle, Flashing & Curbing	White/Black Fibrous Heterogeneous	20% Glass	80% Non-fibrous (other)	None Detected
Unable to distinguish curbing and flashing					

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EMSL Proj:  
Analysis Date: 12/7/2010

### Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
5212-100-06-Tar Felt 221002320-0006A	Bldg 5212, Roof Shingle, Flashing & Curbing	Black Fibrous Homogeneous	35% Glass	65% Non-fibrous (other)	None Detected
5212-100-06-Tar 221002320-0006B	Bldg 5212, Roof Shingle, Flashing & Curbing	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5214-100-07-Roofing 221002320-0007	Bldg 5214, Roof Shingle, Tar, Insulation, Felt	White/Black Fibrous Heterogeneous	35% Cellulose 10% Glass	55% Non-fibrous (other)	None Detected
5214-100-07-Foam 221002320-0007A	Bldg 5214, Roof Shingle, Tar, Insulation, Felt	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5214-100-07-Insulation 221002320-0007B	Bldg 5214, Roof Shingle, Tar, Insulation, Felt	Brown Fibrous Homogeneous	85% Cellulose	15% Non-fibrous (other)	None Detected
5214-100-07-Tar Paper 221002320-0007C	Bldg 5214, Roof Shingle, Tar, Insulation, Felt	Black Fibrous Homogeneous	35% Glass	65% Non-fibrous (other)	None Detected

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EMSL Proj:  
Analysis Date: 12/7/2010

### Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5214-100-07-Tar 221002320-0007D	Bldg 5214, Roof Shingle, Tar, Insulation, Felt	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5214-100-08-Roofing 221002320-0008	Bldg 5214, Roof Shingle, Tar, Insulation, Felt	White/Black Fibrous Heterogeneous	35% Cellulose 10% Glass	55% Non-fibrous (other)	None Detected
5214-100-08-Foam 221002320-0008A	Bldg 5214, Roof Shingle, Tar, Insulation, Felt	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5214-100-08-Insulation 221002320-0008B	Bldg 5214, Roof Shingle, Tar, Insulation, Felt	Brown Fibrous Homogeneous	85% Cellulose	15% Non-fibrous (other)	None Detected
5214-100-08-Tar Paper 221002320-0008C	Bldg 5214, Roof Shingle, Tar, Insulation, Felt	Black Fibrous Homogeneous	75% Cellulose	25% Non-fibrous (other)	None Detected
5214-100-08-Tar 221002320-0008D	Bldg 5214, Roof Shingle, Tar, Insulation, Felt	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected

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EMSL Proj:  
 Analysis Date: 12/7/2010

## Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5214-100-09-Roofing 221002320-0009	Bldg 5214, Roof Shingle, Tar, Insulation, Felt	White/Black Fibrous Heterogeneous	35% Cellulose 10% Glass	55% Non-fibrous (other)	None Detected
5214-100-09-Foam 221002320-0009A	Bldg 5214, Roof Shingle, Tar, Insulation, Felt	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5214-100-09-Insulation 221002320-0009B	Bldg 5214, Roof Shingle, Tar, Insulation, Felt	Brown Fibrous Homogeneous	85% Cellulose	15% Non-fibrous (other)	None Detected
5214-100-09-Tar Paper 221002320-0009C	Bldg 5214, Roof Shingle, Tar, Insulation, Felt	Black Fibrous Heterogeneous	75% Cellulose	25% Non-fibrous (other)	None Detected
5214-100-09-Tar 221002320-0009D	Bldg 5214, Roof Shingle, Tar, Insulation, Felt	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5210-101-10 221002320-0010	Bldg 5210, Pipe Flashing Cement	Black Non-Fibrous Homogeneous	10% Cellulose	90% Non-fibrous (other)	None Detected

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### Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5210-101-11 221002320-0011	Bldg 5210, Pipe Flashing Cement	Black Non-Fibrous Homogeneous	10% Cellulose	90% Non-fibrous (other)	None Detected
5210-101-12 221002320-0012	Bldg 5210, Pipe Flashing Cement	Black Non-Fibrous Homogeneous	10% Cellulose	90% Non-fibrous (other)	None Detected
5212-101-13 221002320-0013	Bldg 5212, Pipe Flashing Cement	Black Non-Fibrous Homogeneous	10% Cellulose	90% Non-fibrous (other)	None Detected
5212-101-14 221002320-0014	Bldg 5212, Pipe Flashing Cement	Black Non-Fibrous Homogeneous	10% Cellulose	90% Non-fibrous (other)	None Detected
5212-101-15 221002320-0015	Bldg 5212, Pipe Flashing Cement	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5214-101-16 221002320-0016	Bldg 5214, Pipe Flashing Cement	Black Non-Fibrous Homogeneous		96% Non-fibrous (other)	4% Chrysotile
5214-101-17 221002320-0017	Bldg 5214, Pipe Flashing Cement	Black Non-Fibrous Homogeneous		96% Non-fibrous (other)	4% Chrysotile

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### Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5214-101-18 221002320-0018	Bldg 5214, Pipe Flashing Cement	Black Non-Fibrous Homogeneous		96% Non-fibrous (other)	4% Chrysotile

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1065



# Asbestos Lab Services Chain of Custody

EMSL Order Number (Lab Use Only):

221002297

Denver, CO  
Building 12 Suite A  
7330 S. Alton Way  
Centennial, CO 80112  
PHONE: (303) 740-5700  
FAX: (303) 741-1400

Company: Empirical Environmental, LLC		EMSL-Bill to: <input checked="" type="checkbox"/> Same <input type="checkbox"/> Different If Bill to is Different note instructions in Comments**	
Street: 18550 Ranch Hand Rd., Suite 103		Third Party Billing requires written authorization from third party	
City/State/Zip: Peyton, CO 80831			
Report To (Name): Sheila Sealander		Fax: 719-749-0238	
Telephone: 719-749-2068		Email Address: sheila.sealander@empiricalenv.com	
Project Name/Number: 3010128 <b>5210</b>			
Please Provide Results: Email		Purchase Order:	
		State Samples Taken: CO	
Turnaround Time (TAT) Options* - Please Check			
<input type="checkbox"/> 3 Hour <input type="checkbox"/> 6 Hour <input type="checkbox"/> 24 Hour <input type="checkbox"/> 48 Hour <input checked="" type="checkbox"/> 72 Hour <input type="checkbox"/> 96 Hour <input type="checkbox"/> 1 Week <input type="checkbox"/> 2 Week			
*For TEM Air 3 hours/6 hours, please call ahead to schedule. There is a premium charge for 3 Hour TEM AHERA or EPA Level II TAT. You will be asked to sign an authorization form for this service. Analysis completed in accordance with EMSL's Terms and Conditions located in the Analytical Price Guide.			
<b>PCM - Air</b> <input type="checkbox"/> NIOSH 7400 <input type="checkbox"/> w/ OSHA 8hr. TWA <b>PLM - Bulk (reporting limit)</b> <input type="checkbox"/> PLM EPA 600/R-93/116 (<1%) <input type="checkbox"/> PLM EPA NOB (<1%) Point Count <input type="checkbox"/> 400 (<0.25%) <input type="checkbox"/> 1000 (<0.1%) Point Count w/Gravimetric <input type="checkbox"/> 400 (<0.25%) <input type="checkbox"/> 1000 (<0.1%) <input type="checkbox"/> NYS 198.1 (friable in NY) <input type="checkbox"/> NYS 198.6 NOB (non-friable-NY) <input type="checkbox"/> NIOSH 9002 (<1%)		<b>TEM - Air</b> <input type="checkbox"/> 4-4.5hr TAT (AHERA only) <input type="checkbox"/> AHERA 40 CFR, Part 763 <input type="checkbox"/> NIOSH 7402 <input type="checkbox"/> EPA Level II <input type="checkbox"/> ISO 10312 <b>TEM - Bulk</b> <input type="checkbox"/> TEM EPA NOB <input type="checkbox"/> NYS NOB 198.4 (non-friable-NY) <input type="checkbox"/> Chatfield SOP <input type="checkbox"/> TEM Mass Analysis-EPA 600 sec. 2.5 <b>TEM - Water:</b> EPA 100.2 Fibers >10µm <input type="checkbox"/> Waste <input type="checkbox"/> Drinking All Fiber Sizes <input type="checkbox"/> Waste <input type="checkbox"/> Drinking	
		<b>TEM - Dust</b> <input type="checkbox"/> Microvac - ASTM D 5755 <input type="checkbox"/> Wipe - ASTM D6480 <input type="checkbox"/> Carpet Sonication (EPA 600/J-93/167) <b>Soil/Rock/Vermiculite</b> <input type="checkbox"/> PLM CARB 435 - A (0.25% sensitivity) <input type="checkbox"/> PLM CARB 435 - B (0.1% sensitivity) <input type="checkbox"/> TEM CARB 435 - B (0.1% sensitivity) <input type="checkbox"/> TEM CARB 435 - C (0.01% sensitivity) <input type="checkbox"/> EPA Protocol (Semi-Quantitative) <input type="checkbox"/> EPA Protocol (Quantitative) <b>Other:</b>	
<input type="checkbox"/> Check For Positive Stop - Clearly Identify Homogenous Group			
Samplers Name: Fay L. Ward		Samplers Signature: Fay L. Ward	
Sample #	Sample Description	Volume/Area (Air) HA # (Bulk)	Date/Time Sampled
5210-01-01	DRYWALL INT CHAM' & TAIL TEXTURE	JANITOR CLOSET	11/26/10/9AM
5210-01-02	DRYWALL INT CHAM' & TAIL TEXTURE	BROOM CLOSET	11/26/10
5210-01-03	DRYWALL INT CHAM' & TAIL TEXTURE	JANITOR CLOSET	11/26/10
5210-01-04	DRYWALL INT CHAM' & TAIL TEXTURE	ELECTRICAL CLOSET	11/26/10
5210-01-05	DRYWALL INT CHAM' & TAIL TEXTURE	BROOM CLOSET	11/26/10
5210-01-06	DRYWALL INT CHAM' & TAIL TEXTURE	JANITOR CLOSET	11/26/10
5210-01-07	DRYWALL INT CHAM' & TAIL TEXTURE	BROOM CLOSET	11/26/10
5210-02-08	BLACK FLOCK TILE W/BULK W/HAZ	BROOM CLOSET	11/26/10/6AM
Client Sample # (s): 5210-01-01 - 5210-02-06		Total # of Samples: 64	
Relinquished (Client): Fay L. Ward		Date: 11-29-10 Time:	
Received (Lab): [Signature]		Date: 11/29/10 Time: 11 AM	
Comments/Special Instructions: walking			



# Asbestos Lab Services Chain of Custody

## EMSL Order Number (Lab Use Only):

221002297

Denver, CO  
Building 12 Suite A  
7330 S. Alton Way  
Centennial, CO 80112  
PHONE: (303) 740-5700  
FAX: (303) 741-1400

Sample #	Sample Description	Volume/Area (Air) HA # (Bulk)	Date/Time Sampled
5210-02-09	BLACK FLOOR TILE w/ BLACK MASTIC	2nd Broom Closet #223	11-26-10
5210-02-10	BLACK FLOOR TILE w/ BLACK MASTIC	2nd Broom Closet #373	11-26-10
5210-03-11	BLACK BASE COVE w/ MASTIC	Broom Closet #123	11-26-10
5210-03-12	BLACK BASE COVE w/ MASTIC	2nd JANITOR CLOSET	11-26-10
5210-03-13	BLACK BASE COVE w/ MASTIC	2nd Broom Closet	11-26-10
5210-04-14	WHITE PIPE WRAP PUTTY SHINY	JANITOR CLOSET	11-26-10
5210-04-15	WHITE PIPE WRAP PUTTY	2nd PIPE CHASE	11-26-10
5210-04-16	WHITE PIPE WRAP PUTTY	3rd PIPE CHASE	11-26-10
5210-05-17	WHITE FLOOR TILE w/ YELLOW MASTIC	HALL BY DRINKING FTR	11-26-10
5210-05-18	WHITE FLOOR TILE w/ YELLOW MASTIC	2nd HALLWAY	11-26-10
5210-05-19	WHITE FLOOR TILE w/ YELLOW MASTIC	3rd HALLWAY	11-26-10
5210-06-20	BLUE SPECK CARPET w/ YELLOW MASTIC	BEHIND DOOR RM 110	11-26-10
5210-06-21	BLUE SPECK CARPET w/ YELLOW MASTIC	2nd DAY Rm	11-26-10
5210-06-22	BLUE SPECK CARPET w/ YELLOW MASTIC	3rd RM # 301	11-26-10
5210-07-23	SINK INSULATION	1st WOMEN'S RESTROOM	11-26-10
5210-07-24	SINK INSULATION	2nd MEN'S RESTROOM	11-26-10
Comments/Special Instructions:			

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# Asbestos Lab Services Chain of Custody

## EMSL Order Number (Lab Use Only):

221002297

Denver, CO  
Building 12 Suite A  
7330 S. Alton Way  
Centennial, CO 80112  
PHONE: (303) 740-5700  
FAX: (303) 741-1400

Sample #	Sample Description	Volume/Area (Air) HA # (Bulk)	Date/Time Sampled
5210-07-25	SINK INSULATION	3RD MELOS 12 RESTROOM	11-26-10
5210-08-26	WHITE CERAMIC TILE MASTIC w/ GREEN DRYWALL BD	1ST WOMENS UNDER RESTROOM SINK	11-26-10
5210-08-27	WHITE CERAMIC TILE MASTIC w/ GREEN DRYWALL BD	2ND WOMENS RESTROOM	11-26-10
5210-08-28	WHITE CERAMIC TILE MASTIC w/ GREEN DRYWALL	3RD MELOS RESTROOM	11-26-10
5210-09-29	2"x2" TILE GREEN GROUT (UNDER FLOOR TILE)	UNISEX/HAND ICESTROOM	11-26-10
5210-09-30	2"x2" TILE GREEN GROUT (UNDER FLOOR TILE)	2ND MENS BATH	11-26-10
5210-09-31	2"x2" TILE GREEN GROUT (UNDER FLOOR TILE)	2ND MENS BATH	11-26-10
5210-10-32	DROP CEILING TILE	1ST DAY ROOM	11-26-10
5210-10-33	DROP CEILING TILE	2ND DAY ROOM	11-26-10
5210-10-34	DROP CEILING TILE	3RD LAUNDRY	11-26-10
5210-11-35	WHITE PIPE PCTTY (SOFT)	1ST DAY ROOM	11-26-10
5210-11-36	WHITE PIPE PCTTY (SOFT)	2ND DAY ROOM	11-26-10
5210-11-37	WHITE PIPE PCTTY (SOFT)	1ST DAY ROOM	
5210-12-38	PIPE WRAP INSULATION	1ST MECH RM.	11-26-10
5210-12-39	PIPE WRAP INSULATION	2ND MECH RM.	11-26-10
5210-12-40	PIPE WRAP INSULATION	3RD PIPE CHASE	11-26-10

Comments/Special Instructions:

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# Asbestos Lab Services Chain of Custody

## EMSL Order Number (Lab Use Only):

221002297

Denver, CO  
 Building 12 Suite A  
 7330 S. Alton Way  
 Centennial, CO 80112  
 PHONE: (303) 740-5700  
 FAX: (303) 741-1400

Sample #	Sample Description	Volume/Area (Air) HA # (Bulk)	Date/Time Sampled
5210-13-41	SILVER HVAC WRAP	1st MEN RM	11-26-10
5210-13-42	SILVER HVAC WRAP	2nd PIPE CHASE	11-26-10
5210-13-43	SILVER HVAC WRAP	3rd PIPE CHASE	11-26-10
5210-14-44	BLACK CAULK (WINDOW)	1st RM # 105	11-26-10
5210-14-45	BLACK CAULK (WINDOW)	HALL WINDOW	11-26-10
5210-14-46	BLACK CAULK (WINDOW)	RM # 306	11-26-10
5210-15-47	WHITE CAULK GLASS BLOCK WINDOWS	1st DAY RM	11-26-10
5210-15-48	WHITE CAULK GLASS BLOCK WINDOWS	2nd DAY RM	11-26-10
5210-15-49	WHITE CAULK GLASS BLOCK WINDOWS	3rd STORAGE RM	11-26-10
5210-16-50	DK GREEN GROUT (COVER)	1st COVER	11-26-10
5210-16-51	DK GREEN GROUT (LANDING)	2nd LANDING	11-26-10
5210-16-52	DK GREEN GROUT (LANDING)	3rd LANDING	11-26-10
5210-17-53	YELLOW PIPE PUTTY	2nd MEN'S BATH	11-26-10
5210-17-54	YELLOW PIPE PUTTY	1st WOMEN'S BATH	11-26-10
5210-17-55	YELLOW PIPE PUTTY	3rd MEN'S RESTROOM	11-26-10
5210-18-56	NO #18		

Comments/Special Instructions:



EMSL ANALYTICAL INC.  
10000 E. 10th Avenue, Suite 100, Denver, CO 80231

## Asbestos Lab Services Chain of Custody

EMSL Order Number (Lab Use Only):

221002297

Denver, CO  
Building 12 Suite A  
7330 S. Alton Way  
Centennial, CO 80112  
PHONE: (303) 740-5700  
FAX: (303) 741-1400

Sample #	Sample Description	Volume/Area (Air) HA # (Bulk)	Date/Time Sampled
5210-18-57	NO #10		
5210-18-58			
5210-19-59	BROWN LINOLEUM TILE MASTIC	3RD LAUNDRERY ROOM #20	11-26-10
5210-19-60	BROWN LINOLEUM TILE MASTIC	3RD STORAGE #318	11-26-10
5210-19-61	BROWN LINOL. TILE MASTIC	3RD LAUNDRERY RM #310	11-26-10
5210-20-62	EXTERIOR BEIGE/WHITE CAULK	EXTERIOR	11-26-10
5210-20-63	EXTERIOR BEIGE/WHITE CAULK	EXTERIOR	11-26-10
5210-20-64	EXTERIOR BEIGE/WHITE CAULK	EXTERIOR	11-26-10
5210-21-65	EXTERIOR BLACK CAULK	EXTERIOR	11-26-10
5210-21-66	EXTERIOR BLACK CAULK	EXTERIOR	11-26-10
5210-21-67	EXTERIOR BLACK CAULK	EXTERIOR	11-26-10

Comments/Special Instructions:

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# Asbestos Lab Services Chain of Custody

EMSL Order Number (Lab Use Only):

221002319

Denver, CO  
Building 12 Suite A  
7330 S. Alton Way  
Centennial, CO 80112  
PHONE: (303) 740-5700  
FAX: (303) 741-1400

Company: Empirical Environmental, LLC		EMSL-Bill to: <input checked="" type="checkbox"/> Same <input type="checkbox"/> Different If Bill to is Different note instructions in Comments** Third Party Billing requires written authorization from third party	
Street: 18550 Ranch Hand Rd., Suite 103			
City/State/Zip: Peyton, CO 80831			
Report To (Name): Sheila Sealander		Fax: 719-749-0238	
Telephone: 719-749-2068		Email Address: sheila.sealander@empiricalenv.com	
Project Name/Number: 3010120			
Please Provide Results: Email		Purchase Order:	
		State Samples Taken: CO	
Turnaround Time (TAT) Options* - Please Check			
<input type="checkbox"/> 3 Hour <input type="checkbox"/> 6 Hour <input type="checkbox"/> 24 Hour <input type="checkbox"/> 48 Hour <input checked="" type="checkbox"/> 72 Hour <input type="checkbox"/> 96 Hour <input type="checkbox"/> 1 Week <input type="checkbox"/> 2 Week			
*For TEM Air 3 hours/6 hours, please call ahead to schedule. There is a premium charge for 3 Hour TEM AHERA or EPA Level II TAT. You will be asked to sign an authorization form for this service. Analysis completed in accordance with EMSL's Terms and Conditions located in the Analytical Price Guide.			
<b>PCM - Air</b> <input type="checkbox"/> NIOSH 7400 <input type="checkbox"/> w/ OSHA 8hr. TWA <b>PLM - Bulk (reporting limit)</b> <input checked="" type="checkbox"/> PLM EPA 600/R-93/116 (<1%) <input type="checkbox"/> PLM EPA NOB (<1%) Point Count <input type="checkbox"/> 400 (<0.25%) <input type="checkbox"/> 1000 (<0.1%) Point Count w/Gravimetric <input type="checkbox"/> 400 (<0.25%) <input type="checkbox"/> 1000 (<0.1%) <input type="checkbox"/> NYS 198.1 (friable in NY) <input type="checkbox"/> NYS 198.6 NOB (non-friable-NY) <input type="checkbox"/> NIOSH 9002 (<1%)		<b>TEM - Air</b> <input type="checkbox"/> 4-4.5hr TAT (AHERA only) <input type="checkbox"/> AHERA 40 CFR, Part 763 <input type="checkbox"/> NIOSH 7402 <input type="checkbox"/> EPA Level II <input type="checkbox"/> ISO 10312 <b>TEM - Bulk</b> <input type="checkbox"/> TEM EPA NOB <input type="checkbox"/> NYS NOB 198.4 (non-friable-NY) <input type="checkbox"/> Chatfield SOP <input type="checkbox"/> TEM Mass Analysis-EPA 600 sec. 2.5 <b>TEM - Water:</b> EPA 100.2 Fibers >10µm <input type="checkbox"/> Waste <input type="checkbox"/> Drinking All Fiber Sizes <input type="checkbox"/> Waste <input type="checkbox"/> Drinking	
		<b>TEM-Dust</b> <input type="checkbox"/> Microvac - ASTM D 5755 <input type="checkbox"/> Wipe - ASTM D6480 <input type="checkbox"/> Carpet Sonication (EPA 600/J-93/167) <b>Soil/Rock/Vermiculite</b> <input type="checkbox"/> PLM CARB 435 - A (0.25% sensitivity) <input type="checkbox"/> PLM CARB 435 - B (0.1% sensitivity) <input type="checkbox"/> TEM CARB 435 - B (0.1% sensitivity) <input type="checkbox"/> TEM CARB 435 - C (0.01% sensitivity) <input type="checkbox"/> EPA Protocol (Semi-Quantitative) <input type="checkbox"/> EPA Protocol (Quantitative) <b>Other:</b> <input type="checkbox"/>	
<input type="checkbox"/> Check For Positive Stop - Clearly Identify Homogenous Group			
Samplers Name: FAY WARD		Samplers Signature: Fay Ward	
Sample #	Sample Description	Volume/Area (Air) HA # (Bulk)	Date/Time Sampled
5216-100-01	Bldg 5216, Roof shingle, tar, insulation, felt	West Side	12-2-10 11A
5216-100-02	" " " "	North Side	12-2-10 11A
5216-100-03	Bldg 5216 Roof curbing + flashing, shingle	West Side	12-2-10 11A
5220-100-04	Bldg 5220 Roof shingle, tar, insul. + felt	South Side	12-2-10 11 <sup>30</sup> A
5220-100-05	" " " "	North Side	12-2-10 11 <sup>30</sup> A
5220-100-06	Bldg 5220 Roof shingle, flashing + curbing	West Side	12-2-10 11 <sup>30</sup> A
5224-100-07	Bldg 5224 Roof shingle, tar, insulation, felt	South	12p 12-2-10
5224-100-08	" " " "	North	12p 12-2-10
Client Sample # (s): 5216-100-01 to 5220-102-21		Total # of Samples: 21	
Relinquished (Client): Fay Ward		Date: 12-2-10 Time: 10 <sup>00</sup>	
Received (Lab): EMSL		Date: 12/3/10 Time: 9:05 am	
Comments/Special Instructions: 12/3 FE			

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EMSL ANALYTICAL INC.  
LABORATORY OF ENVIRONMENTAL TOXICOLOGY

# Asbestos Lab Services Chain of Custody

EMSL Order Number (Lab Use Only):

221002319

Denver, CO  
Building 12 Suite A  
7330 S. Alton Way  
Centennial, CO 80112  
PHONE: (303) 740-5700  
FAX: (303) 741-1400

Sample #	Sample Description	Volume/Area (Air) HA # (Bulk)	Date/Time Sampled
5224-100-09	Bldg 5224, Roof shingle, flashing + curbing	North Side	12-2-10 12p
5216-101-10	Bldg 5216 Pipe flashing cement	center	" " 11A
5216-101-11	" " "	center north	" " 11A
5216-101-12	" " "	center east	" " 11A
5220-101-13	Bldg 5220 Pipe flashing cement	center	" " 1130A
5220-101-14	" " "	center	" " 1130A
5220-101-15	" " "	center	" " 1130A
5224-101-16	Bldg 5224 pipe flashing cement	center west	" " 12p
5224-101-17	" " "	center	" " 12p
5224-101-18	" " "	center east	" " 12p
5220-102-19	Bldg 5220 yellow caulk	elevator housing	" " 11 <sup>30</sup> A
5220-102-20	" " yellow caulk	" "	" " 11 <sup>30</sup> A
5220-102-21	" " yellow caulk	" "	" " 11 <sup>30</sup> A

Comments/Special Instructions:

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**TAB 3**  
**ASBESTOS FIGURES**



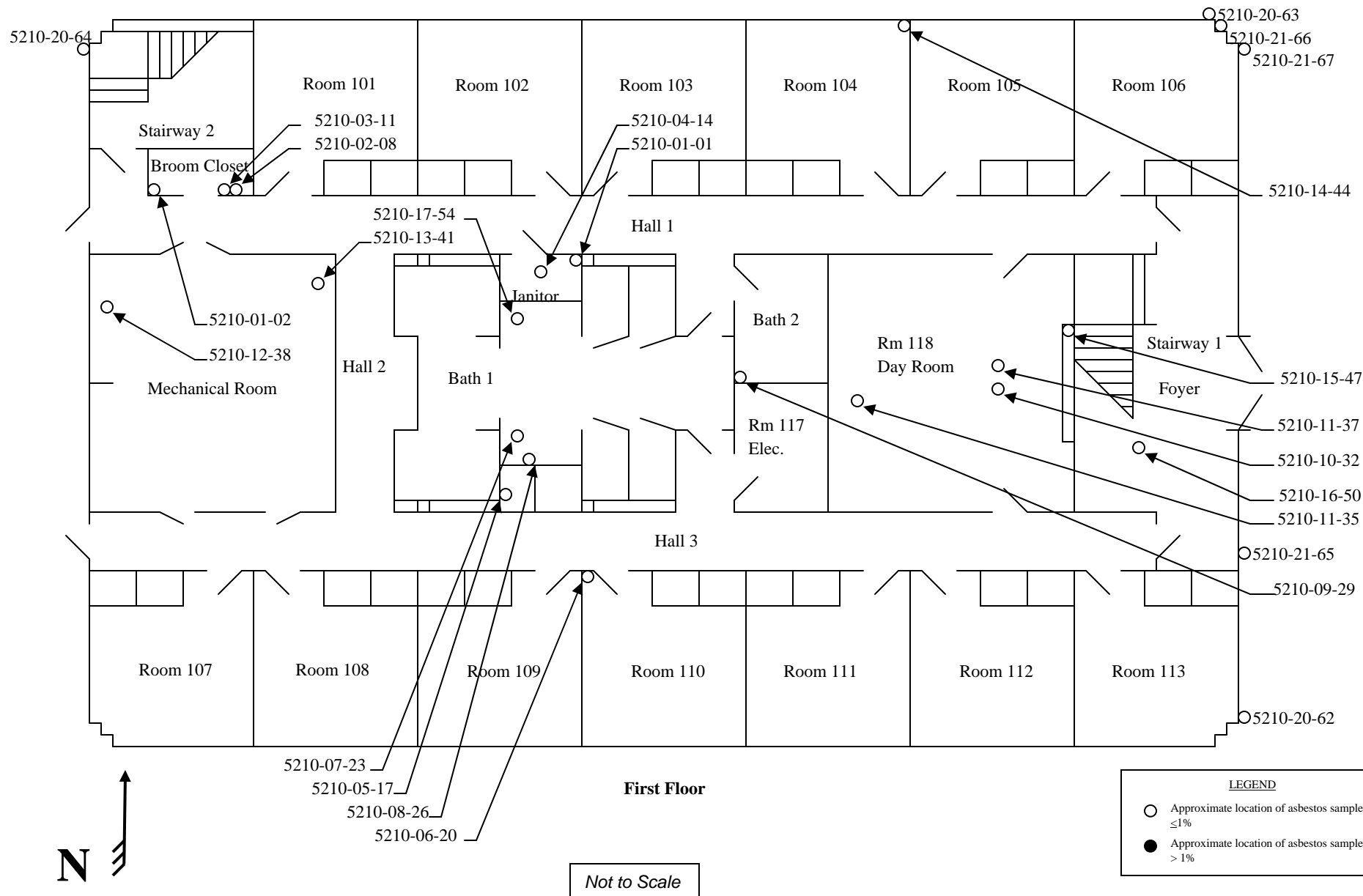


Figure 1 of 4 - Site Diagram

Project # 3010128

Drawn by FW  
 Drawn Dec. 2010

Limited Asbestos Survey  
 USAFA Prep School Building 5210  
 APPENDIX F  
 Colorado Springs, Colorado

**Empirical Environmental, LLC**

Phone (719) 749-2068 Fax (719) 749-0238  
 Page 71 of 233

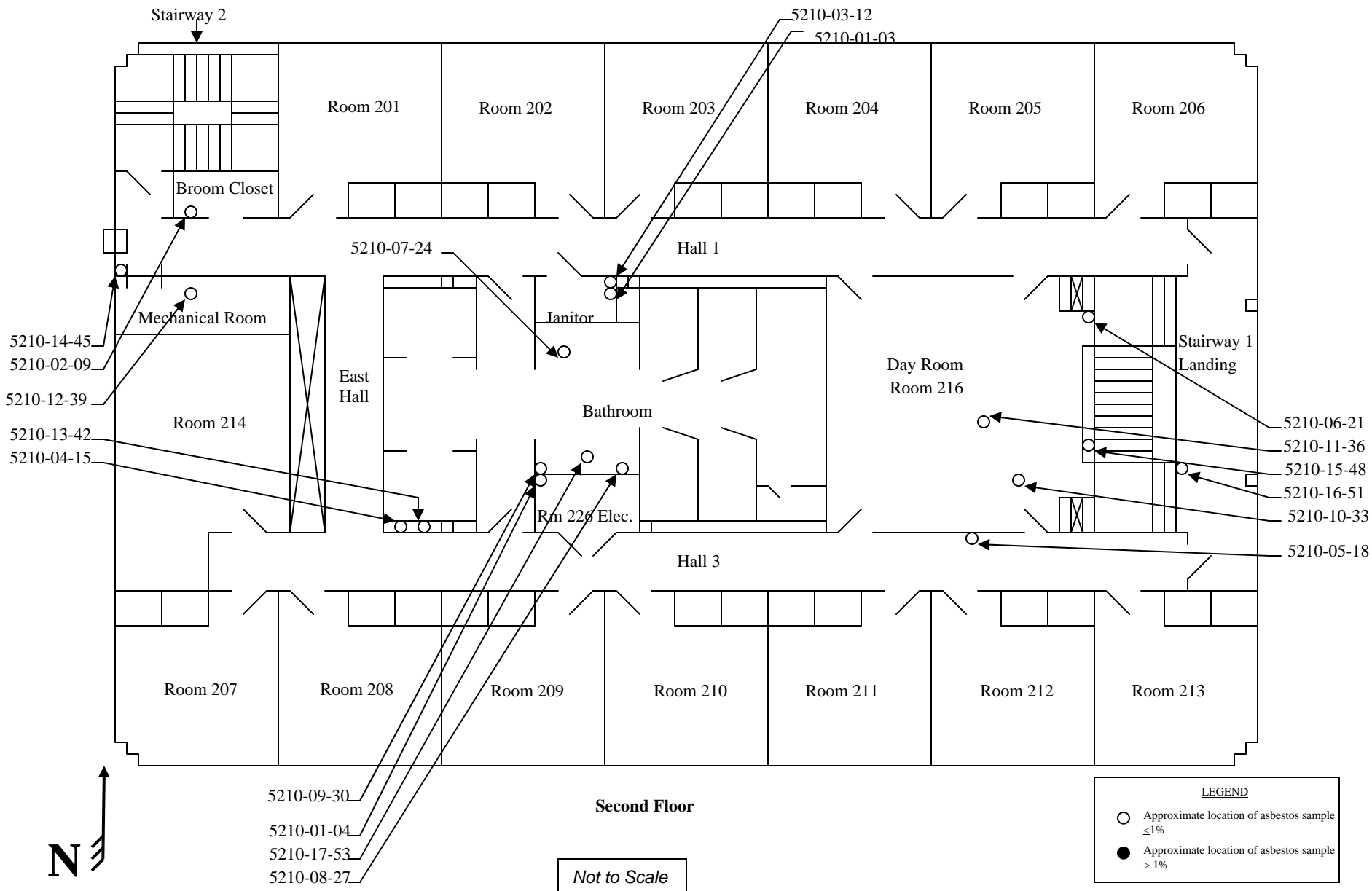


Figure 2 of 4 - Site Diagram

Project # 3010128

Drawn by FW  
Drawn Dec. 2010

Limited Asbestos Survey  
USAFA Prep School, Building 5210  
APPENDIX F  
Colorado Springs, Colorado

**Empirical Environmental, LLC**

Phone (719) 749-2068 Fax (719) 749-0238  
Page 72 of 233

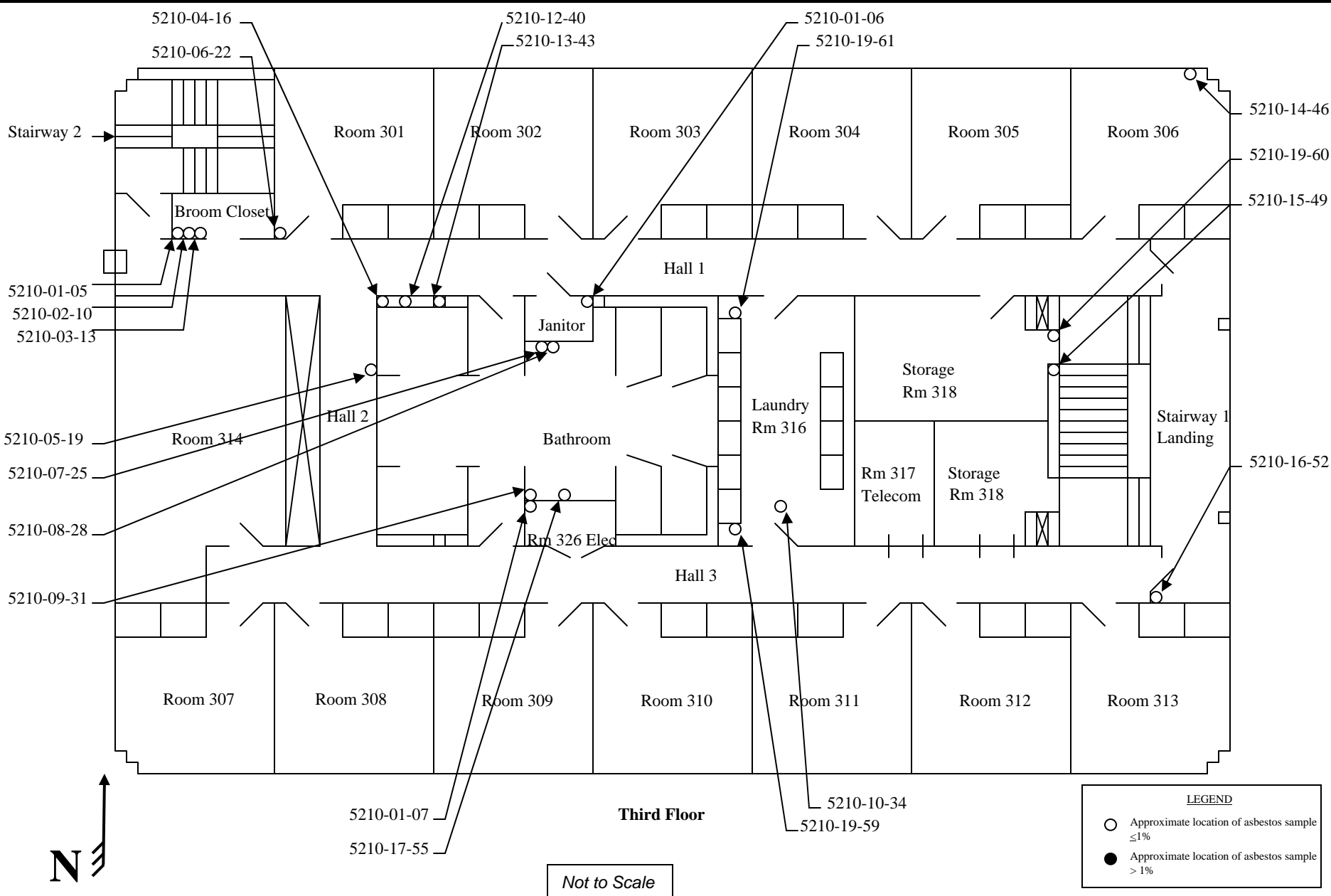


Figure 3 of 4 - Site Diagram

Project # 3010128

Drawn by FW  
Drawn Dec. 2010

Limited Asbestos Survey  
USAFA Prep School, Building 5210  
APPENDIX F  
Colorado Springs, Colorado

**Empirical Environmental, LLC**

Phone (719) 749-2068 Fax (719) 749-0238  
Page 73 of 233

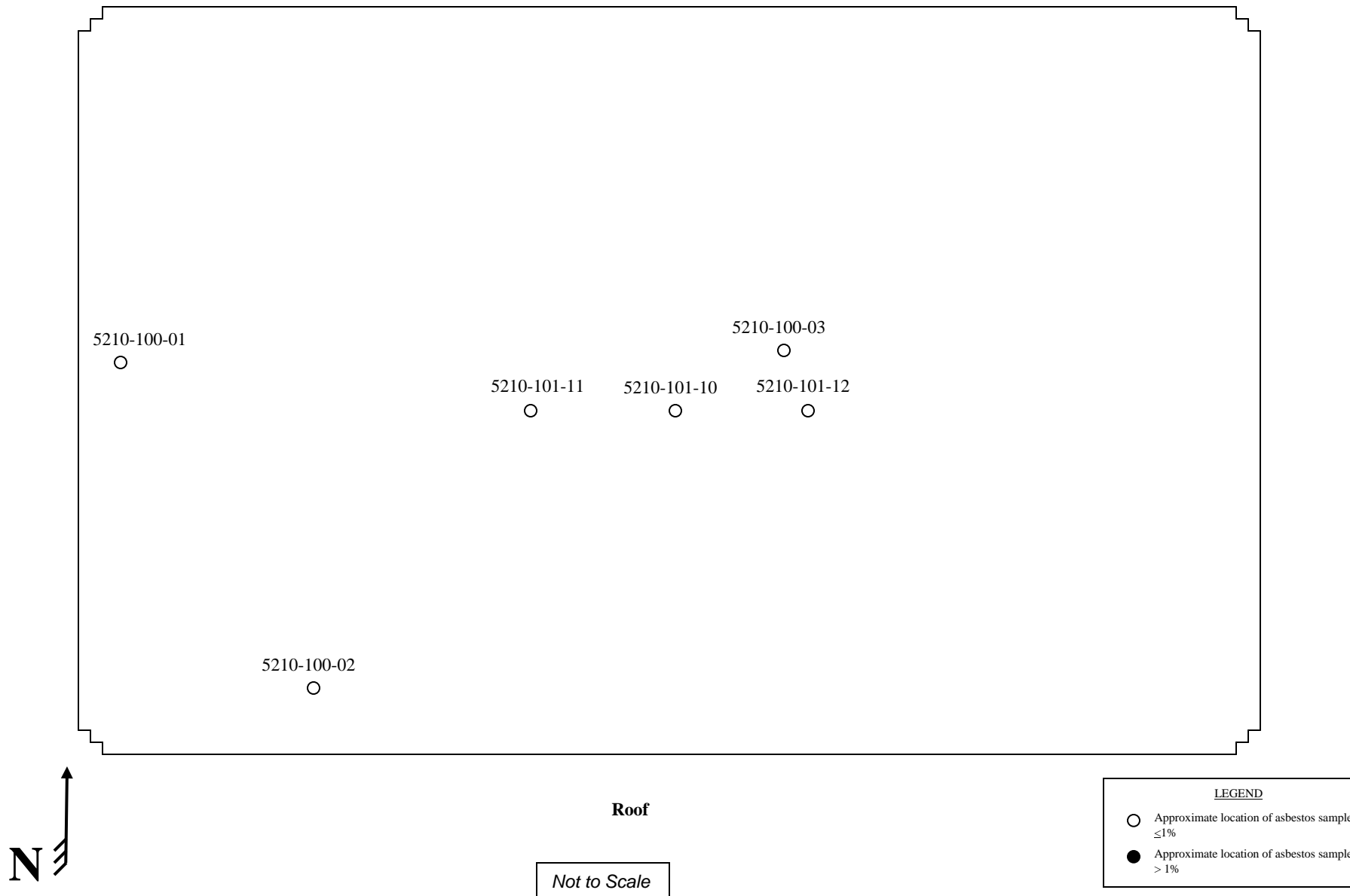


Figure 4 of 4 - Site Diagram

Project # 3010128

Drawn by FW  
Drawn Dec. 2010

Limited Asbestos Survey  
USAFA Prep School, Building 5210  
**APPENDIX F**  
Colorado Springs, Colorado

**Empirical Environmental, LLC**

Phone (719) 749-2068 Fax (719) 749-0238  
Page 74 of 233

## **APPENDIX C**

### **ASBESTOS – BUILDING 5212**

**TAB 1**

**HOMOGENEOUS AREAS**

Table 2  
**ASBESTOS INVENTORY SURVEY**  
 Building 5212, Preparatory School, USAFA  
 Colorado Springs, Colorado  
 December 2010

**Homogeneous Areas in the Building 5212**

NUMBER	DESCRIPTION	MATERIAL TYPE	ASBESTOS	LOCATION
1	Texture, Drywall, Joint Cmpnd, Tape	Miscellaneous	NO	Throughout Building
2	Dark Grey Grout	Miscellaneous	NO	Stairway 1
3	2 X 2 Drop Ceiling Tile	Miscellaneous	NO	Day Rooms, Laundry Room
4	White Pipe Wrap Putty	TSI	NO	Day Room, Laundry Room Pipes
5	White Caulk	Surfacing	NO	Day Rooms and Storage Rooms
6	Sink Insulation	Surfacing	NO	Restrooms
7	White Tile Mastic with Green Drywall	Miscellaneous	NO	Restrooms
8	Grey Grout	Surfacing	NO	Restrooms
9	Pipe Wrap Insulation	TSI	NO	Throughout Pipe System
10	Silver HVAC Wrap	TSI	NO	Elec. Rm and Pipe Chase
11	Black Base Cove with Mastic	Miscellaneous	NO	Stor. Rm, Elec. Rm, Broom Closets
12	Black Floor Tile with Mastic	Miscellaneous	NO	Broom Closets
13	White Pipe Putty	TSI	NO	Mechanical Rm, Pipe Chase
14	Blue Speck Carpet with Mastic	Miscellaneous	NO	Throughout Building
15	Black Caulk	Surfacing	NO	Windows Throughout Building
16	White Floor Tile with Mastic	Miscellaneous	NO	Hallways
17	Exterior Beige Caulk	Miscellaneous	NO	Exterior
18	Exterior Black Caulk	Miscellaneous	NO	Exterior

Table 2  
**ASBESTOS INVENTORY SURVEY**  
 Building 5212, Preparatory School, USAFA  
 Colorado Springs, Colorado  
 December 2010

**Homogeneous Areas in the Building 5212**

NUMBER	DESCRIPTION	MATERIAL TYPE	ASBESTOS	LOCATION
19	Yellow Sink Putty	Miscellaneous	NO	Restrooms
20	Brown Linoleum Tile Mastic	Miscellaneous	NO	Storage Rooms, Laundry Rooms
21	Exterior White Caulk	Miscellaneous	NO	Exterior
22	Exterior Clear Caulk	Miscellaneous	NO	Exterior
23 (100)	Roof Cap (Shingle), Tar, Insulation and Felt	Miscellaneous	NO	Roof
24 (101)	Pipe Flashing Cement	Surfacing	NO	Roof



**TAB 2**

**LABORATORY REPORTS AND CHAIN OF CUSTODY**

**EMSL Analytical, Inc.**

7330 S. Alton Way Building 12 Suite A, Centennial, CO 80112

Phone: (303) 740-5700 Fax: (303) 741-1400 Email: [denverlab@emsl.com](mailto:denverlab@emsl.com)

Attn: **Sheila Sealander**  
**Empirical Environmental**  
**18550 Ranch Hand Road**  
**Suite 103**  
**Peyton, CO 80831**

Customer ID: EMPR78  
Customer PO:  
Received: 11/29/10 11:00 AM  
EMSL Order: 221002287

Fax: (719) 749-0238 Phone: (719) 749-2068  
Project: **3010128 Bldg 5212**

EMSL Proj:  
Analysis Date: 11/30/2010

### Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5212-01-01-Texture 221002287-0001	Drywall, Jnt Cmpd, Tape & Texture	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-01-01-Tape 221002287-0001A	Drywall, Jnt Cmpd, Tape & Texture	White Fibrous Homogeneous	90% Cellulose	10% Non-fibrous (other)	<b>None Detected</b>
5212-01-01-Joint Compound 221002287-0001B	Drywall, Jnt Cmpd, Tape & Texture	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-01-01-Drywall 221002287-0001C	Drywall, Jnt Cmpd, Tape & Texture	Brown/White Fibrous Heterogeneous	10% Cellulose 5% Glass	85% Non-fibrous (other)	<b>None Detected</b>
5212-01-02-Texture 221002287-0002	Drywall, Jnt Cmpd, Tape & Texture	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-01-02-Tape 221002287-0002A	Drywall, Jnt Cmpd, Tape & Texture	White Fibrous Homogeneous	90% Cellulose	10% Non-fibrous (other)	<b>None Detected</b>

Initial report from 12/02/2010 08:35:54

Analyst(s)

DeCavallas Michael (112)

Erin Orthun, Laboratory Manager  
or other approved signatory

EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST or any agency of the federal government. Non-friable organically bound materials present a problem matrix and therefore EMSL recommends gravimetric reduction prior to analysis. Samples received in good condition unless otherwise noted.

Samples analyzed by EMSL Analytical, Inc. 7330 S. Alton Way Building 12 Suite A, Centennial CO NVLAP Lab Code 200828-0

**EMSL Analytical, Inc.**

7330 S. Alton Way Building 12 Suite A, Centennial, CO 80112

Phone: (303) 740-5700 Fax: (303) 741-1400 Email: [denverlab@emsl.com](mailto:denverlab@emsl.com)

Attn: **Sheila Sealander**  
**Empirical Environmental**  
**18550 Ranch Hand Road**  
**Suite 103**  
**Peyton, CO 80831**

Customer ID: EMPR78  
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 EMSL Order: 221002287

Fax: (719) 749-0238 Phone: (719) 749-2068  
 Project: **3010128 Bldg 5212**

EMSL Proj:  
 Analysis Date: 11/30/2010


## Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5212-01-02-Joint Compound 221002287-0002B	Drywall, Jnt Cmpd, Tape & Texture	White Non-Fibrous  Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-01-02-Drywall 221002287-0002C	Drywall, Jnt Cmpd, Tape & Texture	Brown/White Fibrous Heterogeneous	10% Cellulose 5% Glass	85% Non-fibrous (other)	<b>None Detected</b>
5212-01-03-Texture 221002287-0003	Drywall, Jnt Cmpd, Tape & Texture	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-01-03-Tape 221002287-0003A	Drywall, Jnt Cmpd, Tape & Texture	White Fibrous Homogeneous	90% Cellulose	10% Non-fibrous (other)	<b>None Detected</b>
5212-01-03-Joint Compound 221002287-0003B	Drywall, Jnt Cmpd, Tape & Texture	White Non-Fibrous  Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-01-03-Drywall 221002287-0003C	Drywall, Jnt Cmpd, Tape & Texture	Brown/White Fibrous Heterogeneous	10% Cellulose 5% Glass	85% Non-fibrous (other)	<b>None Detected</b>

Initial report from 12/02/2010 08:35:54

Analyst(s)

DeCavallas Michael (112)

  
 Erin Orthun, Laboratory Manager  
 or other approved signatory

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Samples analyzed by EMSL Analytical, Inc. 7330 S. Alton Way Building 12 Suite A, Centennial CO NVLAP Lab Code 200828-0

**EMSL Analytical, Inc.**

7330 S. Alton Way Building 12 Suite A, Centennial, CO 80112

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Attn: **Sheila Sealander**  
**Empirical Environmental**  
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**Suite 103**  
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Project: **3010128 Bldg 5212**

EMSL Proj:  
Analysis Date: 11/30/2010

### Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5212-01-04-Texture 221002287-0004	Drywall, Jnt Cmpd, Tape & Texture	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-01-04-Tape 221002287-0004A	Drywall, Jnt Cmpd, Tape & Texture	White Fibrous Heterogeneous	90% Cellulose	10% Non-fibrous (other)	<b>None Detected</b>
5212-01-04-Joint Compound 221002287-0004B	Drywall, Jnt Cmpd, Tape & Texture	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-01-04-Drywall 221002287-0004C	Drywall, Jnt Cmpd, Tape & Texture	Brown/White Fibrous Heterogeneous	10% Cellulose 5% Glass	85% Non-fibrous (other)	<b>None Detected</b>
5212-01-05-Texture 221002287-0005	Drywall, Jnt Cmpd, Tape & Texture	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-01-05-Tape 221002287-0005A	Drywall, Jnt Cmpd, Tape & Texture	White Fibrous Homogeneous	90% Cellulose	10% Non-fibrous (other)	<b>None Detected</b>

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### Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5212-01-05-Joint Compound 221002287-0005B	Drywall, Jnt Cmpd, Tape & Texture	White Non-Fibrous  Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-01-05-Drywall 221002287-0005C	Drywall, Jnt Cmpd, Tape & Texture	Brown/White Fibrous Heterogeneous	10% Cellulose 5% Glass	85% Non-fibrous (other)	<b>None Detected</b>
5212-01-06-Texture 221002287-0006	Drywall, Jnt Cmpd, Tape & Texture	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-01-06-Tape 221002287-0006A	Drywall, Jnt Cmpd, Tape & Texture	White Fibrous Homogeneous	90% Cellulose	10% Non-fibrous (other)	<b>None Detected</b>
5212-01-06-Joint Compound 221002287-0006B	Drywall, Jnt Cmpd, Tape & Texture	White Non-Fibrous  Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-01-06-Drywall 221002287-0006C	Drywall, Jnt Cmpd, Tape & Texture	Brown/White Fibrous Heterogeneous	10% Cellulose 5% Glass	85% Non-fibrous (other)	<b>None Detected</b>

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### Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5212-01-07-Texture 221002287-0007	Drywall, Jnt Cmpd, Tape & Texture	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-01-07-Tape 221002287-0007A	Drywall, Jnt Cmpd, Tape & Texture	White Fibrous Homogeneous	90% Cellulose	10% Non-fibrous (other)	<b>None Detected</b>
5212-01-07-Joint Compound 221002287-0007B	Drywall, Jnt Cmpd, Tape & Texture	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-01-07-Drywall 221002287-0007C	Drywall, Jnt Cmpd, Tape & Texture	Brown/White Fibrous Heterogeneous	10% Cellulose 5% Glass	85% Non-fibrous (other)	<b>None Detected</b>
5212-02-08 221002287-0008	Dk Grey Grout	Gray Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-02-09 221002287-0009	Dk Grey Grout	Gray Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-02-10 221002287-0010	Dk Grey Grout	Gray Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>

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EMSL Proj:  
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## Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5212-03-11 221002287-0011	Drop Ceiling Tile	Tan/White Fibrous Heterogeneous	40% Cellulose 40% Min. Wool	10% Non-fibrous (other) 10% Perlite	<b>None Detected</b>
5212-03-12 221002287-0012	Drop Ceiling Tile	Tan/White Fibrous Heterogeneous	40% Cellulose 40% Min. Wool	10% Non-fibrous (other) 10% Perlite	<b>None Detected</b>
5212-03-13 221002287-0013	Drop Ceiling Tile	Tan/White Fibrous Heterogeneous	40% Cellulose 40% Min. Wool	10% Non-fibrous (other) 10% Perlite	<b>None Detected</b>
5212-04-14 221002287-0014	White Putty Soft	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-04-15 221002287-0015	White Putty Soft	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-04-16 221002287-0016	White Putty Soft	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-05-17 221002287-0017	White Caulk (Glass Blk Windows)	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>

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## Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5212-05-18 221002287-0018	White Caulk (Glass Blk Windows)	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-05-19 221002287-0019	White Caulk (Glass Blk Windows)	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-06-20 221002287-0020	Sink Insulation	Black Non-Fibrous Homogeneous	2% Cellulose	98% Non-fibrous (other)	<b>None Detected</b>
5212-06-21 221002287-0021	Sink Insulation	Black Non-Fibrous Homogeneous	2% Cellulose	98% Non-fibrous (other)	<b>None Detected</b>
5212-06-22 221002287-0022	Sink Insulation	Black Non-Fibrous Homogeneous	2% Cellulose	98% Non-fibrous (other)	<b>None Detected</b>
5212-07-23- Ceramic Tile 221002287-0023	Ceramic Wh Tile mastic w/ Green Board	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-07-23-Mastic 221002287-0023A	Ceramic Wh Tile mastic w/ Green Board	Cream Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>

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### Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5212-07-23-Fiber Board 221002287-0023B	Ceramic Wh Tile mastic w/ Green Board	Brown/Green Fibrous  Homogeneous	95% Cellulose	5% Non-fibrous (other)	<b>None Detected</b>
5212-07-24-Ceramic Tile 221002287-0024	Ceramic Wh Tile mastic w/ Green Board	White Non-Fibrous  Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-07-24-Mastic 221002287-0024A	Ceramic Wh Tile mastic w/ Green Board	Cream Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-07-24-Fiber Board 221002287-0024B	Ceramic Wh Tile mastic w/ Green Board	Brown/Green Fibrous  Homogeneous	95% Cellulose	5% Non-fibrous (other)	<b>None Detected</b>
5212-07-25-Ceramic Tile 221002287-0025	Ceramic Wh Tile mastic w/ Green Board	White Non-Fibrous  Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-07-25-Mastic 221002287-0025A	Ceramic Wh Tile mastic w/ Green Board	Cream Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>

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## Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5212-07-25-Fiber Board 221002287-0025B	Ceramic Wh Tile mastic w/ Green Board	Brown/Green Fibrous  Heterogeneous	95% Cellulose	5% Non-fibrous (other)	None Detected
5212-08-26 221002287-0026	Grey Grout (2x2 Tile Under)	Gray Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5212-08-27 221002287-0027	Grey Grout (2x2 Tile Under)	Gray Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5212-08-28 221002287-0028	Grey Grout (2x2 Tile Under)	Gray Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5212-09-29 221002287-0029	White Pipe Wrap Insulation	White Fibrous Heterogeneous	40% Cellulose	60% Non-fibrous (other)	None Detected
5212-09-30 221002287-0030	White Pipe Wrap Insulation	White Fibrous Heterogeneous	40% Cellulose	60% Non-fibrous (other)	None Detected
5212-09-31 221002287-0031	White Pipe Wrap Insulation	White Fibrous Heterogeneous	40% Cellulose	60% Non-fibrous (other)	None Detected

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Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5212-10-32 221002287-0032	Silver HVAC Insulation	Silver/Yellow Fibrous Heterogeneous	40% Glass	60% Non-fibrous (other)	<b>None Detected</b>
5212-10-33 221002287-0033	Silver HVAC Insulation	Silver/Yellow Fibrous Heterogeneous	40% Glass	60% Non-fibrous (other)	<b>None Detected</b>
5212-10-34 221002287-0034	Silver HVAC Insulation	Silver/Yellow Fibrous Heterogeneous	20% Glass	80% Non-fibrous (other)	<b>None Detected</b>
5212-11-35-Cove Base 221002287-0035	Black Base Cove w/ Yellow Mastic	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-11-35-Mastic 221002287-0035A	Black Base Cove w/ Yellow Mastic	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-11-36-Cove Base 221002287-0036	Black Base Cove w/ Yellow Mastic	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>

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Project: **3010128 Bldg 5212**

EMSL Proj:  
Analysis Date: 11/30/2010

### Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5212-11-36-Mastic 221002287-0036A	Black Base Cove w/ Yellow Mastic	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5212-11-37-Cove Base 221002287-0037	Black Base Cove w/ Mastic	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5212-11-37-Mastic 221002287-0037A	Black Base Cove w/ Mastic	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5212-12-38-Floor Tile 221002287-0038	Black Tile w/ Mastic	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5212-12-38-Mastic 221002287-0038A	Black Tile w/ Mastic	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5212-12-39-Floor Tile 221002287-0039	Black Tile w/ Mastic	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected

Initial report from 12/02/2010 08:35:54

Analyst(s)

DeCavallas Michael (112)

Erin Orthun, Laboratory Manager  
or other approved signatory

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Samples analyzed by EMSL Analytical, Inc. 7330 S. Alton Way Building 12 Suite A, Centennial CO NVLAP Lab Code 200828-0

**EMSL Analytical, Inc.**

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Project: **3010128 Bldg 5212**

EMSL Proj:  
Analysis Date: 11/30/2010

### Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5212-12-39-Mastic 221002287-0039A	Black Tile w/ Mastic	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-12-40-Floor Tile 221002287-0040	Black Tile w/ Mastic	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-12-40-Mastic 221002287-0040A	Black Tile w/ Mastic	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-13-41 221002287-0041	White Putty	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-13-42 221002287-0042	White Putty	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-13-43 221002287-0043	White Putty	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-14-44-Carpet 221002287-0044	Carpet w/ Blue Specks & Yellow Mastic	Blue Fibrous Heterogeneous	50% Synthetic	50% Non-fibrous (other)	<b>None Detected</b>

Initial report from 12/02/2010 08:35:54

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DeCavallas Michael (112)

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 Project: **3010128 Bldg 5212**

EMSL Proj:  
 Analysis Date: 11/30/2010

### Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5212-14-44-Mastic 221002287-0044A	Carpet w/ Blue Specks & Yellow Mastic	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-14-45-Carpet 221002287-0045	Carpet w/ Blue Specks & Yellow Mastic	Blue Fibrous Heterogeneous	50% Synthetic	50% Non-fibrous (other)	<b>None Detected</b>
5212-14-45-Mastic 221002287-0045A	Carpet w/ Blue Specks & Yellow Mastic	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-14-46-Carpet 221002287-0046	Carpet w/ Blue Specks & Yellow Mastic	Blue Fibrous Heterogeneous	50% Synthetic	50% Non-fibrous (other)	<b>None Detected</b>
5212-14-46-Mastic 221002287-0046A	Carpet w/ Blue Specks & Yellow Mastic	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-15-47 221002287-0047	Black Caulk Windows	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-15-48 221002287-0048	Black Caulk Windows	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>

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Analyst(s)

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Project: **3010128 Bldg 5212**

EMSL Proj:  
Analysis Date: 11/30/2010

### Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5212-15-49 221002287-0049	Black Caulk Windows	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-16-50-Floor Tile 221002287-0050	White Tile w/ Yellow Mastic	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-16-50-Mastic 221002287-0050A	White Tile w/ Yellow Mastic	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-16-51-Floor Tile 221002287-0051	White Tile w/ Yellow Mastic	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-16-51-Mastic 221002287-0051A	White Tile w/ Yellow Mastic	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-16-52-Floor Tile 221002287-0052	White Tile w/ Yellow Mastic	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>

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 Project: **3010128 Bldg 5212**

EMSL Proj:  
 Analysis Date: 11/30/2010

## Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5212-16-52-Mastic 221002287-0052A	White Tile w/ Yellow Mastic	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-17-53 221002287-0053	Exterior Beige Caulk	Beige Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-17-54 221002287-0054	Exterior Beige Caulk	Beige Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-17-55 221002287-0055	Exterior Beige Caulk	Beige Non-Fibrous Heterogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-18-56 221002287-0056	Exterior Black Caulk	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-18-57 221002287-0057	Exterior Black Caulk	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-18-58 221002287-0058	Exterior Black Caulk	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>

Initial report from 12/02/2010 08:35:54

Analyst(s)

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Project: **3010128 Bldg 5212**

EMSL Proj:  
Analysis Date: 11/30/2010

### Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5212-19-59 221002287-0059	Yellow Sink Putty	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-19-60 221002287-0060	Yellow Sink Putty	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-19-61 221002287-0061	Yellow Sink Putty	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-20-62-Floor Tile 221002287-0062	Brown Linoleum Tile Mastic	Brown Non-Fibrous  Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-20-62-Mastic 221002287-0062A	Brown Linoleum Tile Mastic	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-20-63-Floor Tile 221002287-0063	Brown Linoleum Tile Mastic	Brown Non-Fibrous  Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>

Initial report from 12/02/2010 08:35:54

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Analysis Date: 11/30/2010

### Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5212-20-63-Mastic 221002287-0063A	Brown Linoleum Tile Mastic	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-20-64-Floor Tile 221002287-0064	Brown Linoleum Tile Mastic	Brown Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-20-64-Mastic 221002287-0064A	Brown Linoleum Tile Mastic	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-21-65 221002287-0065	Exterior White Caulk	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-21-66 221002287-0066	Exterior White Caulk	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-21-67 221002287-0067	Exterior White Caulk	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-22-68 221002287-0068	Exterior Clear Caulk	Clear Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>

Initial report from 12/02/2010 08:35:54

Analyst(s)

DeCavallas Michael (112)

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EMSL Proj:  
Analysis Date: 11/30/2010

### Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5212-22-69 221002287-0069	Exterior Clear Caulk	Clear Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-22-70 221002287-0070	Exterior Clear Caulk	Clear Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>

Initial report from 12/02/2010 08:35:54

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EMSL Order: 221002320

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Project: **3010128**

EMSL Proj:  
Analysis Date: 12/7/2010

### Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5210-100-01-Roofing 221002320-0001	Bldg 5210, Roof Shingle, Tar, Insulation, Felt	Black Fibrous Heterogeneous	30% Glass 10% Cellulose	60% Non-fibrous (other)	None Detected
5210-100-01-Foam 221002320-0001A	Bldg 5210, Roof Shingle, Tar, Insulation, Felt	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5210-100-01-Insulation 221002320-0001B	Bldg 5210, Roof Shingle, Tar, Insulation, Felt	Brown Fibrous Homogeneous	85% Cellulose	15% Non-fibrous (other)	None Detected
5210-100-01-Tar Paper 221002320-0001C	Bldg 5210, Roof Shingle, Tar, Insulation, Felt	Black Fibrous Homogeneous	75% Cellulose	25% Non-fibrous (other)	None Detected
5210-100-01-Tar 221002320-0001D	Bldg 5210, Roof Shingle, Tar, Insulation, Felt	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5210-100-02-Roofing 221002320-0002	Bldg 5210, Roof Shingle, Tar, Insulation, Felt	Black Fibrous Heterogeneous	30% Glass 10% Cellulose	60% Non-fibrous (other)	None Detected

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Analyst(s)

DeCavallas Michael (50)

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 Project: **3010128**

EMSL Proj:  
 Analysis Date: 12/7/2010

## Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5210-100-02-Foam 221002320-0002A	Bldg 5210, Roof Shingle, Tar, Insulation, Felt	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5210-100-02-Insulation 221002320-0002B	Bldg 5210, Roof Shingle, Tar, Insulation, Felt	Brown Fibrous Homogeneous	85% Cellulose	15% Non-fibrous (other)	<b>None Detected</b>
5210-100-02-Tar Paper 221002320-0002C	Bldg 5210, Roof Shingle, Tar, Insulation, Felt	Black Fibrous Homogeneous	75% Cellulose	25% Non-fibrous (other)	<b>None Detected</b>
5210-100-02-Tar 221002320-0002D	Bldg 5210, Roof Shingle, Tar, Insulation, Felt	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5210-100-03-Shingle 221002320-0003	Bldg 5210, Roof Shingle, Flashing, Tar & Curbing	White/Black Fibrous Heterogeneous	20% Glass	80% Non-fibrous (other)	<b>None Detected</b>
Unable to distinguish curbing and flashing					
5210-100-03-Tar Felt 221002320-0003A	Bldg 5210, Roof Shingle, Flashing, Tar & Curbing	Black Fibrous Heterogeneous	35% Glass	65% Non-fibrous (other)	<b>None Detected</b>

Initial report from 12/07/2010 15:19:46

Analyst(s)

DeCavallas Michael (50)

Erin Orthun, Laboratory Manager  
 or other approved signatory

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Samples analyzed by EMSL Analytical, Inc. 7330 S. Alton Way Building 12 Suite A, Centennial CO NVLAP Lab Code 200828-0

**EMSL Analytical, Inc.**

7330 S. Alton Way Building 12 Suite A, Centennial, CO 80112

Phone: (303) 740-5700 Fax: (303) 741-1400 Email: [denverlab@emsl.com](mailto:denverlab@emsl.com)

Attn: **Sheila Sealander**  
**Empirical Environmental**  
**18550 Ranch Hand Road**  
**Suite 103**  
**Peyton, CO 80831**

Customer ID: EMPR78  
Customer PO:  
Received: 12/03/10 9:05 AM  
EMSL Order: 221002320

Fax: (719) 749-0238 Phone: (719) 749-2068  
Project: **3010128**

EMSL Proj:  
Analysis Date: 12/7/2010


### Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5210-100-03-Tar 221002320-0003B	Bldg 5210, Roof Shingle, Flashing, Tar & Curbing	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-100-04-Roofing 221002320-0004	Bldg 5212, Roof Shingle, Tar, Insulation, Felt	Black Fibrous  Heterogeneous	30% Glass 10% Cellulose	60% Non-fibrous (other)	<b>None Detected</b>
5212-100-04-Foam 221002320-0004A	Bldg 5212, Roof Shingle, Tar, Insulation, Felt	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-100-04-Insulation 221002320-0004B	Bldg 5212, Roof Shingle, Tar, Insulation, Felt	Brown Fibrous  Homogeneous	85% Cellulose	15% Non-fibrous (other)	<b>None Detected</b>
5212-100-04-Tar Paper 221002320-0004C	Bldg 5212, Roof Shingle, Tar, Insulation, Felt	Black Fibrous  Heterogeneous	75% Cellulose	25% Non-fibrous (other)	<b>None Detected</b>
5212-100-04-Tar 221002320-0004D	Bldg 5212, Roof Shingle, Tar, Insulation, Felt	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>

Initial report from 12/07/2010 15:19:46

Analyst(s)

DeCavallas Michael (50)

  
Erin Orthun, Laboratory Manager  
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Fax: (719) 749-0238 Phone: (719) 749-2068  
 Project: **3010128**

EMSL Proj:  
 Analysis Date: 12/7/2010

## Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5212-100-05-Roofing 221002320-0005	Bldg 5212, Roof Shingle, Tar, Insulation, Felt	White/Black	30% Cellulose	60% Non-fibrous (other)	<b>None Detected</b>
		Fibrous	10% Glass		
		Heterogeneous			
5212-100-05-Foam 221002320-0005A	Bldg 5212, Roof Shingle, Tar, Insulation, Felt	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-100-05-Insulation 221002320-0005B	Bldg 5212, Roof Shingle, Tar, Insulation, Felt	Brown Fibrous Homogeneous	85% Cellulose	15% Non-fibrous (other)	<b>None Detected</b>
5212-100-05-Tar Paper 221002320-0005C	Bldg 5212, Roof Shingle, Tar, Insulation, Felt	Black Fibrous Homogeneous	75% Cellulose	25% Non-fibrous (other)	<b>None Detected</b>
5212-100-05-Tar 221002320-0005D	Bldg 5212, Roof Shingle, Tar, Insulation, Felt	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-100-06-Shingle 221002320-0006	Bldg 5212, Roof Shingle, Flashing & Curbing	White/Black Fibrous Heterogeneous	20% Glass	80% Non-fibrous (other)	<b>None Detected</b>
Unable to distinguish curbing and flashing					

Initial report from 12/07/2010 15:19:46

Analyst(s)

DeCavallas Michael (50)

Erin Orthun, Laboratory Manager  
 or other approved signatory

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Samples analyzed by EMSL Analytical, Inc. 7330 S. Alton Way Building 12 Suite A, Centennial CO NVLAP Lab Code 200828-0

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Fax: (719) 749-0238 Phone: (719) 749-2068  
Project: **3010128**

EMSL Proj:  
Analysis Date: 12/7/2010

### Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
5212-100-06-Tar Felt 221002320-0006A	Bldg 5212, Roof Shingle, Flashing & Curbing	Black Fibrous Homogeneous	35% Glass	65% Non-fibrous (other)	None Detected
5212-100-06-Tar 221002320-0006B	Bldg 5212, Roof Shingle, Flashing & Curbing	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5214-100-07-Roofing 221002320-0007	Bldg 5214, Roof Shingle, Tar, Insulation, Felt	White/Black Fibrous Heterogeneous	35% Cellulose 10% Glass	55% Non-fibrous (other)	None Detected
5214-100-07-Foam 221002320-0007A	Bldg 5214, Roof Shingle, Tar, Insulation, Felt	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5214-100-07-Insulation 221002320-0007B	Bldg 5214, Roof Shingle, Tar, Insulation, Felt	Brown Fibrous Homogeneous	85% Cellulose	15% Non-fibrous (other)	None Detected
5214-100-07-Tar Paper 221002320-0007C	Bldg 5214, Roof Shingle, Tar, Insulation, Felt	Black Fibrous Homogeneous	35% Glass	65% Non-fibrous (other)	None Detected

Initial report from 12/07/2010 15:19:46

Analyst(s)

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Project: **3010128**

EMSL Proj:  
Analysis Date: 12/7/2010

### Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5214-100-07-Tar 221002320-0007D	Bldg 5214, Roof Shingle, Tar, Insulation, Felt	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5214-100-08-Roofing 221002320-0008	Bldg 5214, Roof Shingle, Tar, Insulation, Felt	White/Black Fibrous Heterogeneous	35% Cellulose 10% Glass	55% Non-fibrous (other)	None Detected
5214-100-08-Foam 221002320-0008A	Bldg 5214, Roof Shingle, Tar, Insulation, Felt	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5214-100-08-Insulation 221002320-0008B	Bldg 5214, Roof Shingle, Tar, Insulation, Felt	Brown Fibrous Homogeneous	85% Cellulose	15% Non-fibrous (other)	None Detected
5214-100-08-Tar Paper 221002320-0008C	Bldg 5214, Roof Shingle, Tar, Insulation, Felt	Black Fibrous Homogeneous	75% Cellulose	25% Non-fibrous (other)	None Detected
5214-100-08-Tar 221002320-0008D	Bldg 5214, Roof Shingle, Tar, Insulation, Felt	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected

Initial report from 12/07/2010 15:19:46

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 Project: **3010128**

EMSL Proj:  
 Analysis Date: 12/7/2010

### Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5214-100-09-Roofing 221002320-0009	Bldg 5214, Roof Shingle, Tar, Insulation, Felt	White/Black Fibrous  Heterogeneous	35% Cellulose 10% Glass	55% Non-fibrous (other)	<b>None Detected</b>
5214-100-09-Foam 221002320-0009A	Bldg 5214, Roof Shingle, Tar, Insulation, Felt	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-100-09-Insulation 221002320-0009B	Bldg 5214, Roof Shingle, Tar, Insulation, Felt	Brown Fibrous  Homogeneous	85% Cellulose	15% Non-fibrous (other)	<b>None Detected</b>
5214-100-09-Tar Paper 221002320-0009C	Bldg 5214, Roof Shingle, Tar, Insulation, Felt	Black Fibrous  Heterogeneous	75% Cellulose	25% Non-fibrous (other)	<b>None Detected</b>
5214-100-09-Tar 221002320-0009D	Bldg 5214, Roof Shingle, Tar, Insulation, Felt	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5210-101-10 221002320-0010	Bldg 5210, Pipe Flashing Cement	Black Non-Fibrous Homogeneous	10% Cellulose	90% Non-fibrous (other)	<b>None Detected</b>

Initial report from 12/07/2010 15:19:46

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Fax: (719) 749-0238 Phone: (719) 749-2068  
Project: **3010128**

EMSL Proj:  
Analysis Date: 12/7/2010

### Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5210-101-11 221002320-0011	Bldg 5210, Pipe Flashing Cement	Black Non-Fibrous Homogeneous	10% Cellulose	90% Non-fibrous (other)	None Detected
5210-101-12 221002320-0012	Bldg 5210, Pipe Flashing Cement	Black Non-Fibrous Homogeneous	10% Cellulose	90% Non-fibrous (other)	None Detected
5212-101-13 221002320-0013	Bldg 5212, Pipe Flashing Cement	Black Non-Fibrous Homogeneous	10% Cellulose	90% Non-fibrous (other)	None Detected
5212-101-14 221002320-0014	Bldg 5212, Pipe Flashing Cement	Black Non-Fibrous Homogeneous	10% Cellulose	90% Non-fibrous (other)	None Detected
5212-101-15 221002320-0015	Bldg 5212, Pipe Flashing Cement	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5214-101-16 221002320-0016	Bldg 5214, Pipe Flashing Cement	Black Non-Fibrous Homogeneous		96% Non-fibrous (other)	4% Chrysotile
5214-101-17 221002320-0017	Bldg 5214, Pipe Flashing Cement	Black Non-Fibrous Homogeneous		96% Non-fibrous (other)	4% Chrysotile

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EMSL Proj:  
Analysis Date: 12/7/2010

### Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5214-101-18 221002320-0018	Bldg 5214, Pipe Flashing Cement	Black Non-Fibrous Homogeneous		96% Non-fibrous (other)	4% Chrysotile

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 EMSL ANALYTICAL, INC.  
 LABORATORY SERVICES

# Asbestos Lab Services Chain of Custody

EMSL Order Number (Lab Use Only):

221002287

 Denver, CO  
 Building 12 Suite A  
 7330 S. Alton Way  
 Centennial, CO 80112  
 PHONE: (303) 740-5700  
 FAX: (303) 741-1400

Company: Empirical Environmental, LLC		EMSL-Bill to: <input checked="" type="checkbox"/> Same <input type="checkbox"/> Different If Bill to is Different note instructions in Comments**	
Street: 18550 Ranch Hand Rd., Suite 103		Third Party Billing requires written authorization from third party	
City/State/Zip: Peyton, CO 80831			
Report To (Name): Sheila Sealander		Fax: 719-749-0238	
Telephone: 719-749-2068		Email Address: sheila.sealander@empiricalenv.com	
Project Name/Number: 3010128 <i>5212</i>			
Please Provide Results: Email		Purchase Order: <i>per Sheila</i>	
		State Samples Taken: CO	
Turnaround Time (TAT) Options* - Please Check			
<input type="checkbox"/> 3 Hour <input type="checkbox"/> 6 Hour <input type="checkbox"/> 24 Hour <input type="checkbox"/> 48 Hour <input checked="" type="checkbox"/> 72 Hour <input type="checkbox"/> 96 Hour <input type="checkbox"/> 1 Week <input type="checkbox"/> 2 Week			
<small>*For TEM Air 3 hours/6 hours, please call ahead to schedule. There is a premium charge for 3 Hour TEM AHERA or EPA Level II TAT. You will be asked to sign an authorization form for this service. Analysis completed in accordance with EMSL's Terms and Conditions located in the Analytical Price Guide.</small>			
<b>PCM - Air</b> <input type="checkbox"/> NIOSH 7400 <input type="checkbox"/> w/ OSHA 8hr. TWA <b>PLM - Bulk (reporting limit)</b> <input type="checkbox"/> PLM EPA 600/R-93/116 (<1%) <input type="checkbox"/> PLM EPA NOB (<1%) Point Count <input type="checkbox"/> 400 (<0.25%) <input type="checkbox"/> 1000 (<0.1%) Point Count w/Gravimetric <input type="checkbox"/> 400 (<0.25%) <input type="checkbox"/> 1000 (<0.1%) <input type="checkbox"/> NYS 198.1 (friable in NY) <input type="checkbox"/> NYS 198.6 NOB (non-friable-NY) <input type="checkbox"/> NIOSH 9002 (<1%)		<b>TEM - Air</b> <input type="checkbox"/> 4-4.5hr TAT (AHERA only) <input type="checkbox"/> AHERA 40 CFR, Part 763 <input type="checkbox"/> NIOSH 7402 <input type="checkbox"/> EPA Level II <input type="checkbox"/> ISO 10312 <b>TEM - Bulk</b> <input type="checkbox"/> TEM EPA NOB <input type="checkbox"/> NYS NOB 198.4 (non-friable-NY) <input type="checkbox"/> Chatfield SOP <input type="checkbox"/> TEM Mass Analysis-EPA 600 sec. 2.5 <b>TEM - Water:</b> EPA 100.2 Fibers >10µm <input type="checkbox"/> Waste <input type="checkbox"/> Drinking All Fiber Sizes <input type="checkbox"/> Waste <input type="checkbox"/> Drinking	
		<b>TEM - Dust</b> <input type="checkbox"/> Microvac - ASTM D 5755 <input type="checkbox"/> Wipe - ASTM D6480 <input type="checkbox"/> Carpet Sonication (EPA 600/J-93/167) <b>Soil/Rock/Vermiculite</b> <input type="checkbox"/> PLM CARB 435 - A (0.25% sensitivity) <input type="checkbox"/> PLM CARB 435 - B (0.1% sensitivity) <input type="checkbox"/> TEM CARB 435 - B (0.1% sensitivity) <input type="checkbox"/> TEM CARB 435 - C (0.01% sensitivity) <input type="checkbox"/> EPA Protocol (Semi-Quantitative) <input type="checkbox"/> EPA Protocol (Quantitative) <b>Other:</b> <input type="checkbox"/>	
<input type="checkbox"/> Check For Positive Stop - Clearly Identify Homogenous Group			
Samplers Name: <i>Fay L. Ward</i>		Samplers Signature: <i>Fay L Ward</i>	
Sample #	Sample Description	Volume/Area (Air) HA # (Bulk)	Date/Time Sampled
5212-01-01	DRYWALL, JNT CMPD, TAPE & TEXTURE	1st JANITORS CLOSET	11-26-10
5212-01-02	DRYWALL, JNT CMPD, TAPE & TEXTURE	1st RM #123 BROOM CLOSET	11-26-10
5212-01-03	DRYWALL, JNT CMPD, TAPE & TEXTURE	2nd ELCT. RM	11-26-10
5212-01-04	DRYWALL, JNT CMPD, TAPE & TEXTURE	2nd BROOM CLOSET	"
5212-01-05	DRYWALL, JNT CMPD, TAPE & TEXTURE	2nd JANITORS CLOSET	"
5212-01-06	DRYWALL, JNT CMPD, TAPE & TEXTURE	3rd JANITORS CLOSET	"
5212-01-07	DRYWALL, JNT CMPD, TAPE & TEXTURE	3rd BROOM CLOSET	"
5212-02-08	DR. GREY GROUT	FOYER	"
Client Sample # (s): 5212-01 - 5212-02-08		Total # of Samples: 70	
Relinquished (Client): <i>Fay L. Ward</i>		Date: 11-29-10 Time:	
Received (Lab): <i>MOLWALLER</i>		Date: 11/29/10 Time: 11Am	
Comments/Special Instructions: <i>walkin</i>			

2287

Page 2 of 25



## Chain of Custody

### Asbestos Lab Services

EMSL Analytical, Inc.  
 Building 12 Suite A  
 7330 S. Alton Way  
 Centennial, CO 80112  
 Phone: (303) 740-5700  
 Fax: (303) 741-1400  
<http://www.emsl.com>

Please print all information legibly.

Client Sample # (s) 5212-02-09 - 5212-06-22Total Samples #: 14

Relinquished: \_\_\_\_\_ Date: \_\_\_\_\_

Time: \_\_\_\_\_

Received: \_\_\_\_\_ Date: \_\_\_\_\_

Time: \_\_\_\_\_

Relinquished: \_\_\_\_\_ Date: \_\_\_\_\_

Time: \_\_\_\_\_

Received: \_\_\_\_\_ Date: \_\_\_\_\_

Time: \_\_\_\_\_

SAMPLE NUMBER	SAMPLE DESCRIPTION/LOCATION	VOLUME (if applicable)
5212-02-09	DK GREEN GROUT	2ND LANDING
5212-02-10	DK GREEN GROUT	3RD LANDING
5212-03-11	DROP CEILING TILE	1ST DAY RM
5212-03-12	DROP CEILING TILE	2ND DAY RM
5212-03-13	DROP CEILING TILE	3RD LAUNDRY RM
5212-04-14	WHITE PUTTY SOFT	1ST DAY RM
5212-04-15	WHITE PUTTY SOFT	2ND DAY RM
5212-04-16	WHITE PUTTY SOFT	3RD LAUNDRY
5212-05-17	WHITE CAULK (GLASS BLK WINDOWS)	1ST DAY RM GLASS BLK WINDOW
5212-05-18	WHITE CAULK (GLASS BLK WINDOWS)	2ND DAY RM
5212-05-19	WHITE CAULK (GLASS BLK WINDOWS)	3RD STORAGE RM
5212-06-20	SINK INSULATION	1ST WOMENS RESTROOM
5212-06-21	SINK INSULATION	2ND MENS RESTROOM
5212-06-22	SINK INSULATION	3RD MENS RESTROOM



3 of 5



# Chain of Custody

## Asbestos Lab Services

EMSL Analytical, Inc.  
 Building 12 Suite A  
 7330 S. Alton Way  
 Centennial, CO 80112  
 Phone: (303) 740-5700  
 Fax: (303) 741-1400  
<http://www.emsl.com>

Please print all information legibly.

Client Sample # (s) 5212-07-23 - 5212-11-36

Total Samples #: 14

Relinquished: \_\_\_\_\_ Date: \_\_\_\_\_

Time: \_\_\_\_\_

Received: \_\_\_\_\_ Date: \_\_\_\_\_

Time: \_\_\_\_\_

Relinquished: \_\_\_\_\_ Date: \_\_\_\_\_

Time: \_\_\_\_\_

Received: \_\_\_\_\_ Date: \_\_\_\_\_

Time: \_\_\_\_\_

SAMPLE NUMBER	SAMPLE DESCRIPTION/LOCATION	VOLUME (if applicable)
5212-07-23	CERAMIC WH TILE MASTIC w/ GREENBOARD	1 <sup>st</sup> WOMENS RESTROOM
5212-07-24	CERAMIC WH. TILE MASTIC w/ GREENBOARD	2 <sup>nd</sup> MENS RESTROOM
5212-07-25	CERAMIC WH. TILE MASTIC w/ GREENBOARD	3 <sup>rd</sup> MENS RESTROOM
5212-08-26	GREEN GROUT (2X2 TILE UNDER)	1 <sup>st</sup> WOMENS REST ROOM
5212-08-27	GREEN GROUT (2X2 TILE UNDER)	2 <sup>nd</sup> MENS REST ROOM
5212-08-28	GREEN GROUT (2X2 TILE UNDER)	3 <sup>rd</sup> MENS REST ROOM
5212-09-29	WHITE PIPE WRAP INSULATION	1 <sup>st</sup> WOMENS REST ROOM CEILING
5212-09-30	WHITE PIPE WRAP INSULATION	2 <sup>nd</sup> MECH RM
5212-09-31	WHITE PIPE WRAP INSULATION	3 <sup>rd</sup> PIPE CHASE
5212-10-32	SILVER HVAC INSULATION	1 <sup>st</sup> ELECT ROOM
5212-10-33	SILVER HVAC INSULATION	2 <sup>nd</sup> HALL PIPE CHASE
5212-10-34	SILVER HVAC INSULATION	3 <sup>rd</sup> PIPE CHASE
5212-11-35	BLACK BASE COVE w/ YELLOW MASTIC	1 <sup>st</sup> BROOM CLOSET RM #123
5212-11-36	BLACK BASE COVE w/ YELLOW MASTIC	2 <sup>nd</sup> ELECTRICAL RM



# Chain of Custody

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Building 12 Suite A  
7330 S. Alton Way  
Centennial, CO 80112  
Phone: (303) 740-5700  
Fax: (303) 741-1400  
<http://www.emsl.com>

Please print all information legibly.

Client Sample # (s) 5212-11-37 - 5212-16-50

Total Samples #: 14

Relinquished: \_\_\_\_\_ Date: \_\_\_\_\_

Time: \_\_\_\_\_

Received: \_\_\_\_\_ Date: \_\_\_\_\_

Time: \_\_\_\_\_

Relinquished: \_\_\_\_\_ Date: \_\_\_\_\_

Time: \_\_\_\_\_

Received: \_\_\_\_\_ Date: \_\_\_\_\_

Time: \_\_\_\_\_

SAMPLE NUMBER	SAMPLE DESCRIPTION/LOCATION	VOLUME (if applicable)
5212-11-37	BLACK PAINT COVE w/ MASTIC	2ND FLOOR RM
5212-12-38	BLACK TILE w/ MASTIC	1ST FLOOR CLOSET
5212-12-39	BLACK TILE w/ MASTIC	2ND FLOOR CLOSET
5212-12-40	BLACK TILE w/ MASTIC	3RD FLOOR CLOSET
5212-13-41	WHITE PUTTY	1ST WATER HEATER MAINT MECH ROOM VALVE
5212-13-42	WHITE PUTTY	2ND PIPE CHASE
5212-13-43	WHITE PUTTY	1ST PIPE CHASE
5212-14-44	CARPET w/ BLUE SPECKS & YELLOW MASTIC	1ST RM # 107
5212-14-45	CARPET w/ BLUE SPECKS & YELLOW MASTIC	2ND RM # 212
5212-14-46	CARPET w/ BLUE SPECKS & YELLOW MASTIC	3RD RM # 302
5212-15-47	BLACK CAULK WINDOWS	1ST RM # 103
5212-15-48	BLACK CAULK WINDOWS	2ND RM # 212
5212-15-49	BLACK CAULK WINDOWS	3RD LANDING WINDOW
5212-16-50	WHITE TILE w/ YELLOW MASTIC	1ST BACK DOOR





# Chain of Custody

## Asbestos Lab Services

EMSL Analytical, Inc.  
Building 12 Suite A  
7330 S. Alton Way  
Centennial, CO 80112  
Phone: (303) 740-5700  
Fax: (303) 741-1400  
<http://www.emsl.com>

Page 2 of 2  
5 of 5

Please print all information legibly.

Client Sample # (s) 5212-16-51 - 5212-20-64

Total Samples #: 14

Relinquished: \_\_\_\_\_ Date: \_\_\_\_\_

Time: \_\_\_\_\_

Received: \_\_\_\_\_ Date: \_\_\_\_\_

Time: \_\_\_\_\_

Relinquished: \_\_\_\_\_ Date: \_\_\_\_\_

Time: \_\_\_\_\_

Received: \_\_\_\_\_ Date: \_\_\_\_\_

Time: \_\_\_\_\_

SAMPLE NUMBER	SAMPLE DESCRIPTION/LOCATION	VOLUME (if applicable)
5212-16-51	WHITE TILE w/ YELLOW MASTIC	2ND BACK DOOR
5212-16-52	WHITE TILE w/ YELLOW MASTIC	3RD RM #316-1 STORAGE
5212-17-53	EXTERIOR BEIGE CAULK	EXTERIOR
5212-17-54	EXTERIOR BEIGE CAULK	EXTERIOR
5212-17-55	EXTERIOR BEIGE CAULK	EXTERIOR
5212-18-56	EXTERIOR BLACK CAULK	EXTERIOR
5212-18-57	EXTERIOR BLACK CAULK	EXTERIOR
5212-18-58	EXTERIOR BLACK CAULK	EXTERIOR
5212-19-59	YELLOW SINK PUTTY	3RD MEN'S RESTROOM
5212-19-60	YELLOW SINK PUTTY	3RD MEN'S RESTROOM
5212-19-61	YELLOW SINK PUTTY	3RD MEN'S RESTROOM
5212-20-62	BROWN LINOLEUM TILE MASTIC	3RD LAUNDRY RM
5212-20-63	BROWN LINOLEUM TILE MASTIC	3RD LAUNDRY RM
5212-20-64	BROWN LINOLEUM TILE MASTIC	3RD LAUNDRY RM



# Chain of Custody

## Asbestos Lab Services

EMSL Analytical, Inc.  
 Building 12 Suite A  
 7330 S. Alton Way  
 Centennial, CO 80112  
 Phone: (303) 740-5700  
 Fax: (303) 741-1400  
<http://www.emsl.com>

Please print all information legibly.

Client Sample # (s) 5212-21-65 - 5212-22-70

Total Samples #: 6

Relinquished: Gay S. Ward Date: 11-28-10

Time: \_\_\_\_\_

Received: \_\_\_\_\_ Date: \_\_\_\_\_

Time: \_\_\_\_\_

Relinquished: \_\_\_\_\_ Date: \_\_\_\_\_

Time: \_\_\_\_\_

Received: \_\_\_\_\_ Date: \_\_\_\_\_

Time: \_\_\_\_\_

SAMPLE NUMBER	SAMPLE DESCRIPTION/LOCATION	VOLUME (if applicable)
5212-21-65	EXTERIOR WHITE CAULK	SE SIDE
5212-21-66	EXTERIOR WHITE CAULK	NE SIDE
5212-21-67	EXTERIOR WHITE CAULK	NE SIDE
5212-22-68	EXTERIOR CLEAR CAULK	SOUTH SIDE 1/2 way
5212-22-69	EXTERIOR CLEAR CAULK	NORTH SIDE 1/2 way
5212-22-70	EXTERIOR CLEAR CAULK	N.W. CORNER



EMSL ANALYTICAL, INC.  
A HANOVER COMPANY

# Asbestos Lab Services Chain of Custody

EMSL Order Number (Lab Use Only):

221002319

Denver, CO  
Building 12 Suite A  
7330 S. Alton Way  
Centennial, CO 80112  
PHONE: (303) 740-5700  
FAX: (303) 741-1400

Company: Empirical Environmental, LLC		EMSL-Bill to: <input checked="" type="checkbox"/> Same <input type="checkbox"/> Different If Bill to is Different note instructions in Comments** Third Party Billing requires written authorization from third party	
Street: 18550 Ranch Hand Rd., Suite 103			
City/State/Zip: Peyton, CO 80831			
Report To (Name): Sheila Sealander		Fax: 719-749-0238	
Telephone: 719-749-2068		Email Address: sheila.sealander@empiricalenv.com	
Project Name/Number: 3010120			
Please Provide Results: Email		Purchase Order:	
		State Samples Taken: CO	
Turnaround Time (TAT) Options* - Please Check			
<input type="checkbox"/> 3 Hour <input type="checkbox"/> 6 Hour <input type="checkbox"/> 24 Hour <input type="checkbox"/> 48 Hour <input checked="" type="checkbox"/> 72 Hour <input type="checkbox"/> 96 Hour <input type="checkbox"/> 1 Week <input type="checkbox"/> 2 Week			
*For TEM Air 3 hours/6 hours, please call ahead to schedule. There is a premium charge for 3 Hour TEM AHERA or EPA Level II TAT. You will be asked to sign an authorization form for this service. Analysis completed in accordance with EMSL's Terms and Conditions located in the Analytical Price Guide.			
<b>PCM - Air</b> <input type="checkbox"/> NIOSH 7400 <input type="checkbox"/> w/ OSHA 8hr. TWA <b>PLM - Bulk (reporting limit)</b> <input checked="" type="checkbox"/> PLM EPA 600/R-93/116 (<1%) <input type="checkbox"/> PLM EPA NOB (<1%) Point Count <input type="checkbox"/> 400 (<0.25%) <input type="checkbox"/> 1000 (<0.1%) Point Count w/Gravimetric <input type="checkbox"/> 400 (<0.25%) <input type="checkbox"/> 1000 (<0.1%) <input type="checkbox"/> NYS 198.1 (friable in NY) <input type="checkbox"/> NYS 198.6 NOB (non-friable-NY) <input type="checkbox"/> NIOSH 9002 (<1%)		<b>TEM - Air</b> <input type="checkbox"/> 4-4.5hr TAT (AHERA only) <input type="checkbox"/> AHERA 40 CFR, Part 763 <input type="checkbox"/> NIOSH 7402 <input type="checkbox"/> EPA Level II <input type="checkbox"/> ISO 10312 <b>TEM - Bulk</b> <input type="checkbox"/> TEM EPA NOB <input type="checkbox"/> NYS NOB 198.4 (non-friable-NY) <input type="checkbox"/> Chatfield SOP <input type="checkbox"/> TEM Mass Analysis-EPA 600 sec. 2.5 <b>TEM - Water:</b> EPA 100.2 Fibers >10µm <input type="checkbox"/> Waste <input type="checkbox"/> Drinking All Fiber Sizes <input type="checkbox"/> Waste <input type="checkbox"/> Drinking	
		<b>TEM-Dust</b> <input type="checkbox"/> Microvac - ASTM D 5755 <input type="checkbox"/> Wipe - ASTM D6480 <input type="checkbox"/> Carpet Sonication (EPA 600/J-93/167) <b>Soil/Rock/Vermiculite</b> <input type="checkbox"/> PLM CARB 435 - A (0.25% sensitivity) <input type="checkbox"/> PLM CARB 435 - B (0.1% sensitivity) <input type="checkbox"/> TEM CARB 435 - B (0.1% sensitivity) <input type="checkbox"/> TEM CARB 435 - C (0.01% sensitivity) <input type="checkbox"/> EPA Protocol (Semi-Quantitative) <input type="checkbox"/> EPA Protocol (Quantitative) <b>Other:</b> <input type="checkbox"/>	
<input type="checkbox"/> Check For Positive Stop - Clearly Identify Homogenous Group			
Samplers Name: FAY WARD		Samplers Signature: Fay Ward	
Sample #	Sample Description	Volume/Area (Air) HA # (Bulk)	Date/Time Sampled
5216-100-01	Bldg 5216, Roof shingle, tar, insulation, felt	West Side	12-2-10 11A
5216-100-02	" " " "	North Side	12-2-10 11A
5216-100-03	Bldg 5216 Roof curbing + flashing + shingle	West Side	12-2-10 11A
5220-100-04	Bldg 5220 Roof shingle, tar, insul. + felt	South Side	12-2-10 11 <sup>30</sup> A
5220-100-05	" " " "	North Side	12-2-10 11 <sup>30</sup> A
5220-100-06	Bldg 5220 Roof shingle, flashing + curbing	West Side	12-2-10 11 <sup>30</sup> A
5224-100-07	Bldg 5224 Roof shingle, tar, insulation, felt	South	12p 12-2-10
5224-100-08	" " " "	North	12p 12-2-10
Client Sample # (s): 5216-100-01 to 5220-102-21		Total # of Samples: 21	
Relinquished (Client): Fay Ward		Date: 12-2-10 Time: 10 <sup>00</sup>	
Received (Lab): EMSL		Date: 12/3/10 Time: 9:05 am	
Comments/Special Instructions: 12/3 FE			

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EMSL ANALYTICAL INC.  
LABORATORY OF ENVIRONMENTAL TOXICOLOGY

# Asbestos Lab Services Chain of Custody

EMSL Order Number (Lab Use Only):

221002319

Denver, CO  
Building 12 Suite A  
7330 S. Alton Way  
Centennial, CO 80112  
PHONE: (303) 740-5700  
FAX: (303) 741-1400

Sample #	Sample Description	Volume/Area (Air) HA # (Bulk)	Date/Time Sampled
5224-100-09	Bldg 5224, Roof shingle, flashing + curbing	North Side	12-2-10 12p
5216-101-10	Bldg 5216 Pipe flashing cement	center	" " 11A
5216-101-11	" " "	center north	" " 11A
5216-101-12	" " "	center east	" " 11A
5220-101-13	Bldg 5220 Pipe flashing cement	center	" " 1130A
5220-101-14	" " "	center	" " 1130A
5220-101-15	" " "	center	" " 1130A
5224-101-16	Bldg 5224 pipe flashing cement	center west	" " 12p
5224-101-17	" " "	center	" " 12p
5224-101-18	" " "	center east	" " 12p
5220-102-19	Bldg 5220 yellow caulk	elevator housing	" " 11 <sup>30</sup> A
5220-102-20	" " yellow caulk	" "	" " 11 <sup>30</sup> A
5220-102-21	" " yellow caulk	" "	" " 11 <sup>30</sup> A

Comments/Special Instructions:

Controlled Document - Asbestos Lab Services COC - A1.0 - 11/23/2009

Page 1 of 2 Pages

**TAB 3**

**ASBESTOS FIGURES**

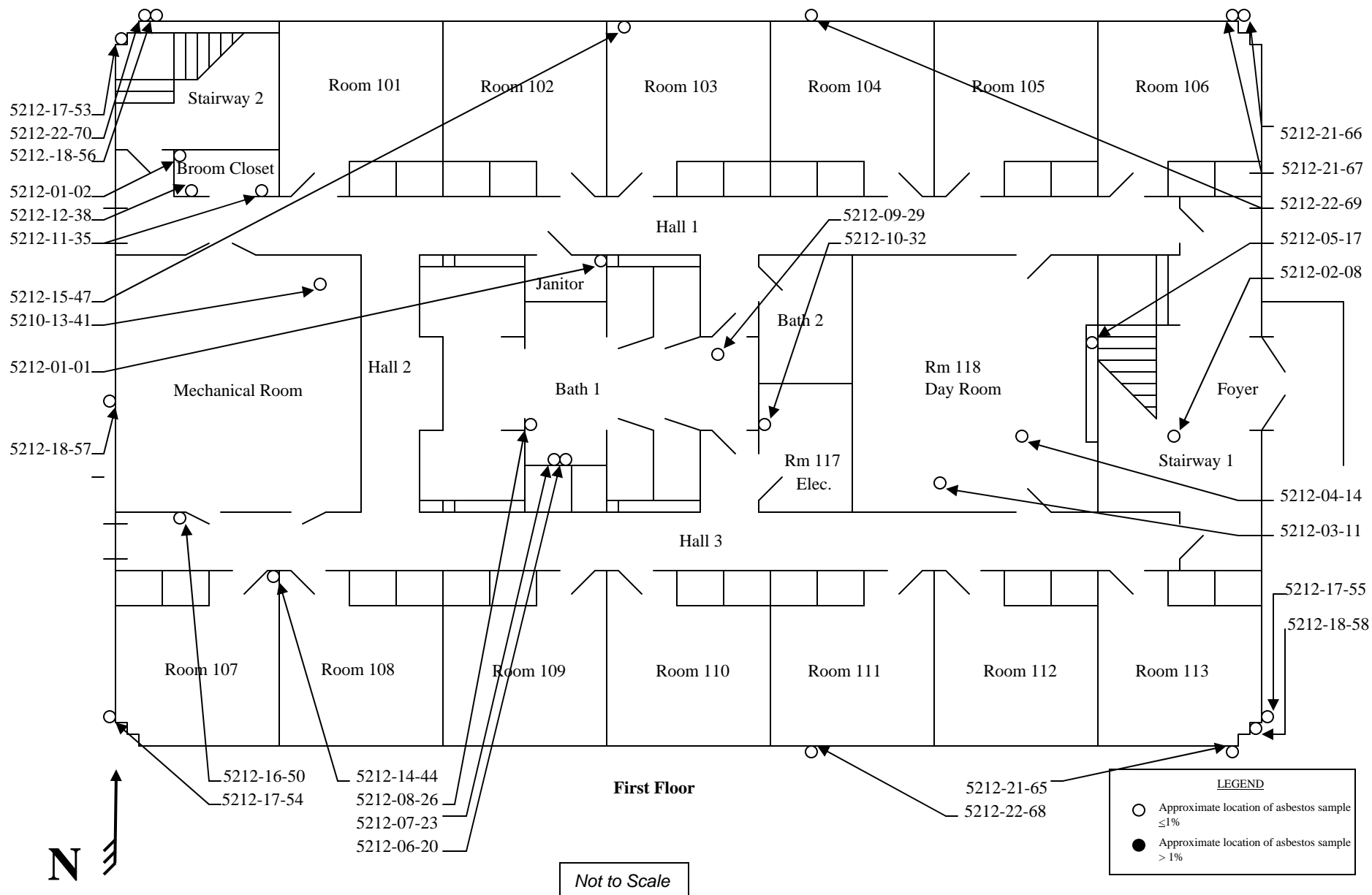


Figure 1 of 4 - Site Diagram

Project # 3010128

Drawn by FW  
Drawn Dec. 2010

Limited Asbestos Survey  
USAFA Prep School Building 5212  
**APPENDIX F**  
Colorado Springs, Colorado

**Empirical Environmental, LLC**

Phone (719) 749-2068 Fax (719) 749-0238  
Page 116 of 233

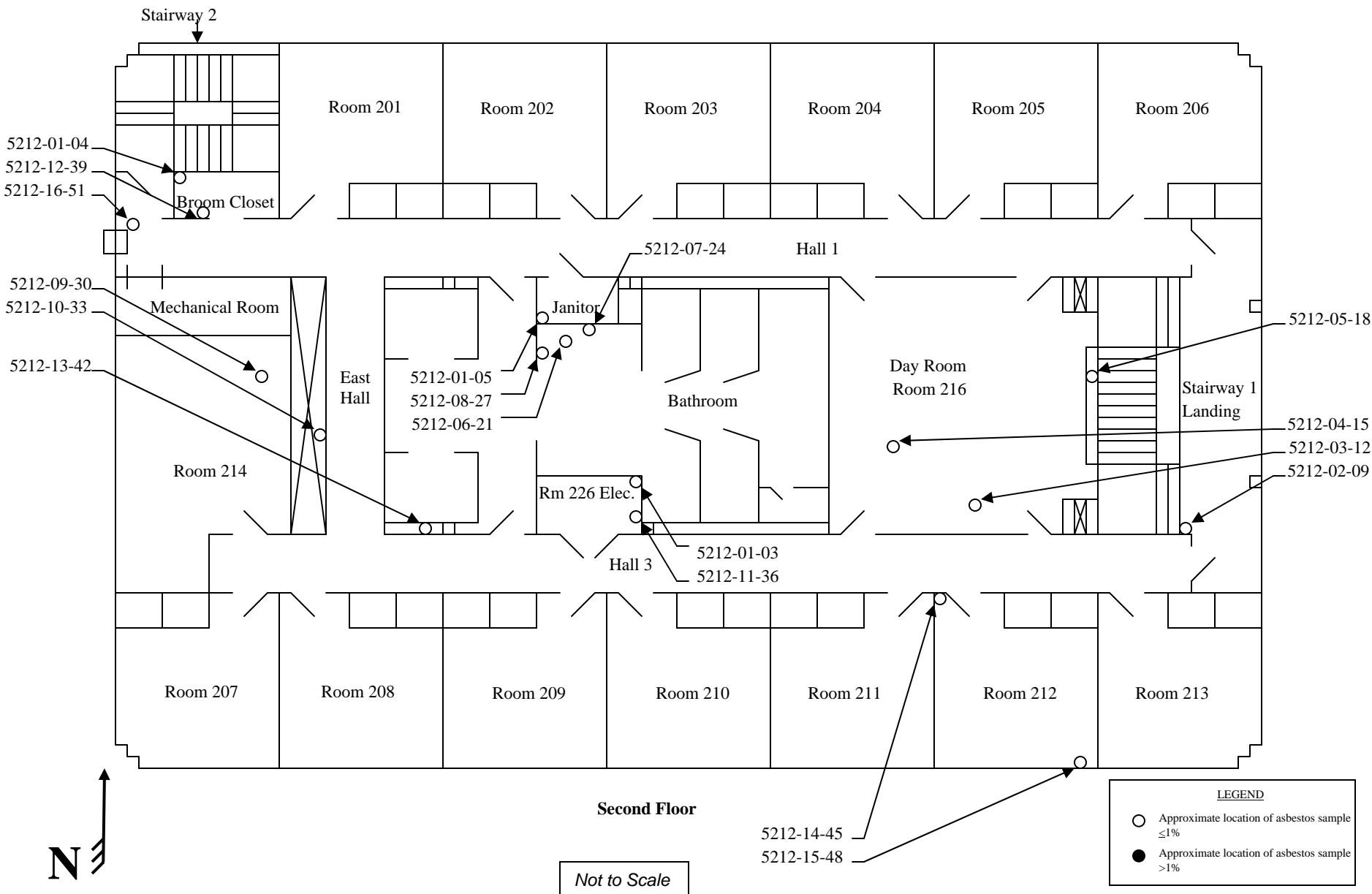


Figure 2 of 4 - Site Diagram

Project # 3010128

Drawn by FW  
Drawn Dec. 2010

Limited Asbestos Survey  
USAFA Prep School, Building 5212  
APPENDIX F  
Colorado Springs, Colorado

**Empirical Environmental, LLC**

Phone (719) 749-2068 Fax (719) 749-0238  
Page 117 of 233

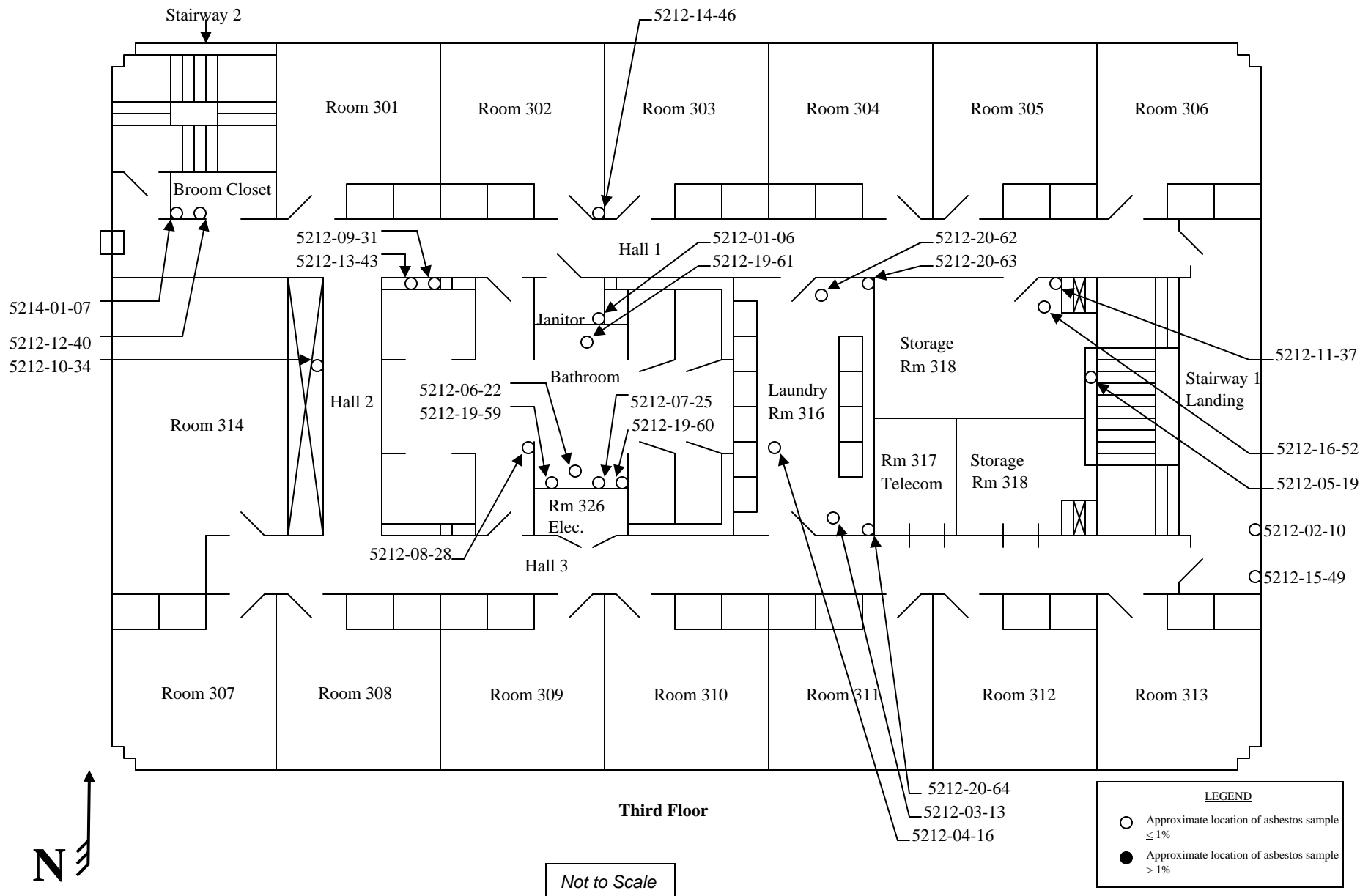


Figure 3 of 4 - Site Diagram

Project # 3010128

Drawn by FW  
Drawn Dec. 2010

Limited Asbestos Survey  
USAFA Prep School, Building 5212  
APPENDIX F  
Colorado Springs, Colorado

**Empirical Environmental, LLC**

Phone (719) 749-2068 Fax (719) 749-0238  
Page 118 of 233



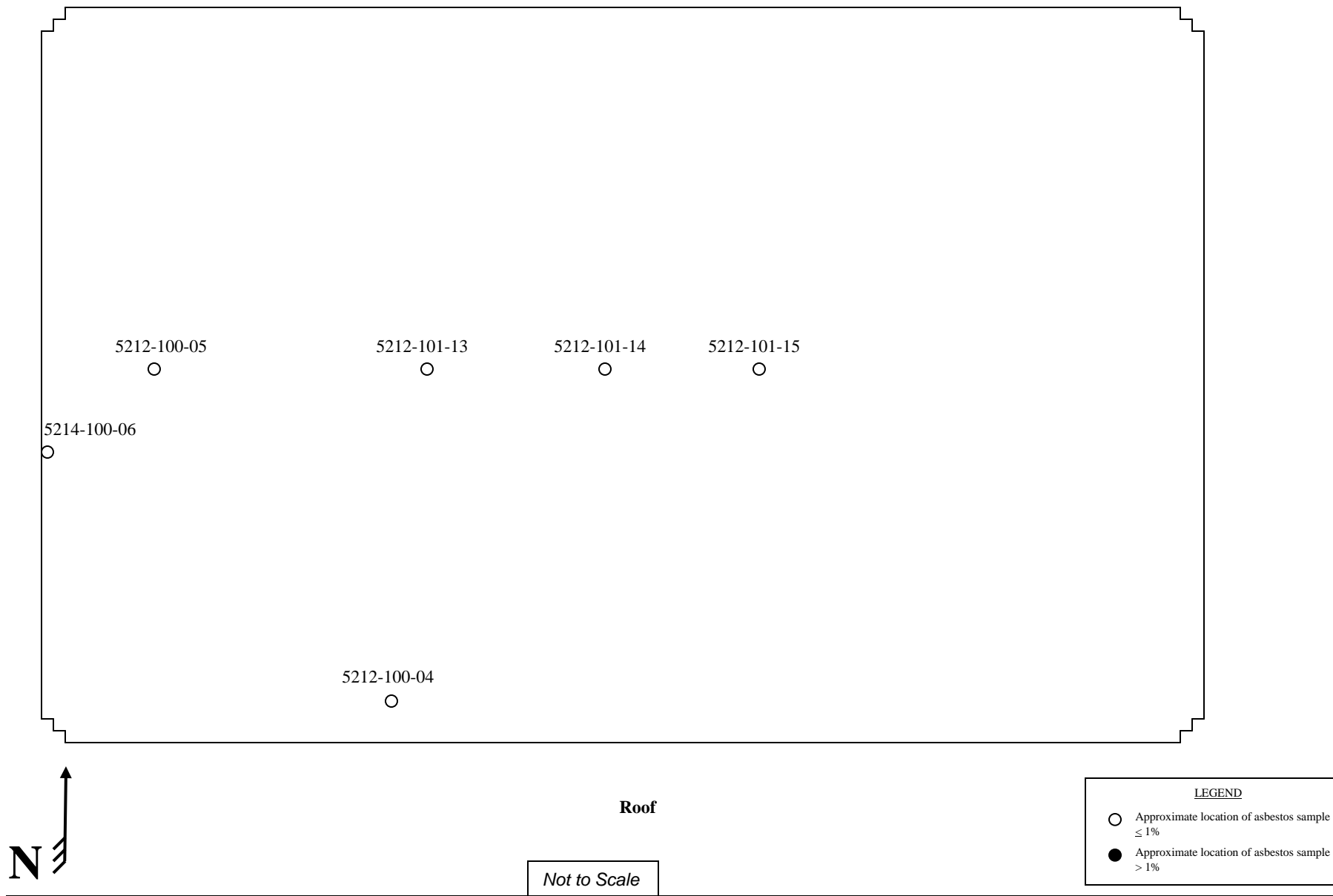


Figure 4 of 4 - Site Diagram

Project # 3010128

Drawn by FW  
Drawn Dec. 2010

Limited Asbestos Survey  
USAFA Prep School, Building 5212  
**APPENDIX F**  
Colorado Springs, Colorado

**Empirical Environmental, LLC**

Phone (719) 749-2068 Fax (719) 749-0238  
Page 119 of 233

## **APPENDIX D**

### **ASBESTOS – BUILDING 5214**

**TAB 1**

**HOMOGENEOUS AREAS**

Table 3  
**ASBESTOS INVENTORY SURVEY**  
 Building 5214, Preparatory School, USAFA  
 Colorado Springs, Colorado  
 December 2010

**Homogeneous Areas in the Building 5214**

<b>NUMBER</b>	<b>DESCRIPTION</b>	<b>MATERIAL TYPE</b>	<b>ASBESTOS</b>	<b>LOCATION</b>
1	Texture, Drywall, Joint Cmpnd, Tape	Miscellaneous	NO	Throughout Building
2	Dark Grey Grout	Miscellaneous	NO	Stairway 1
3	2 X 2 Drop Ceiling Tile	Miscellaneous	NO	Day Rooms, Laundry Room
4	White Caulk	Surfacing	NO	Day Rooms and Storage Rooms
5	Blue Speck Carpet with Mastic	Miscellaneous	NO	Throughout Building
6	Black Base Cove with Mastic	Miscellaneous	NO	Day Rm., Elec. Rm., Laundry Rm
7	Yellow Foam Insulation	TSI	NO	Elec. Rm
8	White Pipe Putty	TSI	NO	Mech. Rm, Pipe Chase, Restroom
9	Sink Insulation	TSI	NO	Restrooms
10	Yellow Sink Putty	Miscellaneous	NO	Restrooms
11	White Tile Mastic with Green Drywall	Miscellaneous	NO	Restrooms
12	Grey Grout	Miscellaneous	NO	Restrooms
13	White Pipe Wrap Insulation	TSI	NO	Pipe Chase Throughout Bldg.
14	Black Floor Tile with yellow Mastic	Miscellaneous	NO	Broom Closets
15	Black Caulk	Surfacing	NO	Windows Throughout Building
16	White Floor Tile with Mastic	Miscellaneous	NO	Hallways, Storage Room
17	Silver HVAC Wrap	TSI	NO	Mechanical Rm and Pipe Chase
18	White Soft Pipe Putty	Miscellaneous	NO	Mechanical Rm, Day Room

Table 3  
**ASBESTOS INVENTORY SURVEY**  
 Building 5214, Preparatory School, USAFA  
 Colorado Springs, Colorado  
 December 2010

**Homogeneous Areas in the Building 5214**

<b>NUMBER</b>	<b>DESCRIPTION</b>	<b>MATERIAL TYPE</b>	<b>ASBESTOS</b>	<b>LOCATION</b>
19	White Shiny Caulk	Miscellaneous	NO	Pipe Chase Throughout Bldg.
20	White Tile with Grey Specks and Mastic	Miscellaneous	NO	Restroom Hallway
21	Brown Linoleum Tile with Mastic	Miscellaneous	NO	Laundry Rooms
22	Grey Putty	TSI	NO	Hallway 2 Pipe Chase
23	Exterior Black Caulk	Miscellaneous	NO	Exterior
24	Exterior Beige Caulk	Miscellaneous	NO	Exterior
25	Exterior White Caulk	Miscellaneous	NO	Exterior
26	Exterior Clear Caulk	Miscellaneous	NO	Exterior
27	Exterior Clear Caulk	Miscellaneous	NO	Exterior
28 (100)	Roof Shingle, Tar, Insulation and Felt	Miscellaneous	NO	Roof
29 (101)	Pipe Flashing Cement	Surfacing	YES	Roof

**TAB 2**

**LABORATORY REPORTS AND CHAIN OF CUSTODY**

**EMSL Analytical, Inc.**

7330 S. Alton Way Building 12 Suite A, Centennial, CO 80112

Phone: (303) 740-5700 Fax: (303) 741-1400 Email: [denverlab@emsl.com](mailto:denverlab@emsl.com)

Attn: **Sheila Sealander**  
**Empirical Environmental**  
**18550 Ranch Hand Road**  
**Suite 103**  
**Peyton, CO 80831**

Customer ID: EMPR78  
Customer PO:  
Received: 11/29/10 11:00 AM  
EMSL Order: 221002286

Fax: (719) 749-0238 Phone: (719) 749-2068  
Project: **3010128 / 5214**

EMSL Proj:  
Analysis Date: 12/1/2010

### Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5214-01-01-Texture 221002286-0001	Drywall, Jnt Cmpd, Tape, Texture	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-01-01-Tape 221002286-0001A	Drywall, Jnt Cmpd, Tape, Texture	White Fibrous Homogeneous	90% Cellulose	10% Non-fibrous (other)	<b>None Detected</b>
5214-01-01-Joint Compound 221002286-0001B	Drywall, Jnt Cmpd, Tape, Texture	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-01-01-Drywall 221002286-0001C	Drywall, Jnt Cmpd, Tape, Texture	Brown/White Fibrous Heterogeneous	10% Cellulose	90% Non-fibrous (other)	<b>None Detected</b>
5214-01-02-Texture 221002286-0002	Drywall, Jnt Cmpd, Tape, Texture	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-01-02-Tape 221002286-0002A	Drywall, Jnt Cmpd, Tape, Texture	White Fibrous Homogeneous	90% Cellulose	10% Non-fibrous (other)	<b>None Detected</b>

Initial report from 12/02/2010 08:33:52

Analyst(s)

Erin Orthun (44)  
DeCavallas Michael (88)

  
Erin Orthun, Laboratory Manager  
or other approved signatory

EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST or any agency of the federal government. Non-friable organically bound materials present a problem matrix and therefore EMSL recommends gravimetric reduction prior to analysis. Samples received in good condition unless otherwise noted.

Samples analyzed by EMSL Analytical, Inc. 7330 S. Alton Way Building 12 Suite A, Centennial CO NVLAP Lab Code 200828-0

**EMSL Analytical, Inc.**

7330 S. Alton Way Building 12 Suite A, Centennial, CO 80112

Phone: (303) 740-5700 Fax: (303) 741-1400 Email: [denverlab@emsl.com](mailto:denverlab@emsl.com)

Attn: **Sheila Sealander**  
**Empirical Environmental**  
**18550 Ranch Hand Road**  
**Suite 103**  
**Peyton, CO 80831**

Customer ID: EMPR78  
Customer PO:  
Received: 11/29/10 11:00 AM  
EMSL Order: 221002286

Fax: (719) 749-0238 Phone: (719) 749-2068  
Project: **3010128 / 5214**

EMSL Proj:  
Analysis Date: 12/1/2010

### Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
5214-01-02-Joint Compound 221002286-0002B	Drywall, Jnt Cmpd, Tape, Texture	White Non-Fibrous  Homogeneous		100% Non-fibrous (other)	None Detected
5214-01-02-Drywall 221002286-0002C	Drywall, Jnt Cmpd, Tape, Texture	Brown/White Fibrous Heterogeneous	10% Cellulose	90% Non-fibrous (other)	None Detected
5214-01-03-Texture 221002286-0003	Drywall, Jnt Cmpd, Tape, Texture	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5214-01-03-Tape 221002286-0003A	Drywall, Jnt Cmpd, Tape, Texture	White Fibrous Homogeneous	90% Cellulose	10% Non-fibrous (other)	None Detected
5214-01-03-Joint Compound 221002286-0003B	Drywall, Jnt Cmpd, Tape, Texture	White Non-Fibrous  Homogeneous		100% Non-fibrous (other)	None Detected
5214-01-03-Drywall 221002286-0003C	Drywall, Jnt Cmpd, Tape, Texture	Brown/White Fibrous Heterogeneous	10% Cellulose	90% Non-fibrous (other)	None Detected

Initial report from 12/02/2010 08:33:52

Analyst(s)

Erin Orthun (44)  
DeCavallas Michael (88)

  
Erin Orthun, Laboratory Manager  
or other approved signatory

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Samples analyzed by EMSL Analytical, Inc. 7330 S. Alton Way Building 12 Suite A, Centennial CO NVLAP Lab Code 200828-0



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Customer ID: EMPR78  
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Project: **3010128 / 5214**

EMSL Proj:  
Analysis Date: 12/1/2010

### Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5214-01-04-Texture 221002286-0004	Drywall, Jnt Cmpd, Tape, Texture	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-01-04-Tape 221002286-0004A	Drywall, Jnt Cmpd, Tape, Texture	White Fibrous Homogeneous	90% Cellulose	10% Non-fibrous (other)	<b>None Detected</b>
5214-01-04-Joint Compound 221002286-0004B	Drywall, Jnt Cmpd, Tape, Texture	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-01-04-Drywall 221002286-0004C	Drywall, Jnt Cmpd, Tape, Texture	Brown/White Fibrous Heterogeneous	10% Cellulose	90% Non-fibrous (other)	<b>None Detected</b>
5214-01-05-Texture 221002286-0005	Drywall, Jnt Cmpd, Tape, Texture	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-01-05-Tape 221002286-0005A	Drywall, Jnt Cmpd, Tape, Texture	White Fibrous Homogeneous	90% Cellulose	10% Non-fibrous (other)	<b>None Detected</b>

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Analyst(s)

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### Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
5214-01-05-Joint Compound 221002286-0005B	Drywall, Jnt Cmpd, Tape, Texture	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5214-01-05-Drywall 221002286-0005C	Drywall, Jnt Cmpd, Tape, Texture	Brown/White Fibrous Heterogeneous	10% Cellulose	90% Non-fibrous (other)	None Detected
5214-01-06-Texture 221002286-0006	Drywall, Jnt Cmpd, Tape, Texture	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5214-01-06-Tape 221002286-0006A	Drywall, Jnt Cmpd, Tape, Texture	White Fibrous Homogeneous	90% Cellulose	10% Non-fibrous (other)	None Detected
5214-01-06-Joint Compound 221002286-0006B	Drywall, Jnt Cmpd, Tape, Texture	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5214-01-06-Drywall 221002286-0006C	Drywall, Jnt Cmpd, Tape, Texture	Brown/White Fibrous Heterogeneous	10% Cellulose	90% Non-fibrous (other)	None Detected

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### Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5214-01-07-Texture 221002286-0007	Drywall, Jnt Cmpd, Tape, Texture	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-01-07-Tape 221002286-0007A	Drywall, Jnt Cmpd, Tape, Texture	White Fibrous Homogeneous	90% Cellulose	10% Non-fibrous (other)	<b>None Detected</b>
5214-01-07-Joint Compound 221002286-0007B	Drywall, Jnt Cmpd, Tape, Texture	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-01-07-Drywall 221002286-0007C	Drywall, Jnt Cmpd, Tape, Texture	Brown/White Fibrous Heterogeneous	10% Cellulose	90% Non-fibrous (other)	<b>None Detected</b>
5214-02-08 221002286-0008	Dk Grey Grout	Gray Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-02-09 221002286-0009	Dk Grey Grout	Gray Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-02-10 221002286-0010	Dk Grey Grout	Gray Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>

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## Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	<u>Non-Asbestos</u>			<u>Asbestos</u>
			%	Fibrous	% Non-Fibrous	% Type
5214-03-11 221002286-0011	Drop Ceiling Tile	Tan/White Fibrous Heterogeneous	40%	Cellulose	10% Non-fibrous (other)	<b>None Detected</b>
			40%	Min. Wool	10% Perlite	
5214-03-12 221002286-0012	Drop Ceiling Tile	Tan/White Fibrous Heterogeneous	40%	Cellulose	10% Non-fibrous (other)	<b>None Detected</b>
			40%	Min. Wool	10% Perlite	
5214-03-13 221002286-0013	Drop Ceiling Tile	Tan/White Fibrous Heterogeneous	40%	Cellulose	10% Non-fibrous (other)	<b>None Detected</b>
			40%	Min. Wool	10% Perlite	
5214-04-14 221002286-0014	White Caulk (Glass Block Window)	White Non-Fibrous Homogeneous			100% Non-fibrous (other)	<b>None Detected</b>
5214-04-15 221002286-0015	White Caulk (Glass Block Window)	White Non-Fibrous Homogeneous			100% Non-fibrous (other)	<b>None Detected</b>
5214-04-16 221002286-0016	White Caulk (Glass Block Windows)	White Non-Fibrous Homogeneous			100% Non-fibrous (other)	<b>None Detected</b>
5214-05-17-Carpet 221002286-0017	Carpet W/Blue Specks	Blue Fibrous Heterogeneous	90%	Synthetic	10% Non-fibrous (other)	<b>None Detected</b>

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### Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5214-05-17-Mastic 221002286-0017A	Carpet W/Blue Specks	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-05-18-Carpet 221002286-0018	Carpet W/Blue Specks	Blue Fibrous Heterogeneous	90% Synthetic	10% Non-fibrous (other)	<b>None Detected</b>
5214-05-18-Mastic 221002286-0018A	Carpet W/Blue Specks	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-05-19-Carpet 221002286-0019	Carpet W/Blue Specks	Blue Non-Fibrous Heterogeneous	90% Synthetic	10% Non-fibrous (other)	<b>None Detected</b>
5214-05-19-Mastic 221002286-0019A	Carpet W/Blue Specks	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-06-20-Cove Base 221002286-0020	Black Cove Base W/Mastic	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-06-20-Mastic 221002286-0020A	Black Cove Base W/Mastic	Cream Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>

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### Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
5214-06-21-Cove Base 221002286-0021	Black Cove Base W/Mastic	Black Non-Fibrous  Homogeneous		100% Non-fibrous (other)	None Detected
5214-06-21-Mastic 221002286-0021A	Black Cove Base W/Mastic	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5214-06-22-Cove Base 221002286-0022	Black Cove Base W/Mastic	Black Non-Fibrous  Homogeneous		100% Non-fibrous (other)	None Detected
5214-06-22-Mastic 221002286-0022A	Black Cove Base W/Mastic	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5214-07-23 221002286-0023	Yellow Foam Insulation	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5214-07-24 221002286-0024	Yellow Foam Insulation	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected

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Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5214-07-25 221002286-0025	Yellow Foam Insulation	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-08-26 221002286-0026	White Pipe Putty	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-08-27 221002286-0027	White Pipe Putty	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-08-28 221002286-0028	White Pipe Putty	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-09-29 221002286-0029	Sink Insulation	Black Non-Fibrous Homogeneous	2% Cellulose	98% Non-fibrous (other)	<b>None Detected</b>
5214-09-30 221002286-0030	Sink Insulation	Black Non-Fibrous Homogeneous	2% Cellulose	98% Non-fibrous (other)	<b>None Detected</b>
5214-09-31 221002286-0031	Sink Insulation	Black Non-Fibrous Homogeneous	2% Cellulose	98% Non-fibrous (other)	<b>None Detected</b>

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Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5214-10-32 221002286-0032	Yellow Sink Putty	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-10-33 221002286-0033	Yellow Sink Putty	White/Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-10-34 221002286-0034	Yellow Sink Putty	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-11-35- Ceramic Tile 221002286-0035	White Ceramic Tile Mastic & Green Board	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-11-35-Mastic 221002286-0035A	White Ceramic Tile Mastic & Green Board	Tan Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-11-35-Fiber Board 221002286-0035B	White Ceramic Tile Mastic & Green Board	Brown/Green Fibrous Homogeneous	90% Cellulose	10% Non-fibrous (other)	<b>None Detected</b>

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Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5214-11-36-Ceramic Tile 221002286-0036	White Ceramic Tile Mastic & Green Board	White Non-Fibrous  Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-11-36-Mastic 221002286-0036A	White Ceramic Tile Mastic & Green Board	Tan Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-11-36-Fiber Board 221002286-0036B	White Ceramic Tile Mastic & Green Board	Brown/Green Fibrous  Homogeneous	90% Cellulose	10% Non-fibrous (other)	<b>None Detected</b>
5214-11-37-Ceramic Tile 221002286-0037	White Ceramic Tile Mastic & Green Board	White Non-Fibrous  Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-11-37-Mastic 221002286-0037A	White Ceramic Tile Mastic & Green Board	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-11-37-Fiber Board 221002286-0037B	White Ceramic Tile Mastic & Green Board	Brown/Green Fibrous  Homogeneous	90% Cellulose	10% Non-fibrous (other)	<b>None Detected</b>

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Customer ID: EMPR78  
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Received: 11/29/10 11:00 AM  
EMSL Order: 221002286

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Project: **3010128 / 5214**

EMSL Proj:  
Analysis Date: 12/1/2010


### Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5214-12-38 221002286-0038	Grey Grout (Under 2x2 Tile)	Gray Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-12-39 221002286-0039	Grey Grout (Under 2x2 Tile)	Gray Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-12-40 221002286-0040	Grey Grout (Under 2x2 Tile)	Gray Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-13-41-Wrap 221002286-0041	White Pipe Wrap Insulation	White Fibrous Homogeneous	20% Cellulose	80% Non-fibrous (other)	<b>None Detected</b>
5214-13-41-Insulation 221002286-0041A	White Pipe Wrap Insulation	Yellow Fibrous Homogeneous	90% Glass	10% Non-fibrous (other)	<b>None Detected</b>
5214-13-42-Wrap 221002286-0042	White Pipe Wrap Insulation	White Fibrous Homogeneous	20% Cellulose	80% Non-fibrous (other)	<b>None Detected</b>

Initial report from 12/02/2010 08:33:52

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Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5214-13-42-Insulation 221002286-0042A	White Pipe Wrap Insulation	Yellow Fibrous  Homogeneous	90% Glass	10% Non-fibrous (other)	<b>None Detected</b>
5214-13-43-Wrap 221002286-0043	White Pipe Wrap Insulation	White Fibrous Homogeneous	20% Cellulose	80% Non-fibrous (other)	<b>None Detected</b>
5214-13-43-Insulation 221002286-0043A	White Pipe Wrap Insulation	Yellow Fibrous  Homogeneous	20% Glass	80% Non-fibrous (other)	<b>None Detected</b>
5214-14-44-Floor Tile 221002286-0044	Black Tile W/Yellow Mastic	Black Non-Fibrous  Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-14-44-Mastic 221002286-0044A	Black Tile W/Yellow Mastic	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-14-45-Floor Tile 221002286-0045	Black Tile W/Yellow Mastic	Black Non-Fibrous  Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>

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### Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5214-14-45-Mastic 221002286-0045A	Black Tile W/Yellow Mastic	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-14-46-Floor Tile 221002286-0046	Black Tile W/Yellow Mastic	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-14-46-Mastic 221002286-0046A	Black Tile W/Yellow Mastic	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-15-47 221002286-0047	Black Caulk Window	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-15-48 221002286-0048	Black Caulk Window	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-15-49 221002286-0049	Black Caulk Window	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>

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### Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
5214-16-50-Floor Tile 221002286-0050	White Floor Tile	White Non-Fibrous  Homogeneous		100% Non-fibrous (other)	None Detected
5214-16-50-Mastic 221002286-0050A	White Floor Tile	Tan Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5214-16-51-Floor Tile 221002286-0051	White Floor Tile W/Mastic	White Non-Fibrous  Homogeneous		100% Non-fibrous (other)	None Detected
5214-16-51-Mastic 221002286-0051A	White Floor Tile W/Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5214-16-52-Floor Tile 221002286-0052	White Floor Tile W/Mastic	White Non-Fibrous  Homogeneous		100% Non-fibrous (other)	None Detected
5214-16-52-Mastic 221002286-0052A	White Floor Tile W/Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected

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## Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5214-17-53 221002286-0053	Silver HVAC Wrap	White/Silver Fibrous Heterogeneous	50% Cellulose 10% Glass	40% Non-fibrous (other)	<b>None Detected</b>
5214-17-54 221002286-0054	Silver HVAC Wrap	White/Silver Fibrous Heterogeneous	50% Cellulose 10% Glass	40% Non-fibrous (other)	<b>None Detected</b>
5214-17-55 221002286-0055	Silver HVAC Wrap	White/Silver Fibrous Heterogeneous	50% Cellulose 10% Glass	40% Non-fibrous (other)	<b>None Detected</b>
5214-18-56 221002286-0056	White Pipe Putty Soft	White Non-Fibrous Homogeneous	5% Fibrous (other)	95% Non-fibrous (other)	<b>None Detected</b>
5214-18-57 221002286-0057	White Pipe Putty Soft	White Non-Fibrous Homogeneous	5% Fibrous (other)	95% Non-fibrous (other)	<b>None Detected</b>
5214-18-58 221002286-0058	White Pipe Putty Soft	White Fibrous Heterogeneous	5% Fibrous (other)	95% Non-fibrous (other)	<b>None Detected</b>
5214-19-59 221002286-0059	White Shiny Caulk	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>

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### Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5214-19-60 221002286-0060	White Shiny Caulk	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-19-61 221002286-0061	White Shiny Caulk	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-20-62-Floor Tile 221002286-0062	Wh. Floor Tile W/Grey Specks Yellow Mastic	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-20-62-Mastic 221002286-0062A	Wh. Floor Tile W/Grey Specks Yellow Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-20-63-Floor Tile 221002286-0063	Wh. Floor Tile W/Grey Specks Yellow Mastic	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-20-63-Mastic 221002286-0063A	Wh. Floor Tile W/Grey Specks Yellow Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>

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## Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5214-20-64-Floor Tile 221002286-0064	Wh. Floor Tile W/Grey Specks Yellow Mastic	White Non-Fibrous  Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-20-64-Mastic 221002286-0064A	Wh. Floor Tile W/Grey Specks Yellow Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-21-65 221002286-0065	Brown Linoleum Tile W/Mastic	Brown Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
			No mastic present		
5214-21-66-Floor Tile 221002286-0066	Brown Linoleum Tile W/Mastic	Brown Non-Fibrous  Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-21-66-Mastic 221002286-0066A	Brown Linoleum Tile W/Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-21-67-Floor Tile 221002286-0067	Brown Linoleum Tile W/Mastic	Brown Non-Fibrous  Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>

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## Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5214-21-67-Mastic 221002286-0067A	Brown Linoleum Tile W/Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-22-68 221002286-0068	Grey Putty	Gray Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-22-69 221002286-0069	Grey Putty	Gray Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-22-70 221002286-0070	Grey Putty	Gray Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-23-71 221002286-0071	Exterior Black Caulk	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-23-72 221002286-0072	Exterior Black Caulk	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-23-73 221002286-0073	Exterior Black Caulk	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>

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Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5214-24-74 221002286-0074	Exterior Beige Caulk	Beige Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-24-75 221002286-0075	Exterior Beige Caulk	Beige Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-24-76 221002286-0076	Exterior Beige Caulk	Beige Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-25-77 221002286-0077	Exterior White Caulk	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-25-78 221002286-0078	Exterior White Caulk	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-25-79 221002286-0079	Exterior White Caulk	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-26-80 221002286-0080	Exterior Clear Caulk	Clear Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>

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Attn: **Sheila Sealander**  
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Customer ID: EMPR78  
Customer PO:  
Received: 11/29/10 11:00 AM  
EMSL Order: 221002286

Fax: (719) 749-0238 Phone: (719) 749-2068  
Project: **3010128 / 5214**

EMSL Proj:  
Analysis Date: 12/1/2010

### Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5214-26-81 221002286-0081	Exterior Clear Caulk	Clear Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-26-82 221002286-0082	Exterior Clear Caulk	Clear Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-27-83 221002286-0083	Exterior Pipe Tape	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-27-84 221002286-0084	Exterior Pipe Tape	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-27-85 221002286-0085	Exterior Pipe Tape	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>

Initial report from 12/02/2010 08:33:52

Analyst(s)

Erin Orthun (44)  
DeCavallas Michael (88)

  
Erin Orthun, Laboratory Manager  
or other approved signatory

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Samples analyzed by EMSL Analytical, Inc. 7330 S. Alton Way Building 12 Suite A, Centennial CO NVLAP Lab Code 200828-0

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Fax: (719) 749-0238 Phone: (719) 749-2068  
Project: **3010128**

EMSL Proj:  
Analysis Date: 12/7/2010

### Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5210-100-01-Roofing 221002320-0001	Bldg 5210, Roof Shingle, Tar, Insulation, Felt	Black Fibrous Heterogeneous	30% Glass 10% Cellulose	60% Non-fibrous (other)	None Detected
5210-100-01-Foam 221002320-0001A	Bldg 5210, Roof Shingle, Tar, Insulation, Felt	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5210-100-01-Insulation 221002320-0001B	Bldg 5210, Roof Shingle, Tar, Insulation, Felt	Brown Fibrous Homogeneous	85% Cellulose	15% Non-fibrous (other)	None Detected
5210-100-01-Tar Paper 221002320-0001C	Bldg 5210, Roof Shingle, Tar, Insulation, Felt	Black Fibrous Homogeneous	75% Cellulose	25% Non-fibrous (other)	None Detected
5210-100-01-Tar 221002320-0001D	Bldg 5210, Roof Shingle, Tar, Insulation, Felt	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5210-100-02-Roofing 221002320-0002	Bldg 5210, Roof Shingle, Tar, Insulation, Felt	Black Fibrous Heterogeneous	30% Glass 10% Cellulose	60% Non-fibrous (other)	None Detected

Initial report from 12/07/2010 15:19:46

Analyst(s)

DeCavallas Michael (50)

Erin Orthun, Laboratory Manager  
or other approved signatory

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Project: **3010128**

EMSL Proj:  
Analysis Date: 12/7/2010

### Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
5210-100-02-Foam 221002320-0002A	Bldg 5210, Roof Shingle, Tar, Insulation, Felt	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5210-100-02-Insulation 221002320-0002B	Bldg 5210, Roof Shingle, Tar, Insulation, Felt	Brown Fibrous Homogeneous	85% Cellulose	15% Non-fibrous (other)	None Detected
5210-100-02-Tar Paper 221002320-0002C	Bldg 5210, Roof Shingle, Tar, Insulation, Felt	Black Fibrous Homogeneous	75% Cellulose	25% Non-fibrous (other)	None Detected
5210-100-02-Tar 221002320-0002D	Bldg 5210, Roof Shingle, Tar, Insulation, Felt	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5210-100-03-Shingle 221002320-0003	Bldg 5210, Roof Shingle, Flashing, Tar & Curbing	White/Black Fibrous Heterogeneous	20% Glass	80% Non-fibrous (other)	None Detected
Unable to distinguish curbing and flashing					
5210-100-03-Tar Felt 221002320-0003A	Bldg 5210, Roof Shingle, Flashing, Tar & Curbing	Black Fibrous Heterogeneous	35% Glass	65% Non-fibrous (other)	None Detected

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Project: **3010128**

EMSL Proj:  
Analysis Date: 12/7/2010

### Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5210-100-03-Tar 221002320-0003B	Bldg 5210, Roof Shingle, Flashing, Tar & Curbing	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-100-04-Roofing 221002320-0004	Bldg 5212, Roof Shingle, Tar, Insulation, Felt	Black Fibrous  Heterogeneous	30% Glass 10% Cellulose	60% Non-fibrous (other)	<b>None Detected</b>
5212-100-04-Foam 221002320-0004A	Bldg 5212, Roof Shingle, Tar, Insulation, Felt	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5212-100-04-Insulation 221002320-0004B	Bldg 5212, Roof Shingle, Tar, Insulation, Felt	Brown Fibrous  Homogeneous	85% Cellulose	15% Non-fibrous (other)	<b>None Detected</b>
5212-100-04-Tar Paper 221002320-0004C	Bldg 5212, Roof Shingle, Tar, Insulation, Felt	Black Fibrous  Heterogeneous	75% Cellulose	25% Non-fibrous (other)	<b>None Detected</b>
5212-100-04-Tar 221002320-0004D	Bldg 5212, Roof Shingle, Tar, Insulation, Felt	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>

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Analyst(s)

DeCavallas Michael (50)

  
Erin Orthun, Laboratory Manager  
or other approved signatory

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Project: **3010128**

EMSL Proj:  
Analysis Date: 12/7/2010

### Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
5212-100-05-Roofing 221002320-0005	Bldg 5212, Roof Shingle, Tar, Insulation, Felt	White/Black Fibrous Heterogeneous	30% Cellulose 10% Glass	60% Non-fibrous (other)	None Detected
5212-100-05-Foam 221002320-0005A	Bldg 5212, Roof Shingle, Tar, Insulation, Felt	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5212-100-05-Insulation 221002320-0005B	Bldg 5212, Roof Shingle, Tar, Insulation, Felt	Brown Fibrous Homogeneous	85% Cellulose	15% Non-fibrous (other)	None Detected
5212-100-05-Tar Paper 221002320-0005C	Bldg 5212, Roof Shingle, Tar, Insulation, Felt	Black Fibrous Homogeneous	75% Cellulose	25% Non-fibrous (other)	None Detected
5212-100-05-Tar 221002320-0005D	Bldg 5212, Roof Shingle, Tar, Insulation, Felt	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5212-100-06-Shingle 221002320-0006	Bldg 5212, Roof Shingle, Flashing & Curbing	White/Black Fibrous Heterogeneous	20% Glass	80% Non-fibrous (other)	None Detected
Unable to distinguish curbing and flashing					

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EMSL Proj:  
Analysis Date: 12/7/2010

### Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
5212-100-06-Tar Felt 221002320-0006A	Bldg 5212, Roof Shingle, Flashing & Curbing	Black Fibrous Homogeneous	35% Glass	65% Non-fibrous (other)	None Detected
5212-100-06-Tar 221002320-0006B	Bldg 5212, Roof Shingle, Flashing & Curbing	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5214-100-07-Roofing 221002320-0007	Bldg 5214, Roof Shingle, Tar, Insulation, Felt	White/Black Fibrous Heterogeneous	35% Cellulose 10% Glass	55% Non-fibrous (other)	None Detected
5214-100-07-Foam 221002320-0007A	Bldg 5214, Roof Shingle, Tar, Insulation, Felt	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5214-100-07-Insulation 221002320-0007B	Bldg 5214, Roof Shingle, Tar, Insulation, Felt	Brown Fibrous Homogeneous	85% Cellulose	15% Non-fibrous (other)	None Detected
5214-100-07-Tar Paper 221002320-0007C	Bldg 5214, Roof Shingle, Tar, Insulation, Felt	Black Fibrous Homogeneous	35% Glass	65% Non-fibrous (other)	None Detected

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 Analysis Date: 12/7/2010

## Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5214-100-07-Tar 221002320-0007D	Bldg 5214, Roof Shingle, Tar, Insulation, Felt	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-100-08-Roofing 221002320-0008	Bldg 5214, Roof Shingle, Tar, Insulation, Felt	White/Black Fibrous Heterogeneous	35% Cellulose 10% Glass	55% Non-fibrous (other)	<b>None Detected</b>
5214-100-08-Foam 221002320-0008A	Bldg 5214, Roof Shingle, Tar, Insulation, Felt	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-100-08-Insulation 221002320-0008B	Bldg 5214, Roof Shingle, Tar, Insulation, Felt	Brown Fibrous Homogeneous	85% Cellulose	15% Non-fibrous (other)	<b>None Detected</b>
5214-100-08-Tar Paper 221002320-0008C	Bldg 5214, Roof Shingle, Tar, Insulation, Felt	Black Fibrous Homogeneous	75% Cellulose	25% Non-fibrous (other)	<b>None Detected</b>
5214-100-08-Tar 221002320-0008D	Bldg 5214, Roof Shingle, Tar, Insulation, Felt	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>

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Project: **3010128**

EMSL Proj:  
Analysis Date: 12/7/2010

### Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5214-100-09-Roofing 221002320-0009	Bldg 5214, Roof Shingle, Tar, Insulation, Felt	White/Black Fibrous  Heterogeneous	35% Cellulose 10% Glass	55% Non-fibrous (other)	None Detected
5214-100-09-Foam 221002320-0009A	Bldg 5214, Roof Shingle, Tar, Insulation, Felt	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5214-100-09-Insulation 221002320-0009B	Bldg 5214, Roof Shingle, Tar, Insulation, Felt	Brown Fibrous  Homogeneous	85% Cellulose	15% Non-fibrous (other)	None Detected
5214-100-09-Tar Paper 221002320-0009C	Bldg 5214, Roof Shingle, Tar, Insulation, Felt	Black Fibrous  Heterogeneous	75% Cellulose	25% Non-fibrous (other)	None Detected
5214-100-09-Tar 221002320-0009D	Bldg 5214, Roof Shingle, Tar, Insulation, Felt	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
5210-101-10 221002320-0010	Bldg 5210, Pipe Flashing Cement	Black Non-Fibrous Homogeneous	10% Cellulose	90% Non-fibrous (other)	None Detected

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## Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5210-101-11 221002320-0011	Bldg 5210, Pipe Flashing Cement	Black Non-Fibrous Homogeneous	10% Cellulose	90% Non-fibrous (other)	<b>None Detected</b>
5210-101-12 221002320-0012	Bldg 5210, Pipe Flashing Cement	Black Non-Fibrous Homogeneous	10% Cellulose	90% Non-fibrous (other)	<b>None Detected</b>
5212-101-13 221002320-0013	Bldg 5212, Pipe Flashing Cement	Black Non-Fibrous Homogeneous	10% Cellulose	90% Non-fibrous (other)	<b>None Detected</b>
5212-101-14 221002320-0014	Bldg 5212, Pipe Flashing Cement	Black Non-Fibrous Homogeneous	10% Cellulose	90% Non-fibrous (other)	<b>None Detected</b>
5212-101-15 221002320-0015	Bldg 5212, Pipe Flashing Cement	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	<b>None Detected</b>
5214-101-16 221002320-0016	Bldg 5214, Pipe Flashing Cement	Black Non-Fibrous Homogeneous		96% Non-fibrous (other)	<b>4% Chrysotile</b>
5214-101-17 221002320-0017	Bldg 5214, Pipe Flashing Cement	Black Non-Fibrous Homogeneous		96% Non-fibrous (other)	<b>4% Chrysotile</b>

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DeCavallas Michael (50)

  
 Erin Orthun, Laboratory Manager  
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Customer PO:  
Received: 12/03/10 9:05 AM  
EMSL Order: 221002320

Fax: (719) 749-0238 Phone: (719) 749-2068  
Project: **3010128**

EMSL Proj:  
Analysis Date: 12/7/2010

### Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
5214-101-18 221002320-0018	Bldg 5214, Pipe Flashing Cement	Black Non-Fibrous Homogeneous		96% Non-fibrous (other)	4% Chrysotile

Initial report from 12/07/2010 15:19:46

Analyst(s)

DeCavallas Michael (50)

Erin Orthun, Laboratory Manager  
or other approved signatory

EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST or any agency of the federal government. Non-friable organically bound materials present a problem matrix and therefore EMSL recommends gravimetric reduction prior to analysis. Samples received in good condition unless otherwise noted.

Samples analyzed by EMSL Analytical, Inc. 7330 S. Alton Way Building 12 Suite A, Centennial CO NVLAP Lab Code 200828-0



# Asbestos Lab Services Chain of Custody

EMSL Order Number (Lab Use Only):

221002286

Denver, CO  
Building 12 Suite A  
7330 S. Alton Way  
Centennial, CO 80112  
PHONE: (303) 740-5700  
FAX: (303) 741-1400

Company: Empirical Environmental, LLC		EMSL-Bill to: <input checked="" type="checkbox"/> Same <input type="checkbox"/> Different If Bill to is Different note instructions in Comments**	
Street: 18550 Ranch Hand Rd., Suite 103		Third Party Billing requires written authorization from third party	
City/State/Zip: Peyton, CO 80831			
Report To (Name): Sheila Sealander		Fax: 719-749-0238	
Telephone: 719-749-2068		Email Address: sheila.sealander@empiricalenv.com	
Project Name/Number: 3010128 5214			
Please Provide Results: Email		Purchase Order: State Samples Taken: CO	
Turnaround Time (TAT) Options* - Please Check			
<input type="checkbox"/> 3 Hour <input type="checkbox"/> 5 Hour <input type="checkbox"/> 24 Hour <input type="checkbox"/> 48 Hour <input checked="" type="checkbox"/> 72 Hour <input type="checkbox"/> 96 Hour <input type="checkbox"/> 1 Week <input type="checkbox"/> 2 Week			
*For TEM Air 3 hours/6 hours, please call ahead to schedule. There is a premium charge for 3 Hour TEM AHERA or EPA Level II TAT. You will be asked to sign an authorization form for this service. Analysis completed in accordance with EMSL's Terms and Conditions located in the Analytical Price Guide.			
<b>PCM - Air</b> <input type="checkbox"/> NIOSH 7400 <input type="checkbox"/> w/ OSHA 8hr. TWA <b>PLM - Bulk (reporting limit)</b> <input type="checkbox"/> PLM EPA 600/R-93/116 (<1%) <input type="checkbox"/> PLM EPA NOB (<1%) Point Count <input type="checkbox"/> 400 (<0.25%) <input type="checkbox"/> 1000 (<0.1%) Point Count w/Gravimetric <input type="checkbox"/> 400 (<0.25%) <input type="checkbox"/> 1000 (<0.1%) <input type="checkbox"/> NYS 198.1 (friable in NY) <input type="checkbox"/> NYS 198.6 NOB (non-friable-NY) <input type="checkbox"/> NIOSH 9002 (<1%)		<b>TEM - Air</b> <input type="checkbox"/> 4-4.5hr TAT (AHERA only) <input type="checkbox"/> AHERA 40 CFR, Part 763 <input type="checkbox"/> NIOSH 7402 <input type="checkbox"/> EPA Level II <input type="checkbox"/> ISO 10312 <b>TEM - Bulk</b> <input type="checkbox"/> TEM EPA NOB <input type="checkbox"/> NYS NOB 198.4 (non-friable-NY) <input type="checkbox"/> Chatfield SOP <input type="checkbox"/> TEM Mass Analysis-EPA 600 sec. 2.5 <b>TEM - Water:</b> EPA 100.2 Fibers >10µm <input type="checkbox"/> Waste <input type="checkbox"/> Drinking All Fiber Sizes <input type="checkbox"/> Waste <input type="checkbox"/> Drinking	
<input type="checkbox"/> Microvac - ASTM D 5755 <input type="checkbox"/> Wipe - ASTM D6480 <input type="checkbox"/> Carpet Sonication (EPA 600/J-93/167)		<b>Soil/Rock/Vermiculite</b> <input type="checkbox"/> PLM CARB 435 - A (0.25% sensitivity) <input type="checkbox"/> PLM CARB 435 - B (0.1% sensitivity) <input type="checkbox"/> TEM CARB 435 - B (0.1% sensitivity) <input type="checkbox"/> TEM CARB 435 - C (0.01% sensitivity) <input type="checkbox"/> EPA Protocol (Semi-Quantitative) <input type="checkbox"/> EPA Protocol (Quantitative)	
<input type="checkbox"/> Other:			
<input type="checkbox"/> Check For Positive Stop - Clearly Identify Homogenous Group			
Samplers Name: Fay L. Ward		Samplers Signature: Fay L. Ward	
Sample #	Sample Description	Volume/Area (Air) HA # (Bulk)	Date/Time Sampled
5214-01-01	DRY WALL JNT CMPD. TAPE, TEXTURE	1st FLOOR RM	11-27-10
5214-01-02	DRY WALL JNT. CMPD. TAPE & TEXTURE	1st FLOOR RM	"
5214-01-03	DRY WALL JNT CMPD. TAPE & TEXTURE	1st FLOOR RM	"
5214-01-04	DRY WALL JNT CMPD. TAPE & TEXTURE	2nd FLOOR RM	"
5214-01-05	DRY WALL JNT CMPD. TAPE & TEXTURE	2nd FLOOR RM	"
5214-01-06	DRY WALL JNT CMPD. TAPE & TEXTURE	2nd FLOOR RM	"
5214-01-07	DRY WALL JNT CMPD. TAPE & TEXTURE	2nd FLOOR RM	"
5214-02-08	DRY GYREY GROUT	1st FLOOR	"
Client Sample # (s): 5214-01-01 - 5214-27-85		Total # of Samples: 85	
Relinquished (Client): Fay L. Ward		Date: 11-29-10 Time:	
Received (Lab): Mollwaller		Date: 11/29/10 Time: 11Am	
Comments/Special Instructions: walkin			



## Chain of Custody

### Asbestos Lab Services

EMSL Analytical, Inc.  
Building 12 Suite A  
7330 S. Alton Way  
Centennial, CO 80112  
Phone: (303) 740-5700  
Fax: (303) 741-1400  
<http://www.emsl.com>

Please print all information legibly.

Client Sample # (s) 5214-02-09 - 5214-06-22

Total Samples #: \_\_\_\_\_

Relinquished: \_\_\_\_\_ Date: \_\_\_\_\_

Time: \_\_\_\_\_

Received: \_\_\_\_\_ Date: \_\_\_\_\_

Time: \_\_\_\_\_

Relinquished: \_\_\_\_\_ Date: \_\_\_\_\_

Time: \_\_\_\_\_

Received: \_\_\_\_\_ Date: \_\_\_\_\_

Time: \_\_\_\_\_

SAMPLE NUMBER	SAMPLE DESCRIPTION/LOCATION	VOLUME (if applicable)
5214-02-09	DK GREEN GROUT	2ND LANDING
5214-02-10	DK GREEN GROUT	2ND LANDING
5214-03-11	DROP CEILING TILE	#1ST DAY ROOM
5214-03-12	DROP CEILING TILE	2ND DAY ROOM
5214-03-13	DROP CEILING TILE	3RD LAUNDRY
5214-04-14	WHITE CAULK (GLASS BLOCK WINDOW)	1ST DAY ROOM
5214-04-15	WHITE CAULK (GLASS BLOCK WINDOW)	2ND DAY ROOM
5214-04-16	WHITE CAULK (GLASS BLOCK WINDOWS)	3RD STORAGE ROOM
5214-05-17	CARPET w/ BLUE SPECKS	1ST DAY ROOM
5214-05-18	CARPET w/ BLUE SPECKS	2ND RM #202
5214-05-19	CARPET w/ BLUE SPECKS	3RD RM #
5214-06-20	BLACK COVE BASE w/ MASTIC	1ST DAY ROOM
5214-06-21	BLACK COVE BASE w/ MASTIC	2ND SELECT. ROOM
5214-06-22	BLACK COVE BASE w/ MASTIC	3RD LAUNDRY





## Chain of Custody

### Asbestos Lab Services

EMSL Analytical, Inc.  
 Building 12 Suite A  
 7330 S. Alton Way  
 Centennial, CO 80112  
 Phone: (303) 740-5700  
 Fax: (303) 741-1400  
<http://www.emsl.com>

Please print all information legibly.

Client Sample # (s) 5214-07-23 - 5214-11-36

Total Samples 14

Relinquished: \_\_\_\_\_ Date: \_\_\_\_\_

Time: \_\_\_\_\_

Received: \_\_\_\_\_ Date: \_\_\_\_\_

Time: \_\_\_\_\_

Relinquished: \_\_\_\_\_ Date: \_\_\_\_\_

Time: \_\_\_\_\_

Received: \_\_\_\_\_ Date: \_\_\_\_\_

Time: \_\_\_\_\_

SAMPLE NUMBER	SAMPLE DESCRIPTION/LOCATION	VOLUME (if applicable)
5214-07-23	YELLOW FOAM INSULATION	1 <sup>st</sup> ELECT ROOM
5214-07-24	YELLOW FOAM INSULATION	1 <sup>st</sup> ELECT ROOM
5214-07-25	YELLOW FOAM INSULATION	1 <sup>st</sup> ELECT ROOM
5214-08-26	WHITE PIPE PUTTY	1 <sup>st</sup> ELECT ROOM
5214-08-27	WHITE PIPE PUTTY	2 <sup>ND</sup> PIPE CHASE
5214-08-28	WHITE PIPE PUTTY	3 <sup>RD</sup> MEN'S RESTROOM
5214-09-29	SINK INSULATION	1 <sup>st</sup> WOMEN'S RESTROOM
5214-09-30	SINK INSULATION	2 <sup>ND</sup> MEN'S RESTROOM
5214-09-31	SINK INSULATION	3 <sup>RD</sup> MEN'S RESTROOM
5214-10-32	YELLOW SINK PUTTY	1 <sup>st</sup> WOMEN'S RESTROOM
5214-10-33	YELLOW SINK PUTTY	2 <sup>ND</sup> MEN'S RESTROOM
5214-10-34	YELLOW SINK PUTTY	3 <sup>RD</sup> MEN'S RESTROOM
5214-11-35	WHITE CERAMIC TILE MASTIC <sup>GREEN BOARD</sup>	1 <sup>st</sup> WOMEN'S RESTROOM
5214-11-36	WHITE CERAMIC TILE MASTIC <sup>GREEN BOARD</sup>	2 <sup>ND</sup> MEN'S RESTROOM

GREEN  
BOARD



## Chain of Custody

### Asbestos Lab Services

EMSL Analytical, Inc.  
 Building 12 Suite A  
 7330 S. Alton Way  
 Centennial, CO 80112  
 Phone: (303) 740-5700  
 Fax: (303) 741-1400  
<http://www.emsl.com>

Please print all information legibly.

Client Sample # (s) 5214-11-37 - 5214-16-50

Total Samples #: \_\_\_\_\_

Relinquished: Gay Ward Date: \_\_\_\_\_

Time: \_\_\_\_\_

Received: \_\_\_\_\_ Date: \_\_\_\_\_

Time: \_\_\_\_\_

Relinquished: \_\_\_\_\_ Date: \_\_\_\_\_

Time: \_\_\_\_\_

Received: \_\_\_\_\_ Date: \_\_\_\_\_

Time: \_\_\_\_\_

SAMPLE NUMBER	SAMPLE DESCRIPTION/LOCATION	VOLUME (if applicable)
5214-11-37	WH CERAMIC TILE MASTIC & GREENBOARD	3rd MENS RESTROOM
5214-12-38	GREEN GROUT (UNDER 2x2 TILE)	1st WOMENS RESTROOM
5214-12-39	GREEN GROUT (UNDER 2x2 TILE)	2nd MENS RESTROOM
5214-12-40	GREEN GROUT (UNDER 2x2 TILE)	3rd MENS RESTROOM
5214-13-41	WHITE PIPE WRAP INSULATION	1st PIPE CHASE WOMENS RESTROOM
5214-13-42	WHITE PIPE WRAP INSULATION	2nd PIPE CHASE
5214-13-43	WHITE PIPE WRAP INSULATION	3rd PIPE CHASE
5214-14-44	BLACK TILE w/ <sup>YELLOW</sup> MASTIC	1st BROOM CLOSET Rm# 123
5214-14-45	BLACK TILE w/ <sup>YELLOW</sup> MASTIC	2nd BROOM CLOSET Rm# 223
5214-14-46	BLACK TILE w/ <sup>YELLOW</sup> MASTIC	2nd BROOM CLOSET
5214-15-47	BLACK CAULK WINDOW	1st FOYER WINDOW
5214-15-48	BLACK CAULK WINDOW	2nd Rm# 202
5214-15-49	BLACK CAULK WINDOW	3rd LANDING
5214-16-50	WHITE FLOOR TILE	1st BACK ENTRY





## Chain of Custody

### Asbestos Lab Services

EMSL Analytical, Inc.  
 Building 12 Suite A  
 7330 S. Alton Way  
 Centennial, CO 80112  
 Phone: (303) 740-5700  
 Fax: (303) 741-1400  
<http://www.emsl.com>

Please print all information legibly.

Client Sample # (s) 5214-16-51 - 5214-20-64

Total Samples #: \_\_\_\_\_

Relinquished: \_\_\_\_\_ Date: \_\_\_\_\_

Time: \_\_\_\_\_

Received: \_\_\_\_\_ Date: \_\_\_\_\_

Time: \_\_\_\_\_

Relinquished: \_\_\_\_\_ Date: \_\_\_\_\_

Time: \_\_\_\_\_

Received: \_\_\_\_\_ Date: \_\_\_\_\_

Time: \_\_\_\_\_

SAMPLE NUMBER	SAMPLE DESCRIPTION/LOCATION	VOLUME (if applicable)
5214-16-51	WHITE FLOOR TILE w/ MASTIC	2 <sup>nd</sup> HALLWAY
5214-16-52	WHITE FLOOR TILE w/ MASTIC	3 <sup>rd</sup> STORAGE
5214-17-53	SILVER HVAC WRAP	1 <sup>st</sup> MECH ROOM
5214-17-54	SILVER HVAC WRAP	2 <sup>nd</sup> PIPE CHASE (RESTROOM)
5214-17-55	SILVER HVAC WRAP	3 <sup>rd</sup> PIPE CHASE (RESTROOM)
5214-18-56	WHITE PIPE DUTTY SET	1 <sup>st</sup> MECH ROOM
5214-18-57	WHITE PIPE DUTTY SET	2 <sup>nd</sup> DAY ROOM
5214-18-58	WHITE PIPE DUTTY SET	1 <sup>st</sup> MECH ROOM
5214-19-59	WHITE SHINY CHALK	2 <sup>nd</sup> PIPE CHASE
5214-19-60	WHITE SHINY CHALK	2 <sup>nd</sup> PIPE CHASE
5214-19-61	WHITE SHINY CHALK	2 <sup>nd</sup> PIPE CHASE
5214-20-62	WH. FLOOR TILE w/ GREY SPECKS	2 <sup>nd</sup> HALLWAY
5214-20-63	WH. FLOOR TILE w/ GREY SPECKS	2 <sup>nd</sup> HALLWAY
5214-20-64	WH. FLOOR TILE w/ GREY SPECKS	2 <sup>nd</sup> HALLWAY



## Chain of Custody

### Asbestos Lab Services

EMSL Analytical, Inc.  
 Building 12 Suite A  
 7330 S. Alton Way  
 Centennial, CO 80112  
 Phone: (303) 740-5700  
 Fax: (303) 741-1400  
<http://www.emsl.com>

Please print all information legibly.

Client Sample # (s) 5214-21-65 - 5214-25-78

Total Samples #: \_\_\_\_\_

Relinquished: \_\_\_\_\_ Date: \_\_\_\_\_

Time: \_\_\_\_\_

Received: \_\_\_\_\_ Date: \_\_\_\_\_

Time: \_\_\_\_\_

Relinquished: \_\_\_\_\_ Date: \_\_\_\_\_

Time: \_\_\_\_\_

Received: \_\_\_\_\_ Date: \_\_\_\_\_

Time: \_\_\_\_\_

SAMPLE NUMBER	SAMPLE DESCRIPTION/LOCATION	VOLUME (if applicable)
5214-21-65	BROWN LINOLEUM TILE w/MASTIC	3RD LAUNDRY
5214-21-66	BROWN LINOLEUM TILE w/MASTIC	3RD LAUNDRY
5214-21-67	BROWN LINOLEUM TILE w/MASTIC	3RD LAUNDRY
5214-22-68	GREY PUTTY	3RD PIPE CHASE
5214-22-69	GREY PUTTY	3RD PIPE CHASE
5214-22-70	GREY PUTTY	3RD PIPE CHASE
5214-23-71	EXTERIOR BLACK CAULK	SW CORNER
5214-23-72	EXTERIOR BLACK CAULK	SW CORNER
5214-23-73	EXTERIOR BLACK CAULK	SE CORNER
5214-24-74	EXTERIOR WHITE CAULK	SW CORNER
5214-24-75	EXTERIOR WHITE CAULK	SW CORNER
5214-24-76	EXTERIOR WHITE CAULK	SE CORNER
5214-25-77	EXTERIOR WHITE CAULK	SW CORNER
5214-25-78	EXTERIOR WHITE CAULK	SW CORNER



## Chain of Custody

### Asbestos Lab Services

EMSL Analytical, Inc.  
 Building 12 Suite A  
 7330 S. Alton Way  
 Centennial, CO 80112  
 Phone: (303) 740-5700  
 Fax: (303) 741-1400  
<http://www.emsl.com>

Please print all information legibly.

Client Sample # (s) 5214-25-79 - 5214-27-85

Total Samples #: \_\_\_\_\_

Relinquished: \_\_\_\_\_ Date: \_\_\_\_\_

Time: \_\_\_\_\_

Received: \_\_\_\_\_ Date: \_\_\_\_\_

Time: \_\_\_\_\_

Relinquished: \_\_\_\_\_ Date: \_\_\_\_\_

Time: \_\_\_\_\_

Received: \_\_\_\_\_ Date: \_\_\_\_\_

Time: \_\_\_\_\_

SAMPLE NUMBER	SAMPLE DESCRIPTION/LOCATION	VOLUME (if applicable)
5214-25-79	EXTERIOR WHITE CAULK	NE CORNER
5214-26-80	EXTERIOR CLEAR CAULK	N.E. CORNER
5214-26-81	EXTERIOR CLEAR CAULK	NORTH SIDE
5214-26-82	EXTERIOR CLEAR CAULK	SW CORNER
5214-27-83	EXTERIOR PIPE TAPE	EAST SIDE
5214-27-84	EXTERIOR PIPE TAPE	EAST SIDE
5214-27-85	EXTERIOR PIPE TAPE	NORTH SIDE



EMSL ANALYTICAL, INC.  
A HANOVER COMPANY

# Asbestos Lab Services Chain of Custody

EMSL Order Number (Lab Use Only):

221002319

Denver, CO  
Building 12 Suite A  
7330 S. Alton Way  
Centennial, CO 80112  
PHONE: (303) 740-5700  
FAX: (303) 741-1400

Company: Empirical Environmental, LLC		EMSL-Bill to: <input checked="" type="checkbox"/> Same <input type="checkbox"/> Different If Bill to is Different note instructions in Comments** Third Party Billing requires written authorization from third party	
Street: 18550 Ranch Hand Rd., Suite 103			
City/State/Zip: Peyton, CO 80831			
Report To (Name): Sheila Sealander		Fax: 719-749-0238	
Telephone: 719-749-2068		Email Address: sheila.sealander@empiricalenv.com	
Project Name/Number: 3010120			
Please Provide Results: Email		Purchase Order:	
		State Samples Taken: CO	
Turnaround Time (TAT) Options* - Please Check			
<input type="checkbox"/> 3 Hour <input type="checkbox"/> 6 Hour <input type="checkbox"/> 24 Hour <input type="checkbox"/> 48 Hour <input checked="" type="checkbox"/> 72 Hour <input type="checkbox"/> 96 Hour <input type="checkbox"/> 1 Week <input type="checkbox"/> 2 Week			
*For TEM Air 3 hours/6 hours, please call ahead to schedule. There is a premium charge for 3 Hour TEM AHERA or EPA Level II TAT. You will be asked to sign an authorization form for this service. Analysis completed in accordance with EMSL's Terms and Conditions located in the Analytical Price Guide.			
<b>PCM - Air</b> <input type="checkbox"/> NIOSH 7400 <input type="checkbox"/> w/ OSHA 8hr. TWA <b>PLM - Bulk (reporting limit)</b> <input checked="" type="checkbox"/> PLM EPA 600/R-93/116 (<1%) <input type="checkbox"/> PLM EPA NOB (<1%) Point Count <input type="checkbox"/> 400 (<0.25%) <input type="checkbox"/> 1000 (<0.1%) Point Count w/Gravimetric <input type="checkbox"/> 400 (<0.25%) <input type="checkbox"/> 1000 (<0.1%) <input type="checkbox"/> NYS 198.1 (friable in NY) <input type="checkbox"/> NYS 198.6 NOB (non-friable-NY) <input type="checkbox"/> NIOSH 9002 (<1%)		<b>TEM - Air</b> <input type="checkbox"/> 4-4.5hr TAT (AHERA only) <input type="checkbox"/> AHERA 40 CFR, Part 763 <input type="checkbox"/> NIOSH 7402 <input type="checkbox"/> EPA Level II <input type="checkbox"/> ISO 10312 <b>TEM - Bulk</b> <input type="checkbox"/> TEM EPA NOB <input type="checkbox"/> NYS NOB 198.4 (non-friable-NY) <input type="checkbox"/> Chatfield SOP <input type="checkbox"/> TEM Mass Analysis-EPA 600 sec. 2.5 <b>TEM - Water:</b> EPA 100.2 Fibers >10µm <input type="checkbox"/> Waste <input type="checkbox"/> Drinking All Fiber Sizes <input type="checkbox"/> Waste <input type="checkbox"/> Drinking	
		<b>TEM-Dust</b> <input type="checkbox"/> Microvac - ASTM D 5755 <input type="checkbox"/> Wipe - ASTM D6480 <input type="checkbox"/> Carpet Sonication (EPA 600/J-93/167) <b>Soil/Rock/Vermiculite</b> <input type="checkbox"/> PLM CARB 435 - A (0.25% sensitivity) <input type="checkbox"/> PLM CARB 435 - B (0.1% sensitivity) <input type="checkbox"/> TEM CARB 435 - B (0.1% sensitivity) <input type="checkbox"/> TEM CARB 435 - C (0.01% sensitivity) <input type="checkbox"/> EPA Protocol (Semi-Quantitative) <input type="checkbox"/> EPA Protocol (Quantitative) <b>Other:</b> <input type="checkbox"/>	
<input type="checkbox"/> Check For Positive Stop - Clearly Identify Homogenous Group			
Samplers Name: FAY WARD		Samplers Signature: Fay Ward	
Sample #	Sample Description	Volume/Area (Air) HA # (Bulk)	Date/Time Sampled
5216-100-01	Bldg 5216, Roof shingle, tar, insulation, felt	West Side	12-2-10 11A
5216-100-02	" " " "	North Side	12-2-10 11A
5216-100-03	Bldg 5216 Roof curbing + flashing + shingle	West Side	12-2-10 11A
5220-100-04	Bldg 5220 Roof shingle, tar, insul. + felt	South Side	12-2-10 11 <sup>30</sup> A
5220-100-05	" " " "	North Side	12-2-10 11 <sup>30</sup> A
5220-100-06	Bldg 5220 Roof shingle, flashing + curbing	West Side	12-2-10 11 <sup>30</sup> A
5224-100-07	Bldg 5224 Roof shingle, tar, insulation, felt	South	12p 12-2-10
5224-100-08	" " " "	North	12p 12-2-10
Client Sample # (s): 5216-100-01 to 5220-102-21		Total # of Samples: 21	
Relinquished (Client): Fay Ward		Date: 12-2-10 Time: 10 <sup>00</sup>	
Received (Lab): EMSL		Date: 12/3/10 Time: 9:05 am	
Comments/Special Instructions: 12/3 FE			

Controlled Document - Asbestos Lab Services COC - A1.0 - 11/23/2009





EMSL ANALYTICAL INC.  
LABORATORY OF ENVIRONMENTAL TOXICOLOGY

# Asbestos Lab Services Chain of Custody

EMSL Order Number (Lab Use Only):

221002319

Denver, CO  
Building 12 Suite A  
7330 S. Alton Way  
Centennial, CO 80112  
PHONE: (303) 740-5700  
FAX: (303) 741-1400

Sample #	Sample Description	Volume/Area (Air) HA # (Bulk)	Date/Time Sampled
5224-100-09	Bldg 5224, Roof shingle, flashing + curbing	North Side	12-2-10 12p
5216-101-10	Bldg 5216 Pipe flashing cement	center	" 11A
5216-101-11	" " "	center north	" " 11A
5216-101-12	" " "	center east	" " 11A
5220-101-13	Bldg 5220 Pipe flashing cement	center	" " 1130A
5220-101-14	" " "	center	" " 1130A
5220-101-15	" " "	center	" " 1130A
5224-101-16	Bldg 5224 pipe flashing cement	center west	" " 12p
5224-101-17	" " "	center	" " 12p
5224-101-18	" " "	center east	" " 12p
5220-102-19	Bldg 5220 yellow caulk	elevator housing	" " 11 <sup>30</sup> A
5220-102-20	" " yellow caulk	" "	" " 11 <sup>30</sup> A
5220-102-21	" " yellow caulk	" "	" " 11 <sup>30</sup> A

Comments/Special Instructions:

Controlled Document - Asbestos Lab Services COC - A1.0 - 11/23/2009

Page 1 of 2 Pages

**TAB 3**

**ASBESTOS FIGURES**

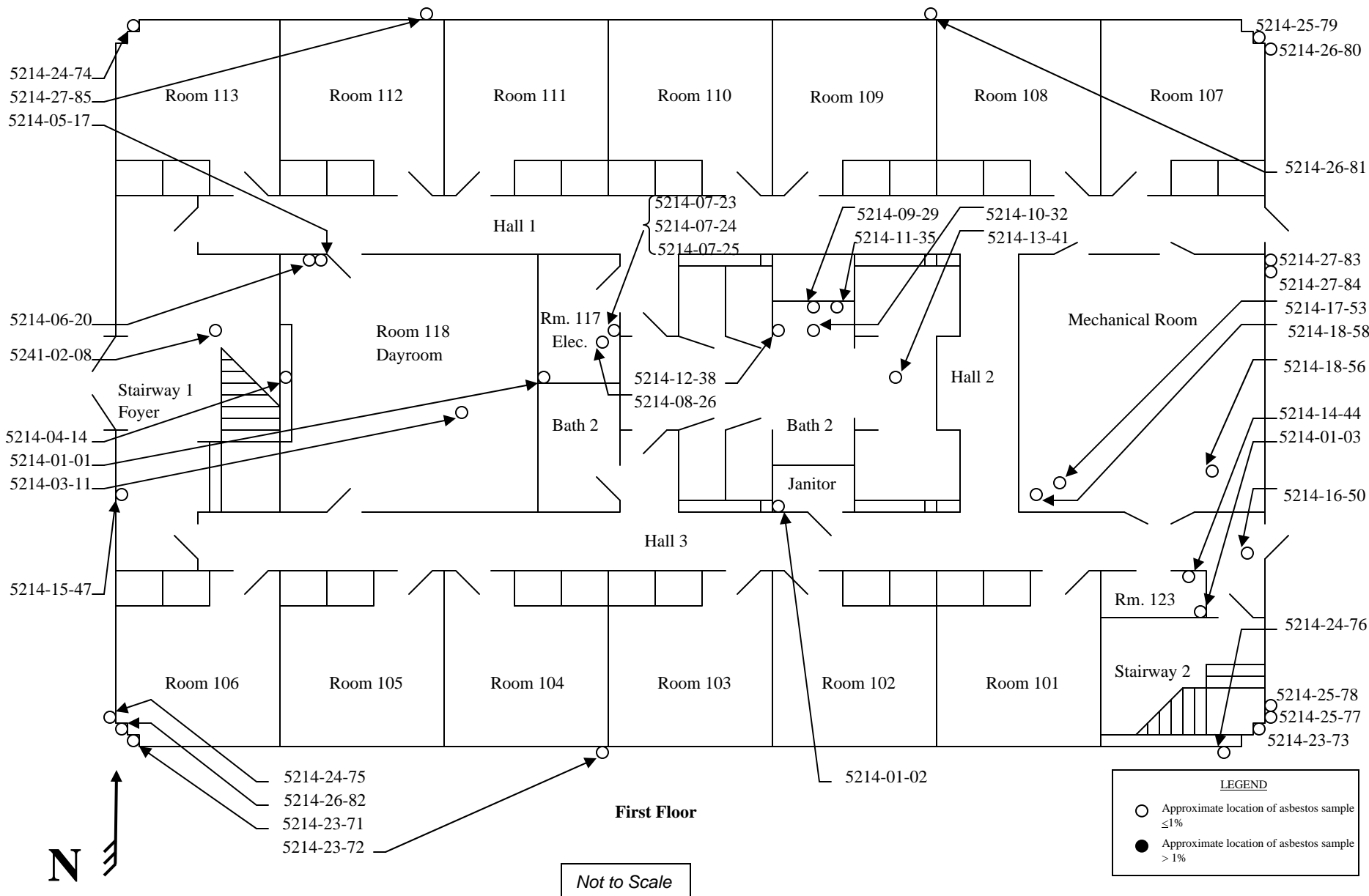


Figure 1 of 4 - Site Diagram

Project # 3010128

Drawn by FW

Drawn Dec.2010

Limited Asbestos Survey  
USAFA Prep School Building 5214  
**APPENDIX F**  
Colorado Springs, Colorado

**Empirical Environmental, LLC**

Phone (719) 749-2068

Fax (719) 749-0238

Page 165 of 233

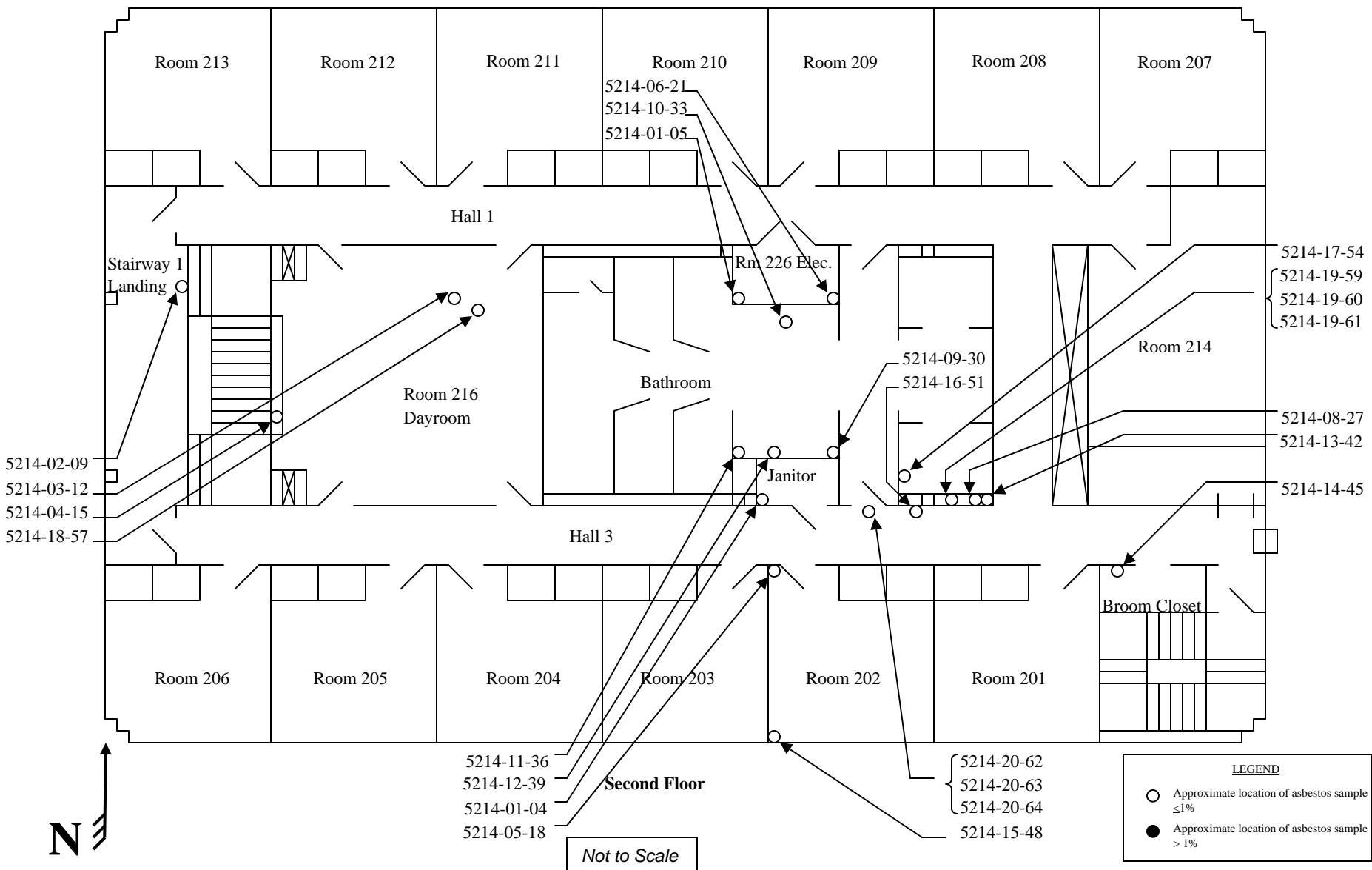


Figure 2 of 4 - Site Diagram

Project # 3010128

Drawn by FW  
Drawn Dec. 2010

Limited Asbestos Survey  
USAFA Prep School, Building 5214  
APPENDIX F  
Colorado Springs, Colorado

**Empirical Environmental, LLC**

Phone (719) 749-2068 Fax (719) 749-0238  
Page 166 of 233



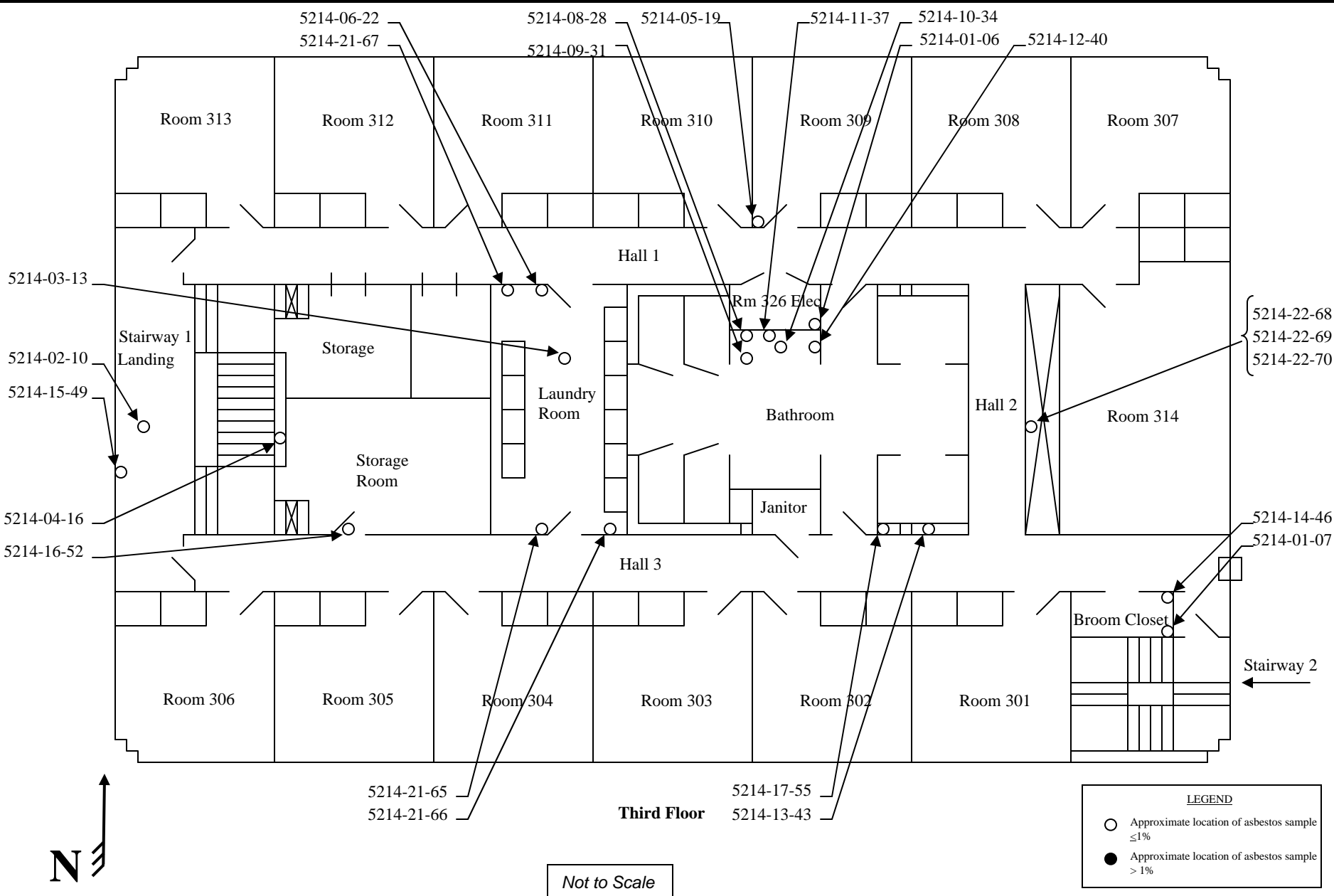


Figure 3 of 4 - Site Diagram

Project # 3010128

Drawn by FW  
Drawn Dec. 2010

Limited Asbestos Survey  
USAFA Prep School, Building 5214  
**APPENDIX F**  
Colorado Springs, Colorado

**Empirical Environmental, LLC**

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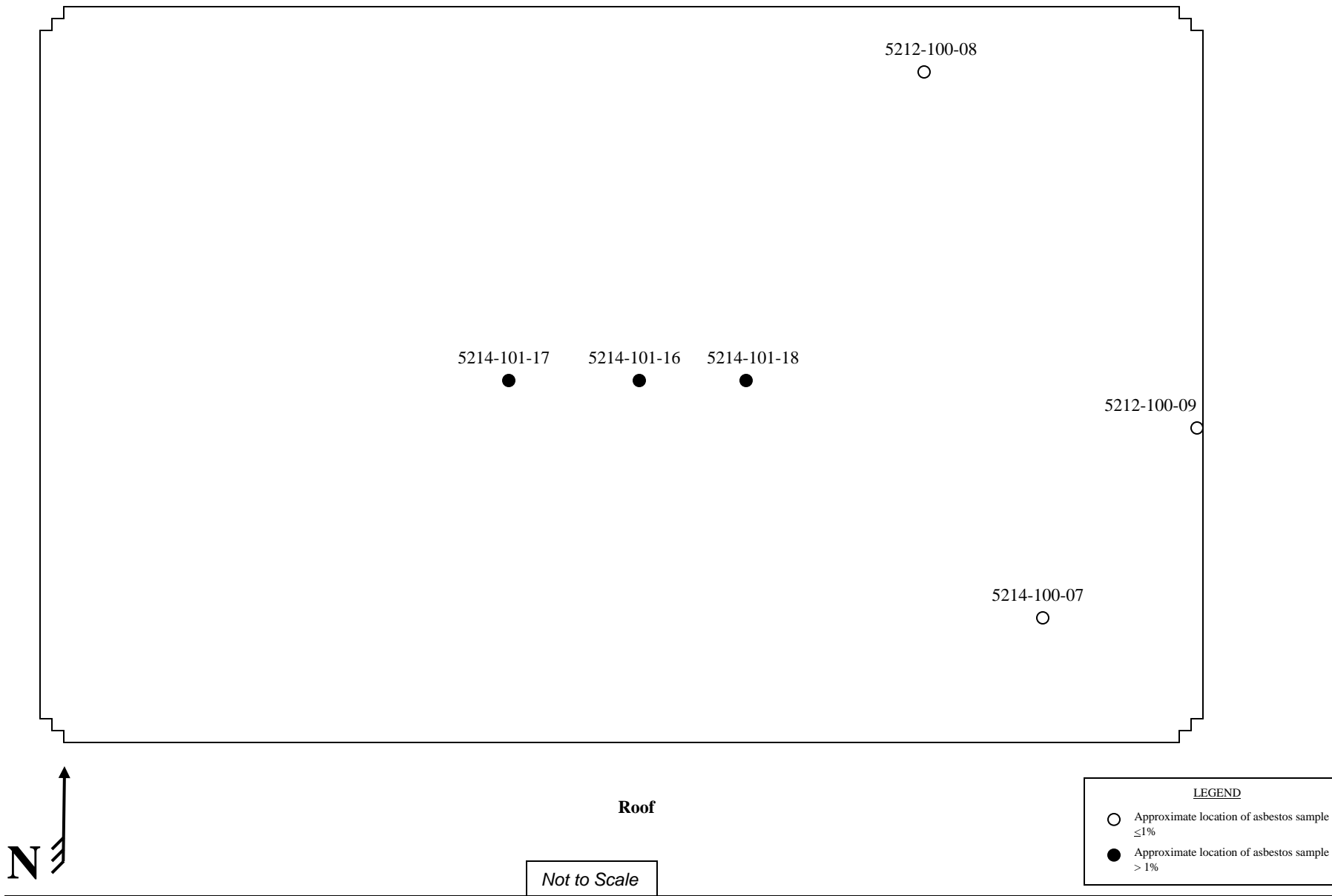


Figure 4 of 4 - Site Diagram

Project # 3010128

Drawn by FW  
Drawn Dec. 2010

Limited Asbestos Survey  
USAFA Prep School, Building 5214  
APPENDIX F  
Colorado Springs, Colorado

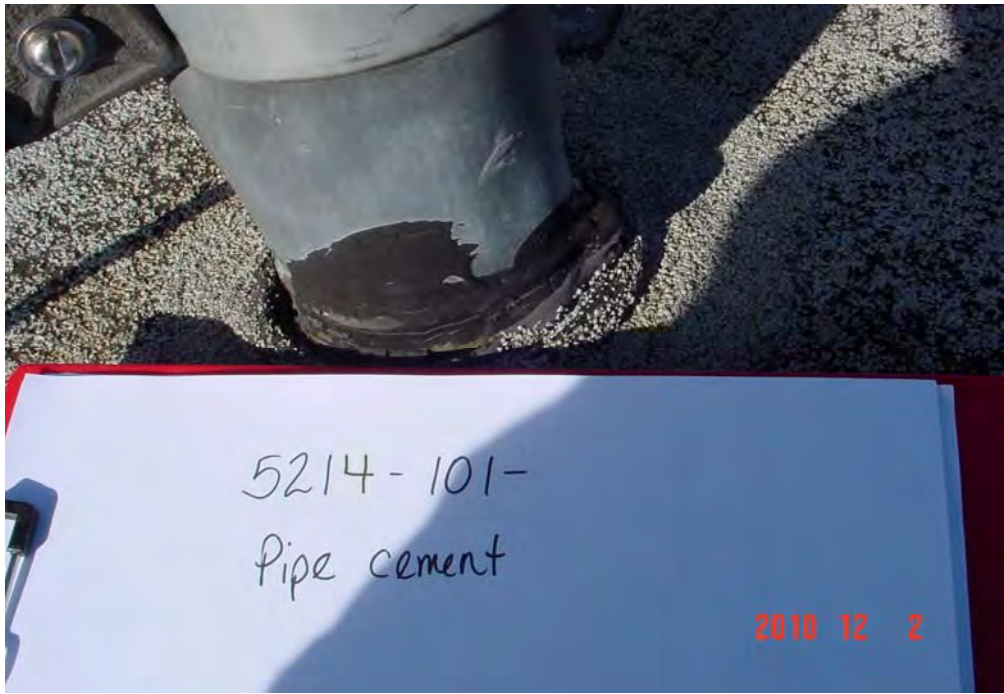
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**TAB 4**

**PHOTOGRAPHS OF ACM**

SAMPLE CONCLUSION  
Bldg. 5220, Preparatory School  
USAFA  
Colorado Springs, Colorado  
Page 1 of 1

SAMPLE NUMBER	5214-101-18
MATERIAL	Pipe Flashing Cement
FRIABLE/NON-FRIABLE	Non-Friable
	
QUANTITY	3 linear feet
RESULTS	4% Chrysotile asbestos in the black mastic
REMARKS	On Roof

## **APPENDIX E**

### **LBP TABLES**

Table 1  
**TESTING COMBINATIONS<sup>1</sup>**  
Page 1 of 2

**Project Name:** Lead-Based Paint Inspection

**Project Address:** USAFA Prep School, Buildings 5210, 5212, 5214, Colorado Springs, CO

**Project Number:** 3010128

Room Equivalent <sup>2</sup>	Building Component	Substrate <sup>3</sup>
Stairways	Handrails	Metal
Stairways	Stair Tread	Metal
Stairways	Stringers	Metal
Stairways	Balusters	Metal
Stairways	Risers	Metal
Stairways	I-Beams	Metal
Hallways and Dorm Rooms	Doors	Wood
Stairways	Support Columns	Metal
Stairways, Dorm Rooms, Day Rooms	Support Columns	Concrete
Stairways, Restrooms, Day Rooms, Hallways, Laundry Rooms	Doors	Metal
Stairways, Restrooms, Day Rooms, Hallways, Laundry Rooms, Dorm Rooms	Door Components <sup>4</sup>	Metal
Stairways, Restrooms, Day Rooms, Hallways, Laundry Rooms, Dorm Rooms	Walls	Drywall
Stairways, Hallways, Day Rooms, Dorm Rooms	Window Components <sup>5</sup>	Metal
Stairways, Hallways, Dorm Rooms, Day Rooms	Registers	Metal
Stairways, Restrooms	Floors	Tile
Restrooms	Walls	Tile
Stairways	Ladders	Metal
Stairway 1, Building 5210 only	Cabinets	Metal
Stairway 1, Building 5210 only	Cabinets	Plastic
Restroom 115, Building 5210 only	Bench	Plastic
Stairway 1, Building 5212 only	Desk Trim	Wood
Exterior	Doors and Door Components	Metal
Exterior	Window Components	Metal
Exterior	Handrails	Metal
Exterior	Vertical Beams	Metal
Exterior	Siding	Metal
Exterior	Horizontal Beams	Metal

Table 1  
**TESTING COMBINATIONS<sup>1</sup>**  
Page 2 of 2

**Project Name:** Lead-Based Paint Inspection

**Project Address:** USAFA Prep School, Buildings 5210, 5212, 5214, Colorado Springs, CO

**Project Number:** 3010128

Room Equivalent <sup>2</sup>	Building Component	Substrate <sup>3</sup>
Exterior, Foyer	Vent Panels	Metal
Exterior, Foyer	Window Components	Metal
Exterior, Foyer	Support Columns	Metal

*Notes:*

1. A testing combination is a unique combination of room equivalent, building component type, and substrate.
2. A room equivalent is an identifiable part of a residence, such as a room, a house exterior, a foyer, staircase, hallway or an exterior area.
3. The substrate is the material beneath the paint.
4. Door components include jambs, casings, trim and thresholds
5. Window components include sills, trim, casings, sashes, and mullions.

Table 2  
**Summary of XRF<sup>1</sup> Results**  
Page 1 of 16

**Project Name:** Lead-Based Paint Inspection

**Project Address:** Building 5210, United States Air Force Prep School, Colorado Springs, CO

**Project Number:** 3010128

XRF										Lead Content (mg/cm <sup>2</sup> ) <sup>2</sup>
Number	Side	Floor	Room	Component	Substrate	Condition	Color	Date/Time	Result	
1	N/A <sup>3</sup>	N/A	SHUTTER CAL	N/A	N/A	N/A	N/A	11/27/2010 12:25	-	1.58
2	N/A	N/A	CALIBRATE	N/A	N/A	N/A	N/A	11/27/2010 12:29	Positive	1.00
3	N/A	N/A	CALIBRATE	N/A	N/A	N/A	N/A	11/27/2010 12:31	Null	1.00
4	N/A	N/A	CALIBRATE	N/A	N/A	N/A	N/A	11/27/2010 12:33	Negative	0.90
5	N/A	N/A	CALIBRATE	N/A	N/A	N/A	N/A	11/27/2010 12:35	Negative	0.50
6	N/A	N/A	SHUTTER CAL	N/A	N/A	N/A	N/A	11/27/2010 12:46	-	1.50
7	N/A	N/A	CALIBRATE	N/A	N/A	N/A	N/A	11/27/2010 12:49	Null	1.00
8	N/A	N/A	CALIBRATE	N/A	N/A	N/A	N/A	11/27/2010 12:50	Null	1.00
9	N/A	N/A	CALIBRATE	N/A	N/A	N/A	N/A	11/27/2010 12:54	Null	1.00
10	N/A	N/A	CALIBRATE	N/A	N/A	N/A	N/A	11/27/2010 12:56	Positive	1.00
11	N/A	N/A	CALIBRATE	N/A	N/A	N/A	N/A	11/27/2010 12:59	Positive	1.00
12	N/A	N/A	CALIBRATE	N/A	N/A	N/A	N/A	11/27/2010 13:01	Positive	1.00
13	A	FIRST	STAIRWAY 1	SUPPORT COLUMN	METAL	INTACT <sup>4</sup>	BLACK	11/27/2010 13:03	Null	0.06
14	A	FIRST	STAIRWAY 1	SUPPORT COLUMN	METAL	INTACT	BLACK	11/27/2010 13:03	Negative	0.01
15	A	FIRST	STAIRWAY 1	CABINET EXT	METAL	INTACT	BLACK	11/27/2010 13:04	Null	0.01
16	A	FIRST	STAIRWAY 1	CABINET EXT	METAL	INTACT	BLACK	11/27/2010 13:05	Null	0.01
17	A	FIRST	STAIRWAY 1	CABINET EXT	PLASTIC	INTACT	BLACK	11/27/2010 13:05	Null	0.00
18	A	FIRST	STAIRWAY 1	CABINET EXT	PLASTIC	INTACT	BLACK	11/27/2010 13:06	Negative	0.00
19	A	FIRST	STAIRWAY 1	DOOR	METAL	FAIR <sup>5</sup>	BLACK	11/27/2010 13:06	Null	0.00
20	A	FIRST	STAIRWAY 1	DOOR	METAL	FAIR	BLACK	11/27/2010 13:07	Negative	0.00
21	A	FIRST	STAIRWAY 1	DR. CASING	METAL	FAIR <sup>6</sup>	BLACK	11/27/2010 13:07	Negative	0.00
22	A	FIRST	STAIRWAY 1	DOOR	METAL	INTACT	BLACK	11/27/2010 13:08	Negative	0.00
23	B	FIRST	STAIRWAY 1	WALL	DRYWALL	INTACT	WHITE	11/27/2010 13:08	Negative	0.00
24	B	FIRST	STAIRWAY 1	WALL	DRYWALL	INTACT	RED	11/27/2010 13:09	Negative	0.00
25	C	FIRST	STAIRWAY 1	WALL	DRYWALL	INTACT	WHITE	11/27/2010 13:10	Negative	0.00
26	C	FIRST	STAIRWAY 1	STWY HAND RAIL	METAL	INTACT	BLACK	11/27/2010 13:11	Negative	0.00
27	C	FIRST	STAIRWAY 1	STAIR TREAD	METAL	FAIR	BLACK	11/27/2010 13:11	Negative	0.00
28	C	FIRST	STAIRWAY 1	STR STRINGER	METAL	INTACT	BLACK	11/27/2010 13:12	Negative	0.00



Table 2  
**Summary of XRF<sup>1</sup> Results**  
Page 2 of 16

**Project Name:** Lead-Based Paint Inspection

**Project Address:** Building 5210, United States Air Force Prep School, Colorado Springs, CO

**Project Number:** 3010128

XRF										Lead Content (mg/cm <sup>2</sup> ) <sup>2</sup>
Number	Side	Floor	Room	Component	Substrate	Condition	Color	Date/Time	Result	
29	D	FIRST	STAIRWAY 1	WALL	DRYWALL	INTACT	WHITE	11/27/2010 13:12	Null	0.00
30	D	FIRST	STAIRWAY 1	WALL	DRYWALL	INTACT	WHITE	11/27/2010 13:13	Negative	0.00
31	D	FIRST	STAIRWAY 1	WALL	DRYWALL	INTACT	RED	11/27/2010 13:13	Negative	0.00
32	D	FIRST	STAIRWAY 1	WALL REGISTER	METAL	INTACT	BEIGE	11/27/2010 13:14	Negative	0.00
33	C	FIRST	STAIRWAY 1	DOOR RHT	METAL	INTACT	GREY	11/27/2010 13:15	Negative	0.00
34	C	FIRST	STAIRWAY 1	DOOR LFT	METAL	INTACT	GREY	11/27/2010 13:16	Negative	0.00
35	B	FIRST	HALL 121	DOOR RM 112	WOOD	INTACT	VARNISH	11/27/2010 13:18	Negative	0.00
36	B	FIRST	HALL 121	DOOR RM 109	WOOD	INTACT	VARNISH	11/27/2010 13:18	Negative	0.00
37	B	FIRST	HALL 121	DOOR RM 107	WOOD	INTACT	VARNISH	11/27/2010 13:19	Negative	0.00
38	D	FIRST	HALL 121	DOOR RM 118	METAL	INTACT	GREY	11/27/2010 13:20	Negative	0.00
39	D	FIRST	HALL 121	DOOR JAMB RM 118	METAL	FAIR	GREY	11/27/2010 13:21	Negative	0.00
40	D	FIRST	HALL 121	DOOR JAMB BATH	METAL	INTACT	GREY	11/27/2010 13:22	Negative	0.00
41	D	FIRST	HALL 121	DOOR BATH	METAL	INTACT	GREY	11/27/2010 13:22	Negative	0.00
42	C	FIRST	HALL 121	DOOR	METAL	INTACT	BLACK	11/27/2010 13:23	Null	0.00
43	C	FIRST	HALL 121	DOOR	METAL	INTACT	BLACK	11/27/2010 13:24	Negative	0.00
44	C	FIRST	HALL 121	DOOR JAMB	METAL	FAIR	BLACK	11/27/2010 13:25	Negative	-0.22
45	C	FIRST	HALL 121	DR. JAMB RM 107	METAL	INTACT	GREY	11/27/2010 13:25	Negative	0.00
46	B	FIRST	HALL 121	DR. JAMB RM 109	METAL	INTACT	GREY	11/27/2010 13:26	Negative	0.00
47	B	FIRST	HALL 121	DR. JAMB RM 112	METAL	INTACT	GREY	11/27/2010 13:27	Negative	0.00
48	A	FIRST	HALL 121	WALL	DRYWALL	INTACT	WHITE	11/27/2010 13:32	Negative	0.00
49	A	FIRST	HALL 121	DOOR	METAL	INTACT	GREY	11/27/2010 13:32	Negative	0.00
50	A	FIRST	HALL 121	DOOR JAMB	METAL	INTACT	GREY	11/27/2010 13:33	Negative	0.00
51	B	FIRST	HALL 121	WALL	DRYWALL	INTACT	WHITE	11/27/2010 13:33	Negative	0.00
52	B	FIRST	HALL 121	WALL	DRYWALL	INTACT	RED	11/27/2010 13:34	Negative	0.00
53	B	FIRST	HALL 121	WALL	DRYWALL	INTACT	WHITE	11/27/2010 13:35	Negative	0.00
54	C	FIRST	HALL 121	WALL	DRYWALL	INTACT	WHITE	11/27/2010 13:35	Negative	0.00
55	D	FIRST	HALL 121	WALL	DRYWALL	INTACT	WHITE	11/27/2010 13:36	Negative	0.00
56	D	FIRST	HALL 121	WALL REGISTER	METAL	INTACT	GREY	11/27/2010 13:36	Negative	0.00
57	D	FIRST	HALL 121	DOOR CHASE	METAL	INTACT	WHITE	11/27/2010 13:37	Negative	0.00

Table 2  
**Summary of XRF<sup>1</sup> Results**  
Page 3 of 16

**Project Name:** Lead-Based Paint Inspection

**Project Address:** Building 5210, United States Air Force Prep School, Colorado Springs, CO

**Project Number:** 3010128

XRF										Lead Content (mg/cm <sup>2</sup> ) <sup>2</sup>
Number	Side	Floor	Room	Component	Substrate	Condition	Color	Date/Time	Result	
58	D	FIRST	HALL 121	WALL	DRYWALL	INTACT	WHITE	11/27/2010 13:38	Negative	0.00
59	A	FIRST	RM 112	WALL	DRYWALL	INTACT	WHITE	11/27/2010 13:39	Negative	0.00
60	B	FIRST	RM 112	WALL REGISTER	METAL	INTACT	GREY	11/27/2010 13:40	Negative	0.00
61	B	FIRST	RM 112	WNDW CASING	METAL	INTACT	BLACK	11/27/2010 13:40	Negative	0.00
62	C	FIRST	RM 112	WALL	DRYWALL	INTACT	WHITE	11/27/2010 13:41	Negative	0.00
63	D	FIRST	RM 112	WALL	DRYWALL	INTACT	WHITE	11/27/2010 13:42	Negative	0.00
64	D	FIRST	RM 112	DOOR	WOOD	INTACT	VARNISH	11/27/2010 13:42	Negative	0.00
65	D	FIRST	RM 112	CLST DOOR LFT	WOOD	INTACT	VARNISH	11/27/2010 13:43	Negative	0.00
66	D	FIRST	RM 112	CLST DOOR RHT	WOOD	INTACT	VARNISH	11/27/2010 13:43	Negative	0.00
67	D	FIRST	RM 109	CLST DOOR RHT	WOOD	INTACT	VARNISH	11/27/2010 13:46	Negative	0.00
68	D	FIRST	RM 109	CLST DOOR LFT	WOOD	INTACT	VARNISH	11/27/2010 13:46	Negative	0.00
69	D	FIRST	RM 109	DOOR	WOOD	INTACT	VARNISH	11/27/2010 13:47	Negative	0.00
70	A	FIRST	RM 109	WALL	DRYWALL	INTACT	WHITE	11/27/2010 13:47	Negative	0.00
71	C	FIRST	RM 109	WALL	DRYWALL	INTACT	WHITE	11/27/2010 13:48	Negative	0.00
72	D	FIRST	RM 109	WALL	DRYWALL	INTACT	WHITE	11/27/2010 13:48	Negative	0.00
73	B	FIRST	RM 109	WALL REGISTER	METAL	INTACT	GREY	11/27/2010 13:49	Negative	0.00
74	B	FIRST	RM 109	WNDW SILL	METAL	INTACT	BLACK	11/27/2010 13:50	Null	0.00
75	B	FIRST	RM 109	WNDW CASING	METAL	INTACT	BLACK	11/27/2010 13:50	Negative	0.00
76	B	FIRST	RM 107	WNDW CASING	METAL	INTACT	BLACK	11/27/2010 13:52	Negative	0.00
77	B	FIRST	RM 107	WALL REGISTER	METAL	INTACT	GREY	11/27/2010 13:53	Negative	0.00
78	D	FIRST	RM 107	CLST DOOR LFT	WOOD	INTACT	VARNISH	11/27/2010 13:53	Negative	0.00
79	D	FIRST	RM 107	CLST DOOR RHT	WOOD	INTACT	VARNISH	11/27/2010 13:54	Negative	0.00
80	D	FIRST	RM 107	DOOR	WOOD	INTACT	VARNISH	11/27/2010 13:54	Negative	0.00
81	A	FIRST	RM 107	WALL	DRYWALL	INTACT	WHITE	11/27/2010 13:55	Negative	0.00
82	C	FIRST	RM 107	WALL	DRYWALL	INTACT	WHITE	11/27/2010 13:55	Negative	0.01
83	D	FIRST	RM 107	WALL	DRYWALL	INTACT	WHITE	11/27/2010 13:56	Negative	0.00
84	A	FIRST	RM 106	WALL	DRYWALL	INTACT	WHITE	11/27/2010 13:58	Negative	0.00
85	C	FIRST	RM 106	WALL	DRYWALL	INTACT	WHITE	11/27/2010 13:59	Negative	0.00
86	C	FIRST	RM 106	SUPPORT COLUMN	CONCRETE	INTACT	WHITE	11/27/2010 13:59	Negative	0.00

Table 2  
**Summary of XRF<sup>1</sup> Results**  
Page 4 of 16

**Project Name:** Lead-Based Paint Inspection

**Project Address:** Building 5210, United States Air Force Prep School, Colorado Springs, CO

**Project Number:** 3010128

XRF										Lead Content (mg/cm <sup>2</sup> ) <sup>2</sup>
Number	Side	Floor	Room	Component	Substrate	Condition	Color	Date/Time	Result	
87	B	FIRST	RM 106	WALL	DRYWALL	INTACT	WHITE	11/27/2010 14:00	Negative	0.00
88	B	FIRST	RM 106	DOOR	WOOD	INTACT	VARNISH	11/27/2010 14:00	Negative	0.00
89	B	FIRST	RM 106	CLST DOOR LFT	WOOD	INTACT	VARNISH	11/27/2010 14:01	Negative	0.00
90	B	FIRST	RM 106	CLST DOOR RHT	WOOD	INTACT	VARNISH	11/27/2010 14:01	Negative	0.00
91	D	FIRST	RM 106	WALL REGISTER	METAL	FAIR	GREY	11/27/2010 14:02	Negative	0.00
92	D	FIRST	RM 106	WNDW CASING	METAL	INTACT	BLACK	11/27/2010 14:03	Negative	0.00
93	D	FIRST	RM 104	WNDW CASING	METAL	INTACT	BLACK	11/27/2010 14:05	Negative	0.00
94	D	FIRST	RM 104	WALL REGISTER	METAL	FAIR	GREY	11/27/2010 14:06	Negative	0.00
95	A	FIRST	RM 104	WALL	DRYWALL	INTACT	WHITE	11/27/2010 14:07	Negative	0.00
96	B	FIRST	RM 104	WALL	DRYWALL	FAIR	WHITE	11/27/2010 14:07	Negative	0.01
97	C	FIRST	RM 104	WALL	DRYWALL	INTACT	WHITE	11/27/2010 14:08	Negative	0.00
98	C	FIRST	RM 104	SUPPORT COLUMN	CONCRETE	INTACT	WHITE	11/27/2010 14:08	Negative	0.01
99	B	FIRST	RM 104	CLST DOOR LFT	WOOD	INTACT	VARNISH	11/27/2010 14:09	Negative	0.00
100	B	FIRST	RM 104	CLST DOOR RHT	WOOD	INTACT	VARNISH	11/27/2010 14:10	Negative	0.00
101	B	FIRST	RM 104	DOOR	WOOD	INTACT	VARNISH	11/27/2010 14:10	Negative	0.00
102	D	FIRST	HALL 120	DOOR RM 104	WOOD	INTACT	VARNISH	11/27/2010 14:12	Negative	0.00
103	D	FIRST	HALL 120	DOOR RM 106	WOOD	INTACT	VARNISH	11/27/2010 14:12	Negative	0.00
104	D	FIRST	HALL 120	DOOR JAMB RM 106	METAL	INTACT	GREY	11/27/2010 14:13	Negative	0.00
105	D	FIRST	HALL 120	DOOR JAMB RM 104	METAL	FAIR	GREY	11/27/2010 14:14	Negative	0.01
106	A	FIRST	HALL 120	DOOR JAMB	METAL	FAIR	GREY	11/27/2010 14:14	Negative	0.00
107	A	FIRST	HALL 120	DOOR	METAL	FAIR	GREY	11/27/2010 14:15	Negative	0.00
108	A	FIRST	HALL 120	WALL	DRYWALL	INTACT	WHITE	11/27/2010 14:15	Negative	0.00
109	B	FIRST	HALL 120	WALL	DRYWALL	INTACT	WHITE	11/27/2010 14:16	Negative	0.00
110	B	FIRST	HALL 120	WALL	DRYWALL	INTACT	WHITE	11/27/2010 14:17	Negative	0.00
111	C	FIRST	HALL 120	WALL	DRYWALL	INTACT	WHITE	11/27/2010 14:17	Negative	0.00
112	C	FIRST	HALL 120	DOOR	METAL	INTACT	BLACK	11/27/2010 14:18	Negative	0.00
113	C	FIRST	HALL 120	DR. CASING	METAL	FAIR	BLACK	11/27/2010 14:18	Negative	0.00
114	D	FIRST	HALL 120	WALL	DRYWALL	INTACT	WHITE	11/27/2010 14:19	Negative	0.00
115	D	FIRST	HALL 120	WALL	DRYWALL	INTACT	WHITE	11/27/2010 14:20	Negative	0.00

Table 2  
**Summary of XRF<sup>1</sup> Results**  
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**Project Name:** Lead-Based Paint Inspection

**Project Address:** Building 5210, United States Air Force Prep School, Colorado Springs, CO

**Project Number:** 3010128

XRF										Lead
Number	Side	Floor	Room	Component	Substrate	Condition	Color	Date/Time	Result	Content (mg/cm <sup>2</sup> ) <sup>2</sup>
116	D	FIRST	HALL 120	WALL	DRYWALL	INTACT	WHITE	11/27/2010 14:20	Negative	0.00
117	D	FIRST	HALL 120	STAIRWAY 2 DOOR	METAL	INTACT	GREY	11/27/2010 14:21	Negative	0.00
118	B	FIRST	HALL 120	DOOR RM 118	METAL	INTACT	GREY	11/27/2010 14:23	Negative	0.00
119	B	FIRST	HALL 120	DOOR JAMB RM 118	METAL	FAIR	GREY	11/27/2010 14:23	Negative	0.00
120	A	FIRST	HALL 122	WALL	DRYWALL	INTACT	WHITE	11/27/2010 14:24	Negative	0.00
121	C	FIRST	HALL 122	WALL	DRYWALL	INTACT	WHITE	11/27/2010 14:25	Negative	0.00
122	A	FIRST	STAIRWAY 2	WALL	DRYWALL	INTACT	WHITE	11/27/2010 14:26	Negative	0.00
123	B	FIRST	STAIRWAY 2	WALL	DRYWALL	INTACT	WHITE	11/27/2010 14:26	Negative	0.00
124	C	FIRST	STAIRWAY 2	WALL	DRYWALL	INTACT	WHITE	11/27/2010 14:27	Negative	0.03
125	D	FIRST	STAIRWAY 2	WALL	DRYWALL	INTACT	WHITE	11/27/2010 14:27	Negative	0.00
126	D	FIRST	STAIRWAY 2	WNDW SILL	METAL	INTACT	BLACK	11/27/2010 14:28	Null	0.00
127	D	FIRST	STAIRWAY 2	WNDW SILL	METAL	INTACT	BLACK	11/27/2010 14:28	Negative	0.00
128	D	FIRST	STAIRWAY 2	WNDW SILL TRIM	METAL	INTACT	WHITE	11/27/2010 14:29	Negative	0.00
129	C	FIRST	STAIRWAY 2	STR BALUSTER	METAL	FAIR	BLACK	11/27/2010 14:30	Negative	0.00
130	B	FIRST	STAIRWAY 2	STR STRINGER	METAL	INTACT	BLACK	11/27/2010 14:30	Negative	0.00
131	B	FIRST	STAIRWAY 2	STR RISER	METAL	FAIR	BLACK	11/27/2010 14:31	Negative	0.00
132	B	FIRST	STAIRWAY 2	STR HAND RAIL	METAL	INTACT	BLACK	11/27/2010 14:31	Negative	0.00
133	B	FIRST	STAIRWAY 2	WALL REGISTER	METAL	INTACT	GREY	11/27/2010 14:32	Negative	0.00
134	C	FIRST	STAIRWAY 2	SUPPORT COLUMN	CONCRETE	INTACT	WHITE	11/27/2010 14:33	Negative	0.00
135	C	FIRST	STAIRWAY 2	I-BEAM	METAL	INTACT	WHITE	11/27/2010 14:34	Negative	0.00
136	A	FIRST	HALL 120	DOOR BATH	METAL	INTACT	GREY	11/27/2010 14:35	Negative	0.01
137	B	FIRST	HALL 120	DOOR BATH	METAL	INTACT	GREY	11/27/2010 14:36	Negative	0.00
138	B	FIRST	HALL 120	DR. JAMB BATH	METAL	INTACT	GREY	11/27/2010 14:37	Negative	0.00
139	A	FIRST	HALL 120	DR. JAMB BATH	METAL	INTACT	GREY	11/27/2010 14:37	Negative	0.00
140	A	FIRST	ROOM 116	WALL	TILE	INTACT	WHITE	11/27/2010 14:38	Negative	0.06
141	B	FIRST	ROOM 116	WALL	TILE	INTACT	WHITE	11/27/2010 14:38	Negative	0.04
142	C	FIRST	ROOM 116	WALL	TILE	INTACT	WHITE	11/27/2010 14:39	Negative	0.01
143	D	FIRST	ROOM 116	WALL	TILE	INTACT	WHITE	11/27/2010 14:39	Negative	0.02
144	Floor	FIRST	ROOM 116	FLOOR	TILE	INTACT	GREY	11/27/2010 14:40	Negative	0.00

Table 2  
**Summary of XRF<sup>1</sup> Results**  
Page 6 of 16

**Project Name:** Lead-Based Paint Inspection

**Project Address:** Building 5210, United States Air Force Prep School, Colorado Springs, CO

**Project Number:** 3010128

XRF										Lead Content (mg/cm <sup>2</sup> ) <sup>2</sup>
Number	Side	Floor	Room	Component	Substrate	Condition	Color	Date/Time	Result	
145	C	FIRST	ROOM 116	DOOR	METAL	INTACT	GREY	11/27/2010 14:40	Negative	0.00
146	Ceiling	FIRST	ROOM 116	CEILING	DRYWALL	INTACT	WHITE	11/27/2010 14:41	Null	0.00
147	Ceiling	FIRST	ROOM 116	CEILING	DRYWALL	INTACT	WHITE	11/27/2010 14:41	Negative	0.00
148	Ceiling	FIRST	ROOM 115	CEILING	DRYWALL	INTACT	WHITE	11/27/2010 14:42	Negative	0.00
149	A	FIRST	ROOM 115	WALL	TILE	INTACT	WHITE	11/27/2010 14:42	Negative	0.01
150	B	FIRST	ROOM 115	WALL	TILE	INTACT	WHITE	11/27/2010 14:43	Negative	0.01
151	C	FIRST	ROOM 115	WALL	TILE	INTACT	WHITE	11/27/2010 14:43	Negative	0.01
152	D	FIRST	ROOM 115	WALL	TILE	INTACT	WHITE	11/27/2010 14:44	Negative	0.01
153	A	FIRST	ROOM 115	WALL	DRYWALL	INTACT	WHITE	11/27/2010 14:44	Negative	0.00
154	B	FIRST	ROOM 115	WALL	DRYWALL	INTACT	WHITE	11/27/2010 14:44	Negative	0.00
155	C	FIRST	ROOM 115	WALL	DRYWALL	INTACT	WHITE	11/27/2010 14:45	Negative	0.00
156	D	FIRST	ROOM 115	WALL	DRYWALL	INTACT	WHITE	11/27/2010 14:46	Negative	0.00
157	B	FIRST	ROOM 115	SHOWER STALL	METAL	INTACT	GREY	11/27/2010 14:47	Negative	0.00
158	C	FIRST	ROOM 115	BENCH	PLASTIC	INTACT	WHITE	11/27/2010 14:48	Negative	0.00
159	Floor	FIRST	ROOM 115	FLOOR	TILE	INTACT	GREY	11/27/2010 14:49	Negative	0.00
160	D	FIRST	ROOM 115	DOOR	METAL	INTACT	GREY	11/27/2010 14:50	Negative	0.00
161	B	FIRST	ROOM 115	DR. CASING	METAL	INTACT	GREY	11/27/2010 14:51	Negative	0.00
162	B	FIRST	ROOM 115	DOOR	METAL	INTACT	GREY	11/27/2010 14:51	Negative	0.01
163	B	FIRST	ROOM 118	DOOR	METAL	FAIR	GREY	11/27/2010 14:52	Negative	0.00
164	D	FIRST	ROOM 118	DOOR	METAL	FAIR	GREY	11/27/2010 14:52	Negative	0.00
165	A	FIRST	ROOM 118	WALL	DRYWALL	INTACT	WHITE	11/27/2010 14:53	Negative	0.00
166	B	FIRST	ROOM 118	WALL	DRYWALL	INTACT	WHITE	11/27/2010 14:53	Negative	0.00
167	C	FIRST	ROOM 118	WALL	DRYWALL	INTACT	WHITE	11/27/2010 14:54	Negative	0.00
168	D	FIRST	ROOM 118	WALL	DRYWALL	INTACT	WHITE	11/27/2010 14:54	Negative	0.00
169	D	FIRST	ROOM 118	SUPPORT COLUMN	CONCRETE	INTACT	WHITE	11/27/2010 14:55	Negative	0.02
170	D	FIRST	ROOM 118	WALL	DRYWALL	INTACT	RED	11/27/2010 14:56	Negative	0.00
171	A	FIRST	ROOM 118	WALL	DRYWALL	INTACT	RED	11/27/2010 14:56	Negative	0.00
172	C	FIRST	ROOM 118	WALL	DRYWALL	INTACT	RED	11/27/2010 14:57	Null	0.00
173	B	FIRST	ROOM 118	WALL	DRYWALL	INTACT	RED	11/27/2010 14:57	Negative	0.00

Table 2  
**Summary of XRF<sup>1</sup> Results**  
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**Project Name:** Lead-Based Paint Inspection

**Project Address:** Building 5210, United States Air Force Prep School, Colorado Springs, CO

**Project Number:** 3010128

XRF										Lead Content (mg/cm <sup>2</sup> ) <sup>2</sup>
Number	Side	Floor	Room	Component	Substrate	Condition	Color	Date/Time	Result	
174	C	FIRST	ROOM 118	WALL	DRYWALL	INTACT	RED	11/27/2010 14:58	Negative	0.00
175	D	FIRST	HALL 120	WALL	DRYWALL	INTACT	RED	11/27/2010 14:59	Negative	0.00
176	B	FIRST	HALL 120	WALL	DRYWALL	INTACT	RED	11/27/2010 15:00	Negative	0.00
177	A	FIRST	HALL 120	WALL	DRYWALL	INTACT	RED	11/27/2010 15:00	Negative	0.00
178	A	EXT	EXTERIOR	DOOR	METAL	FAIR	BLACK	11/27/2010 15:03	Negative	0.00
179	A	EXT	EXTERIOR	DR. CASING	METAL	INTACT	BLACK	11/27/2010 15:03	Negative	0.00
180	A	EXT	EXTERIOR	WNDW CASING	METAL	INTACT	BLACK	11/27/2010 15:04	Negative	0.00
181	A	EXT	EXTERIOR	WNDW CASING	METAL	INTACT	BLACK	11/27/2010 15:05	Null	0.00
182	A	EXT	EXT FOYER	WNDW CASING	METAL	INTACT	BLACK	11/27/2010 15:05	Negative	0.00
183	A	EXT	EXT FOYER	SUPPORT BEAM	METAL	INTACT	BLACK	11/27/2010 15:06	Negative	0.00
184	A	EXT	EXTERIOR	RAMP HAND RAIL	METAL	INTACT	BLACK	11/27/2010 15:07	Negative	0.02
185	A	EXT	EXTERIOR	RAMP HAND RAIL	METAL	INTACT	BLACK	11/27/2010 15:07	Negative	0.10
186	A	EXT	EXTERIOR	VERTICAL BEAM	METAL	FAIR <sup>7</sup>	WHITE	11/27/2010 15:08	Negative	0.00
187	A	EXT	EXTERIOR	VERTICAL BEAM	METAL	FAIR	BLACK	11/27/2010 15:09	Negative	0.00
188	B	EXT	EXTERIOR	WNDW CASING	METAL	FAIR	BLACK	11/27/2010 15:09	Negative	0.00
189	B	EXT	EXTERIOR	EXT. SIDING	METAL	INTACT	BLACK	11/27/2010 15:10	Negative	0.00
190	B	EXT	EXTERIOR	EXT. SIDING	METAL	INTACT	BLACK	11/27/2010 15:11	Negative	0.00
191	B	EXT	EXTERIOR	WNDW CASING	METAL	INTACT	BLACK	11/27/2010 15:12	Negative	0.00
192	C	EXT	EXTERIOR	HORIZONTAL BEAM	METAL	POOR <sup>8</sup>	BLACK	11/27/2010 15:13	Negative	0.08
193	C	EXT	EXTERIOR	WNDW CASING	METAL	INTACT	BLACK	11/27/2010 15:14	Negative	0.00
194	C	EXT	EXTERIOR	DOOR RHT	METAL	INTACT	BLACK	11/27/2010 15:15	Negative	0.00
195	C	EXT	EXTERIOR	VENT PANEL	METAL	INTACT	BLACK	11/27/2010 15:15	Negative	0.00
196	C	EXT	EXTERIOR	WNDW CASING	METAL	INTACT	BLACK	11/27/2010 15:16	Negative	0.00
197	C	EXT	EXTERIOR	DOOR LFT	METAL	FAIR	BLACK	11/27/2010 15:17	Negative	0.00
198	C	EXT	EXTERIOR	DR. CASING	METAL	INTACT	BLACK	11/27/2010 15:18	Negative	0.00
199	C	EXT	EXTERIOR	WNDW CASING	METAL	INTACT	BLACK	11/27/2010 15:18	Negative	-0.27
200 <sup>9</sup>	D	EXT	EXTERIOR	VERTICAL BEAM	METAL	FAIR	WHITE	11/27/2010 15:19	Positive	2.10
201	C	EXT	EXTERIOR	VERTICAL BEAM	METAL	FAIR	WHITE	11/27/2010 15:20	Positive	1.60

Table 2  
**Summary of XRF<sup>1</sup> Results**  
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**Project Name:** Lead-Based Paint Inspection

**Project Address:** Building 5210, United States Air Force Prep School, Colorado Springs, CO

**Project Number:** 3010128

XRF										Lead Content
Number	Side	Floor	Room	Component	Substrate	Condition	Color	Date/Time	Result	(mg/cm <sup>2</sup> ) <sup>2</sup>
202	D	EXT	EXTERIOR	VERTICAL BEAM	METAL	FAIR	WHITE	11/27/2010 15:20	Positive	2.20
203	D	EXT	EXTERIOR	VERTICAL BEAM	METAL	FAIR	BLACK	11/27/2010 15:21	Negative	0.12
204	C	EXT	EXTERIOR	VERTICAL BEAM	METAL	FAIR	BLACK	11/27/2010 15:21	Negative	0.13
205	D	EXT	EXTERIOR	WNDW CASING	METAL	INTACT	BLACK	11/27/2010 15:22	Null	0.00
206	D	EXT	EXTERIOR	WNDW CASING	METAL	INTACT	BLACK	11/27/2010 15:22	Negative	0.00
207	D	EXT	EXTERIOR	EXT. SIDING	METAL	INTACT	BLACK	11/27/2010 15:23	Negative	-0.34
208	D	EXT	EXTERIOR	EXT. SIDING	METAL	INTACT	BLACK	11/27/2010 15:24	Negative	-0.46
209	D	EXT	EXTERIOR	WNDW CASING	METAL	INTACT	BLACK	11/27/2010 15:24	Negative	0.00
210	D	EXT	EXTERIOR	VERTICAL BEAM	METAL	INTACT	WHITE	11/27/2010 15:25	Negative	0.00
211	D	EXT	EXTERIOR	VERTICAL BEAM	METAL	INTACT	BLACK	11/27/2010 15:26	Negative	0.00
212	A	EXT	EXTERIOR	HORIZONTAL BEAM	METAL	POOR	BLACK	11/27/2010 15:26	Negative	0.00
213	A	SECOND	STAIRWAY 1	WNDW CASING	METAL	INTACT	BLACK	11/27/2010 15:33	Negative	0.00
214	A	SECOND	STAIRWAY 1	FLOOR REGISTER	METAL	INTACT	WHITE	11/27/2010 15:34	Negative	0.00
215	B	SECOND	STAIRWAY 1	WALL	DRYWALL	INTACT	WHITE	11/27/2010 15:35	Negative	0.00
216	C	SECOND	STAIRWAY 1	WALL	DRYWALL	FAIR	WHITE	11/27/2010 15:35	Negative	0.00
217	D	SECOND	STAIRWAY 1	WALL	DRYWALL	INTACT	WHITE	11/27/2010 15:35	Null	0.01
218	D	SECOND	STAIRWAY 1	WALL	DRYWALL	INTACT	WHITE	11/27/2010 15:36	Negative	0.00
219	D	SECOND	STAIRWAY 1	SUPPORT COLUMN	CONCRETE	INTACT	WHITE	11/27/2010 15:36	Null	0.00
220	D	SECOND	STAIRWAY 1	SUPPORT COLUMN	CONCRETE	INTACT	WHITE	11/27/2010 15:37	Negative	0.01
221	C	SECOND	STAIRWAY 1	STR HAND RAIL	METAL	INTACT	BLACK	11/27/2010 15:37	Negative	0.00
222	C	SECOND	STAIRWAY 1	DOOR RHT	METAL	INTACT	GREY	11/27/2010 15:38	Negative	0.00
223	C	SECOND	STAIRWAY 1	DR. CASING RHT	METAL	FAIR	GREY	11/27/2010 15:38	Negative	0.00
224	C	SECOND	STAIRWAY 1	DR. CASING LFT	METAL	FAIR	GREY	11/27/2010 15:39	Negative	0.00
225	C	SECOND	STAIRWAY 1	DOOR LFT	METAL	INTACT	GREY	11/27/2010 15:39	Negative	0.00
226	A	SECOND	HALL 221	DOOR	METAL	INTACT	GREY	11/27/2010 15:40	Negative	0.00
227	A	SECOND	HALL 221	DOOR JAMB	METAL	FAIR	GREY	11/27/2010 15:41	Negative	0.00
228	B	SECOND	HALL 221	DOOR RM 213	WOOD	INTACT	VARNISH	11/27/2010 15:42	Negative	0.00
229	B	SECOND	HALL 221	DR. JAMB RM 213	METAL	FAIR	GREY	11/27/2010 15:42	Negative	0.01
230	B	SECOND	HALL 221	DR. JAMB RM 211	METAL	FAIR	GREY	11/27/2010 15:43	Negative	0.00

Table 2  
**Summary of XRF<sup>1</sup> Results**  
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**Project Name:** Lead-Based Paint Inspection

**Project Address:** Building 5210, United States Air Force Prep School, Colorado Springs, CO

**Project Number:** 3010128

XRF										Lead Content (mg/cm <sup>2</sup> ) <sup>2</sup>
Number	Side	Floor	Room	Component	Substrate	Condition	Color	Date/Time	Result	
231	B	SECOND	HALL 221	DOOR RM 211	WOOD	INTACT	VARNISH	11/27/2010 15:44	Negative	0.00
232	D	SECOND	HALL 221	DOOR RM 216	METAL	INTACT	GREY	11/27/2010 15:45	Negative	0.00
233	D	SECOND	HALL 221	DOOR JAMB RM 216	METAL	FAIR	GREY	11/27/2010 15:46	Negative	0.00
234	D	SECOND	HALL 221	DOOR JAMB RM 215	METAL	FAIR	GREY	11/27/2010 15:47	Negative	0.00
235	D	SECOND	HALL 221	DOOR RM 215	METAL	INTACT	GREY	11/27/2010 15:48	Negative	0.00
236	A	SECOND	HALL 221	WALL	DRYWALL	INTACT	WHITE	11/27/2010 15:48	Negative	0.00
237	B	SECOND	HALL 221	WALL	DRYWALL	INTACT	WHITE	11/27/2010 15:49	Negative	0.00
238	C	SECOND	HALL 221	WALL	DRYWALL	INTACT	WHITE	11/27/2010 15:49	Negative	0.00
239	D	SECOND	HALL 221	WALL	DRYWALL	INTACT	WHITE	11/27/2010 15:50	Negative	0.00
240	A	SECOND	HALL 222	WALL	DRYWALL	INTACT	WHITE	11/27/2010 15:50	Negative	0.00
241	C	SECOND	HALL 222	WALL	DRYWALL	INTACT	WHITE	11/27/2010 15:51	Negative	0.00
242	A	SECOND	HALL 220	WALL	DRYWALL	INTACT	WHITE	11/27/2010 15:52	Negative	0.00
243	B	SECOND	HALL 220	WALL	DRYWALL	INTACT	WHITE	11/27/2010 15:52	Negative	0.00
244	A	SECOND	HALL 220	DOOR	METAL	INTACT	GREY	11/27/2010 15:53	Negative	0.00
245	B	SECOND	HALL 220	DOOR LFT RM 218	METAL	FAIR	GREY	11/27/2010 15:53	Negative	0.00
246	B	SECOND	HALL 220	DR. JAMB LFT RM 218	METAL	FAIR	GREY	11/27/2010 15:54	Negative	0.00
247	B	SECOND	HALL 220	DR. JAMB RHT RM 218	METAL	INTACT	GREY	11/27/2010 15:54	Negative	0.00
248	B	SECOND	HALL 220	DOOR RHT RM 218	METAL	INTACT	GREY	11/27/2010 15:55	Negative	0.00
249	B	SECOND	HALL 220	DOOR RM 215	METAL	INTACT	GREY	11/27/2010 15:56	Negative	0.00
250	B	SECOND	HALL 220	DR. JAMB RM 215	METAL	FAIR	GREY	11/27/2010 15:56	Negative	0.00
251	C	SECOND	HALL 220	WALL	DRYWALL	INTACT	WHITE	11/27/2010 15:57	Negative	0.00
252	C	SECOND	HALL 220	WALL REGISTER	METAL	INTACT	GREY	11/27/2010 15:58	Negative	0.00
253	C	SECOND	HALL 220	WNDW CASING	METAL	INTACT	BLACK	11/27/2010 15:58	Null	0.00
254	C	SECOND	HALL 220	WNDW CASING	METAL	INTACT	BLACK	11/27/2010 15:58	Negative	0.00
255	D	SECOND	HALL 220	WALL	DRYWALL	INTACT	WHITE	11/27/2010 15:59	Null	0.01
256	D	SECOND	HALL 220	WALL	DRYWALL	INTACT	WHITE	11/27/2010 15:59	Negative	0.00
257	D	SECOND	HALL 220	DOOR RM 201	WOOD	INTACT	WHITE	11/27/2010 16:00	Negative	0.00
258	D	SECOND	HALL 220	DR. JAMB RM 201	METAL	FAIR	GREY	11/27/2010 16:01	Negative	0.00
259	D	SECOND	HALL 220	DR. JAMB 202	METAL	FAIR	GREY	11/27/2010 16:03	Negative	0.00



Table 2  
**Summary of XRF<sup>1</sup> Results**  
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**Project Name:** Lead-Based Paint Inspection

**Project Address:** Building 5210, United States Air Force Prep School, Colorado Springs, CO

**Project Number:** 3010128

XRF										Lead Content (mg/cm <sup>2</sup> ) <sup>2</sup>
Number	Side	Floor	Room	Component	Substrate	Condition	Color	Date/Time	Result	
260	D	SECOND	HALL 220	DOOR RM 202	WOOD	INTACT	VARNISH	11/27/2010 16:04	Negative	0.00
261	A	SECOND	RM 201	WALL	DRYWALL	INTACT	WHITE	11/27/2010 16:06	Negative	0.00
262	B	SECOND	RM 201	WALL	DRYWALL	INTACT	WHITE	11/27/2010 16:06	Negative	0.00
263	C	SECOND	RM 201	WALL	DRYWALL	INTACT	WHITE	11/27/2010 16:07	Negative	0.00
264	D	SECOND	RM 201	WNDW CASING	METAL	INTACT	BLACK	11/27/2010 16:08	Negative	-0.59
265	D	SECOND	RM 201	WALL REGISTER	METAL	FAIR	GREY	11/27/2010 16:08	Negative	0.00
266	B	SECOND	RM 201	CLST DOOR RHT	WOOD	INTACT	VARNISH	11/27/2010 16:09	Null	0.00
267	B	SECOND	RM 201	CLST DOOR RHT	WOOD	INTACT	VARNISH	11/27/2010 16:09	Negative	0.00
268	B	SECOND	RM 201	DOOR	WOOD	INTACT	VARNISH	11/27/2010 16:10	Negative	0.02
269	B	SECOND	RM 202	DOOR	WOOD	INTACT	VARNISH	11/27/2010 16:11	Negative	0.00
270	B	SECOND	RM 202	CLST DOOR RHT	WOOD	INTACT	VARNISH	11/27/2010 16:12	Negative	0.00
271	A	SECOND	RM 202	WALL	DRYWALL	INTACT	WHITE	11/27/2010 16:12	Negative	0.00
272	B	SECOND	RM 202	WALL	DRYWALL	INTACT	WHITE	11/27/2010 16:12	Negative	0.00
273	C	SECOND	RM 202	WALL	DRYWALL	INTACT	WHITE	11/27/2010 16:13	Negative	0.00
274	D	SECOND	RM 202	WNDW CASING	METAL	INTACT	BLACK	11/27/2010 16:14	Negative	0.00
275	D	SECOND	RM 202	WALL REGISTER	METAL	FAIR	GREY	11/27/2010 16:14	Negative	0.00
276	B	SECOND	RM 211	WALL REGISTER	METAL	FAIR	GREY	11/27/2010 16:17	Negative	0.00
277	B	SECOND	RM 211	WNDW CASING	METAL	INTACT	BLACK	11/27/2010 16:18	Null	0.00
278	B	SECOND	RM 211	WNDW CASING	METAL	INTACT	BLACK	11/27/2010 16:18	Negative	0.00
279	A	SECOND	RM 211	WALL	DRYWALL	INTACT	WHITE	11/27/2010 16:18	Null	0.05
280	A	SECOND	RM 211	WALL	DRYWALL	INTACT	WHITE	11/27/2010 16:19	Negative	0.00
281	C	SECOND	RM 211	WALL	DRYWALL	INTACT	WHITE	11/27/2010 16:19	Negative	0.00
282	D	SECOND	RM 211	WALL	DRYWALL	INTACT	WHITE	11/27/2010 16:20	Negative	0.00
283	D	SECOND	RM 211	CLST DOOR RHT	WOOD	INTACT	VARNISH	11/27/2010 16:20	Negative	0.00
284	D	SECOND	RM 211	DOOR	WOOD	INTACT	VARNISH	11/27/2010 16:21	Negative	0.00
285	D	SECOND	RM 213	DOOR	WOOD	INTACT	VARNISH	11/27/2010 16:22	Negative	0.00
286	D	SECOND	RM 213	CLST DOOR LFT	WOOD	INTACT	VARNISH	11/27/2010 16:22	Negative	0.00
287	A	SECOND	RM 213	WALL	DRYWALL	INTACT	WHITE	11/27/2010 16:23	Negative	0.00
288	C	SECOND	RM 213	WALL	DRYWALL	INTACT	WHITE	11/27/2010 16:23	Null	0.00

Table 2  
**Summary of XRF<sup>1</sup> Results**  
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**Project Name:** Lead-Based Paint Inspection

**Project Address:** Building 5210, United States Air Force Prep School, Colorado Springs, CO

**Project Number:** 3010128

XRF										Lead Content (mg/cm <sup>2</sup> ) <sup>2</sup>
Number	Side	Floor	Room	Component	Substrate	Condition	Color	Date/Time	Result	
289	C	SECOND	RM 213	WALL	DRYWALL	INTACT	WHITE	11/27/2010 16:24	Negative	0.00
290	D	SECOND	RM 213	WALL	DRYWALL	INTACT	WHITE	11/27/2010 16:24	Negative	0.00
291	B	SECOND	RM 213	WALL REGISTER	METAL	INTACT	GREY	11/27/2010 16:25	Negative	0.00
292	B	SECOND	RM 213	WNDW CASING	METAL	INTACT	BLACK	11/27/2010 16:25	Null	0.00
293	B	SECOND	RM 213	WNDW CASING	METAL	INTACT	BLACK	11/27/2010 16:26	Negative	0.00
294	A	SECOND	RM 216	WALL	DRYWALL	INTACT	WHITE	11/27/2010 16:27	Negative	0.00
295	B	SECOND	RM 216	WALL	DRYWALL	INTACT	WHITE	11/27/2010 16:28	Negative	0.00
296	C	SECOND	RM 216	WALL	DRYWALL	INTACT	WHITE	11/27/2010 16:28	Negative	0.00
297	D	SECOND	RM 216	WALL	DRYWALL	INTACT	WHITE	11/27/2010 16:28	Negative	0.00
298	D	SECOND	RM 216	DOOR LFT	METAL	INTACT	GREY	11/27/2010 16:29	Negative	0.00
299	D	SECOND	RM 216	DOOR RHT	METAL	FAIR	GREY	11/27/2010 16:29	Negative	0.00
300	B	SECOND	RM 216	DOOR RHT	METAL	INTACT	GREY	11/27/2010 16:30	Negative	0.00
301	B	SECOND	RM 216	DOOR CASING RHT	METAL	INTACT	GREY	11/27/2010 16:30	Negative	0.00
302	D	SECOND	HALL 220	DR. JAMB LFT	METAL	FAIR	GREY	11/27/2010 16:31	Negative	0.00
303	D	SECOND	HALL 220	DOOR LFT	METAL	INTACT	GREY	11/27/2010 16:32	Negative	0.00
304	D	SECOND	RM 215	DOOR	METAL	INTACT	GREY	11/27/2010 16:33	Negative	0.00
305	B	SECOND	RM 215	DOOR	METAL	INTACT	GREY	11/27/2010 16:34	Negative	0.00
306	A	SECOND	RM 215	WALL	DRYWALL	INTACT	WHITE	11/27/2010 16:34	Negative	0.00
307	A	SECOND	RM 215	WALL	TILE	INTACT	WHITE	11/27/2010 16:35	Negative	0.06
308	B	SECOND	RM 215	WALL	TILE	INTACT	WHITE	11/27/2010 16:35	Negative	0.08
309	B	SECOND	RM 215	WALL	DRYWALL	INTACT	WHITE	11/27/2010 16:35	Negative	0.00
310	C	SECOND	RM 215	WALL	DRYWALL	INTACT	WHITE	11/27/2010 16:36	Negative	0.00
311	C	SECOND	RM 215	WALL	TILE	INTACT	WHITE	11/27/2010 16:36	Negative	0.01
312	D	SECOND	RM 215	WALL	TILE	INTACT	WHITE	11/27/2010 16:37	Negative	0.07
313	D	SECOND	RM 215	WALL	DRYWALL	INTACT	WHITE	11/27/2010 16:37	Negative	0.00
314	A	THIRD	STAIRWAY 1	WALL	DRYWALL	INTACT	WHITE	11/27/2010 16:40	Negative	0.00
315	B	THIRD	STAIRWAY 1	WALL	DRYWALL	INTACT	WHITE	11/27/2010 16:40	Negative	0.00
316	C	THIRD	STAIRWAY 1	WALL	DRYWALL	INTACT	WHITE	11/27/2010 16:41	Negative	0.00
317	D	THIRD	STAIRWAY 1	SUPPORT COLUMN	CONCRETE	INTACT	WHITE	11/27/2010 16:42	Negative	0.00

Table 2  
**Summary of XRF<sup>1</sup> Results**  
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**Project Name:** Lead-Based Paint Inspection

**Project Address:** Building 5210, United States Air Force Prep School, Colorado Springs, CO

**Project Number:** 3010128

XRF										Lead Content (mg/cm <sup>2</sup> ) <sup>2</sup>
Number	Side	Floor	Room	Component	Substrate	Condition	Color	Date/Time	Result	
318	A	THIRD	STAIRWAY 1	WALL REGISTER	METAL	INTACT	WHITE	11/27/2010 16:42	Negative	0.00
319	A	THIRD	STAIRWAY 1	WNDW CASING	METAL	INTACT	BLACK	11/27/2010 16:43	Negative	-0.36
320	C	THIRD	STAIRWAY 1	DOOR RHT	METAL	INTACT	GREY	11/27/2010 16:43	Negative	0.00
321	C	THIRD	STAIRWAY 1	DR. JAMB RHT	METAL	INTACT	GREY	11/27/2010 16:44	Negative	0.00
322	C	THIRD	STAIRWAY 1	DR. JAMB LFT	METAL	FAIR	GREY	11/27/2010 16:45	Negative	0.00
323	C	THIRD	STAIRWAY 1	DOOR LFT	METAL	INTACT	GREY	11/27/2010 16:45	Negative	0.00
324	A	THIRD	HALL 321	DOOR	METAL	INTACT	GREY	11/27/2010 16:57	Negative	0.00
325	D	THIRD	HALL 321	DOOR RM 316	METAL	INTACT	DK GREY	11/27/2010 17:00	Negative	0.00
326	D	THIRD	HALL 321	DR. JAMB RM 316	METAL	INTACT	DK GREY	11/27/2010 17:00	Null	0.00
327	D	THIRD	HALL 321	DR. JAMB RM 316	METAL	INTACT	DK GREY	11/27/2010 17:00	Negative	0.00
328	B	THIRD	HALL 320	DR. JAMB RM 316	METAL	FAIR	GREY	11/27/2010 17:01	Negative	0.00
329	B	THIRD	HALL 320	DOOR RM 316	METAL	FAIR	GREY	11/27/2010 17:02	Negative	0.00
330	D	THIRD	ROOM 316	DOOR	METAL	FAIR	GREY	11/27/2010 17:03	Negative	0.00
331	B	THIRD	ROOM 316	DOOR	METAL	INTACT	DK GREY	11/27/2010 17:03	Negative	0.00
332	A	THIRD	ROOM 316	WALL	DRYWALL	SUBSTRATE <sup>10</sup>	WHITE	11/27/2010 17:04	Negative	0.00
333	B	THIRD	ROOM 316	WALL	DRYWALL	INTACT	WHITE	11/27/2010 17:04	Negative	0.00
334	C	THIRD	ROOM 316	WALL	DRYWALL	INTACT	WHITE	11/27/2010 17:05	Negative	0.00
335	D	THIRD	ROOM 316	WALL	DRYWALL	INTACT	WHITE	11/27/2010 17:05	Negative	0.00
336	A	THIRD	HALL 321	WALL	DRYWALL	INTACT	WHITE	11/27/2010 17:06	Negative	0.02
337	B	THIRD	HALL 321	WALL	DRYWALL	INTACT	WHITE	11/27/2010 17:07	Negative	0.00
338	C	THIRD	HALL 321	WALL	DRYWALL	INTACT	WHITE	11/27/2010 17:07	Negative	0.00
339	D	THIRD	HALL 321	WALL	DRYWALL	INTACT	WHITE	11/27/2010 17:08	Negative	0.00
340	B	THIRD	HALL 321	DOOR RM 308	WOOD	INTACT	VARNISH	11/27/2010 17:09	Negative	0.00
341	B	THIRD	HALL 321	DOOR RM 310	WOOD	INTACT	VARNISH	11/27/2010 17:09	Negative	0.00
342	D	THIRD	RM 308	DOOR	WOOD	INTACT	VARNISH	11/27/2010 17:10	Negative	0.00
343	D	THIRD	RM 308	DR. JAMB	METAL	FAIR	GREY	11/27/2010 17:11	Negative	0.00
344	D	THIRD	RM 308	CLST DOOR	WOOD	INTACT	VARNISH	11/27/2010 17:11	Negative	0.00
345	B	THIRD	RM 308	WNDW CASING	METAL	INTACT	BLACK	11/27/2010 17:12	Negative	0.00

Table 2  
**Summary of XRF<sup>1</sup> Results**  
Page 13 of 16

**Project Name:** Lead-Based Paint Inspection

**Project Address:** Building 5210, United States Air Force Prep School, Colorado Springs, CO

**Project Number:** 3010128

XRF										Lead Content (mg/cm <sup>2</sup> ) <sup>2</sup>
Number	Side	Floor	Room	Component	Substrate	Condition	Color	Date/Time	Result	
346	A	THIRD	RM 308	WALL	DRYWALL	INTACT	WHITE	11/27/2010 17:12	Negative	0.00
347	C	THIRD	RM 308	WALL	DRYWALL	INTACT	WHITE	11/27/2010 17:13	Negative	0.00
348	D	THIRD	RM 308	WALL	DRYWALL	INTACT	WHITE	11/27/2010 17:13	Negative	0.00
349	A	THIRD	RM 310	WALL	DRYWALL	INTACT	WHITE	11/27/2010 17:14	Negative	0.00
350	C	THIRD	RM 310	WALL	DRYWALL	INTACT	WHITE	11/27/2010 17:15	Negative	0.00
351	D	THIRD	RM 310	WALL	DRYWALL	INTACT	WHITE	11/27/2010 17:15	Negative	0.00
352	D	THIRD	RM 310	DOOR	WOOD	INTACT	VARNISH	11/27/2010 17:16	Negative	0.00
353	D	THIRD	RM 310	CLST DOOR LFT	WOOD	INTACT	VARNISH	11/27/2010 17:16	Negative	0.00
354	N/A	N/A	SHUTTER CAL	N/A	N/A	N/A	N/A	11/27/2010 17:23	-	1.63
355	N/A	N/A	CALIBRATE	N/A	N/A	N/A	N/A	11/27/2010 17:26	Positive	1.00
356	N/A	N/A	CALIBRATE	N/A	N/A	N/A	N/A	11/27/2010 17:28	Negative	0.90
357	N/A	N/A	CALIBRATE	N/A	N/A	N/A	N/A	11/27/2010 17:31	Negative	0.90
358	B	THIRD	RM 310	WNDW CASING	METAL	INTACT	BLACK	11/27/2010 17:32	Negative	0.00
359	B	THIRD	RM 307	WNDW CASING	METAL	INTACT	BLACK	11/27/2010 17:34	Null	0.30
360	B	THIRD	RM 307	WNDW CASING	METAL	INTACT	BLACK	11/27/2010 17:34	Negative	-0.51
361	B	THIRD	RM 307	WALL REGISTER	METAL	INTACT	GREY	11/27/2010 17:35	Negative	0.00
362	A	THIRD	RM 307	WALL	DRYWALL	INTACT	WHITE	11/27/2010 17:35	Negative	0.00
363	C	THIRD	RM 307	WALL	DRYWALL	INTACT	WHITE	11/27/2010 17:35	Negative	0.00
364	D	THIRD	RM 307	WALL	DRYWALL	INTACT	WHITE	11/27/2010 17:36	Negative	0.00
365	D	THIRD	RM 307	CLST DOOR LFT	WOOD	INTACT	VARNISH	11/27/2010 17:37	Negative	0.00
366	D	THIRD	RM 307	DOOR	WOOD	INTACT	VARNISH	11/27/2010 17:37	Negative	0.00
367	B	THIRD	HALL 321	DR. JAMB	METAL	INTACT	GREY	11/27/2010 17:38	Negative	0.00
368	B	THIRD	HALL 321	DOOR RM 307	WOOD	INTACT	VARNISH	11/27/2010 17:39	Negative	0.00
369	A	THIRD	HALL 322	WALL	DRYWALL	INTACT	WHITE	11/27/2010 17:39	Negative	0.00
370	C	THIRD	HALL 322	WALL	DRYWALL	INTACT	WHITE	11/27/2010 17:40	Negative	0.00
371	D	THIRD	HALL 321	DOOR BATH 315	METAL	INTACT	GREY	11/27/2010 17:40	Negative	0.00
372	D	THIRD	HALL 321	DR. JAMB BATH 315	METAL	INTACT	GREY	11/27/2010 17:41	Negative	0.00
373	D	THIRD	ROOM 315	DR. JAMB	METAL	INTACT	GREY	11/27/2010 17:41	Negative	0.00
374	D	THIRD	ROOM 315	DOOR	METAL	INTACT	GREY	11/27/2010 17:42	Negative	0.00

Table 2  
**Summary of XRF<sup>1</sup> Results**  
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**Project Name:** Lead-Based Paint Inspection

**Project Address:** Building 5210, United States Air Force Prep School, Colorado Springs, CO

**Project Number:** 3010128

XRF										Lead Content (mg/cm <sup>2</sup> ) <sup>2</sup>
Number	Side	Floor	Room	Component	Substrate	Condition	Color	Date/Time	Result	
375	B	THIRD	ROOM 315	DOOR	METAL	INTACT	GREY	11/27/2010 17:42	Negative	0.00
376	A	THIRD	ROOM 315	WALL	DRYWALL	INTACT	WHITE	11/27/2010 17:43	Null	0.00
377	A	THIRD	ROOM 315	WALL	DRYWALL	INTACT	WHITE	11/27/2010 17:43	Null	0.00
378	A	THIRD	ROOM 315	WALL	DRYWALL	INTACT	WHITE	11/27/2010 17:43	Negative	0.00
379	A	THIRD	ROOM 315	WALL	TILE	INTACT	WHITE	11/27/2010 17:43	Negative	0.01
380	B	THIRD	ROOM 315	WALL	TILE	INTACT	WHITE	11/27/2010 17:44	Negative	0.06
381	B	THIRD	ROOM 315	WALL	DRYWALL	INTACT	WHITE	11/27/2010 17:44	Negative	0.00
382	C	THIRD	ROOM 315	WALL	DRYWALL	INTACT	WHITE	11/27/2010 17:44	Negative	0.00
383	C	THIRD	ROOM 315	WALL	TILE	INTACT	WHITE	11/27/2010 17:45	Negative	0.01
384	D	THIRD	ROOM 315	WALL	TILE	INTACT	WHITE	11/27/2010 17:45	Negative	0.01
385	D	THIRD	ROOM 315	WALL	DRYWALL	INTACT	WHITE	11/27/2010 17:46	Negative	0.00
386	B	THIRD	HALL 320	DOOR BATH	METAL	INTACT	GREY	11/27/2010 17:47	Negative	0.00
387	D	THIRD	HALL 320	DOOR RM 303	WOOD	INTACT	VARNISH	11/27/2010 17:48	Negative	0.00
388	D	THIRD	HALL 320	DR. JAMB RM 303	METAL	FAIR	GREY	11/27/2010 17:49	Negative	0.00
389	D	THIRD	HALL 320	DR. JAMB RM 304	METAL	FAIR	GREY	11/27/2010 17:49	Negative	0.00
390	D	THIRD	HALL 320	DOOR RM 304	WOOD	INTACT	VARNISH	11/27/2010 17:50	Negative	0.00
391	A	THIRD	HALL 320	DOOR	METAL	INTACT	GREY	11/27/2010 17:51	Negative	0.00
392	A	THIRD	HALL 320	WALL	DRYWALL	INTACT	WHITE	11/27/2010 17:51	Negative	0.00
393	B	THIRD	HALL 320	WALL	DRYWALL	INTACT	WHITE	11/27/2010 17:51	Negative	0.00
394	D	THIRD	HALL 320	WALL	DRYWALL	INTACT	WHITE	11/27/2010 17:52	Negative	0.00
395	A	THIRD	RM 304	WALL	DRYWALL	INTACT	WHITE	11/27/2010 17:53	Negative	0.00
396	C	THIRD	RM 304	WALL	DRYWALL	INTACT	WHITE	11/27/2010 17:53	Negative	0.00
397	B	THIRD	RM 304	WALL	DRYWALL	INTACT	WHITE	11/27/2010 17:54	Negative	0.00
398	D	THIRD	RM 304	WNDW CASING	METAL	INTACT	BLACK	11/27/2010 17:54	Negative	-0.23
399	D	THIRD	RM 304	WALL REGISTER	METAL	INTACT	GREY	11/27/2010 17:55	Negative	0.00
400	B	THIRD	RM 304	CLST DOOR LFT	WOOD	INTACT	VARNISH	11/27/2010 17:55	Negative	0.00
401	B	THIRD	RM 304	DOOR	WOOD	INTACT	VARNISH	11/27/2010 17:56	Negative	0.00
402	B	THIRD	RM 303	DOOR	WOOD	INTACT	VARNISH	11/27/2010 17:57	Negative	0.00
403	B	THIRD	RM 303	CLST DOOR RHT	WOOD	INTACT	VARNISH	11/27/2010 17:57	Negative	0.00

Table 2  
**Summary of XRF<sup>1</sup> Results**  
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**Project Name:** Lead-Based Paint Inspection

**Project Address:** Building 5210, United States Air Force Prep School, Colorado Springs, CO

**Project Number:** 3010128

XRF									Lead Content (mg/cm <sup>2</sup> ) <sup>2</sup>	
Number	Side	Floor	Room	Component	Substrate	Condition	Color	Date/Time	Result	
404	A	THIRD	RM 303	WALL	DRYWALL	INTACT	WHITE	11/27/2010 17:58	Negative	0.00
405	B	THIRD	RM 303	WALL	DRYWALL	INTACT	WHITE	11/27/2010 17:58	Negative	0.00
406	C	THIRD	RM 303	WALL	DRYWALL	INTACT	WHITE	11/27/2010 17:58	Negative	0.00
407	D	THIRD	RM 303	WNDW CASING	METAL	INTACT	BLACK	11/27/2010 17:59	Negative	0.00
408	D	THIRD	RM 303	WALL REGISTER	METAL	INTACT	GREY	11/27/2010 18:00	Negative	0.00
409	C	THIRD	HALL 320	WALL	DRYWALL	INTACT	WHITE	11/27/2010 18:01	Negative	0.00
410	C	THIRD	HALL 320	WALL REGISTER	METAL	INTACT	GREY	11/27/2010 18:02	Negative	0.00
411	C	THIRD	HALL 320	WNDW CASING	METAL	INTACT	BLACK	11/27/2010 18:02	Negative	0.00
412	D	THIRD	HALL 320	DOOR RM 324	METAL	INTACT	GREY	11/27/2010 18:03	Negative	0.00
413	D	THIRD	HALL 320	DR. JAMB RM 324	METAL	INTACT	GREY	11/27/2010 18:03	Negative	0.01
414	B	THIRD	STAIRWAY 2	DOOR	METAL	INTACT	GREY	11/27/2010 18:04	Negative	0.00
415	A	THIRD	STAIRWAY 2	STR TREAD	METAL	FAIR	WHITE	11/27/2010 18:06	Negative	0.00
416	A	THIRD	STAIRWAY 2	WALL	DRYWALL	INTACT	WHITE	11/27/2010 18:07	Negative	0.00
417	B	THIRD	STAIRWAY 2	WALL	DRYWALL	INTACT	WHITE	11/27/2010 18:07	Negative	0.01
418	B	SECOND	STAIRWAY 2	WALL	DRYWALL	INTACT	WHITE	11/27/2010 18:07	Negative	0.00
419	A	SECOND	STAIRWAY 2	WALL	DRYWALL	INTACT	WHITE	11/27/2010 18:08	Negative	0.00
420	D	SECOND	STAIRWAY 2	WALL	DRYWALL	INTACT	WHITE	11/27/2010 18:08	Negative	0.01
421	B	SECOND	STAIRWAY 2	STR HAND RAIL	METAL	INTACT	BLACK	11/27/2010 18:09	Negative	0.00
422	B	SECOND	STAIRWAY 2	DOOR	METAL	INTACT	GREY	11/27/2010 18:09	Negative	0.00
423	B	SECOND	STAIRWAY 2	DR. JAMB	METAL	INTACT	GREY	11/27/2010 18:09	Negative	0.00
424	D	SECOND	HALL 220	RM 224 DOOR	METAL	INTACT	GREY	11/27/2010 18:10	Negative	0.00
425	D	THIRD	STAIRWAY 2	STR HAND RAIL	METAL	INTACT	BLACK	11/27/2010 18:11	Negative	0.00
426	C	THIRD	STAIRWAY 2	WALL	DRYWALL	INTACT	WHITE	11/27/2010 18:12	Null	0.05
427	C	THIRD	STAIRWAY 2	WALL	DRYWALL	INTACT	WHITE	11/27/2010 18:13	Negative	0.00
428	N/A	N/A	CALIBRATE	N/A	N/A	N/A	N/A	11/27/2010 18:16	Negative	0.90
429	N/A	N/A	CALIBRATE	N/A	N/A	N/A	N/A	11/27/2010 18:17	Negative	0.90
430	N/A	N/A	CALIBRATE	N/A	N/A	N/A	N/A	11/27/2010 18:20	Positive	1.00
431	N/A	N/A	CALIBRATE	N/A	N/A	N/A	N/A	11/27/2010 18:23	Positive	1.00
432	N/A	N/A	SHUTTER CAL	N/A	N/A	N/A	N/A	11/28/2010 6:08	-	1.59

Table 2  
**Summary of XRF<sup>1</sup> Results**  
Page 16 of 16

**Project Name:** Lead-Based Paint Inspection

**Project Address:** Building 5210, United States Air Force Prep School, Colorado Springs, CO

**Project Number:** 3010128

XRF										Lead Content (mg/cm <sup>2</sup> ) <sup>2</sup>
Number	Side	Floor	Room	Component	Substrate	Condition	Color	Date/Time	Result	
433	N/A	N/A	CALIBRATE	N/A	N/A	N/A	N/A	11/28/2010 6:10	Positive	1.10
434	N/A	N/A	CALIBRATE	N/A	N/A	N/A	N/A	11/28/2010 6:13	Positive	1.00
435	N/A	N/A	CALIBRATE	N/A	N/A	N/A	N/A	11/28/2010 6:16	Positive	1.00
436	Floor	SECOND	ROOM 215	FLOOR	TILE	INTACT	GREY	11/28/2010 6:17	Null	0.00
437	Floor	SECOND	ROOM 215	FLOOR	TILE	INTACT	GREY	11/28/2010 6:17	Negative	0.00
438	Floor	THIRD	ROOM 315	FLOOR	TILE	INTACT	GREY	11/28/2010 6:19	Negative	0.01
<b>439</b>	<b>B</b>	<b>EXT</b>	<b>EXTERIOR</b>	<b>VERTICAL BEAMS</b>	<b>METAL</b>	<b>FAIR</b>	<b>WHITE</b>	<b>11/28/2010 6:21</b>	<b>Positive</b>	<b>1.50</b>
<b>440</b>	<b>C</b>	<b>EXT</b>	<b>EXTERIOR</b>	<b>VERTICAL BEAMS</b>	<b>METAL</b>	<b>FAIR</b>	<b>WHITE</b>	<b>11/28/2010 6:22</b>	<b>Positive</b>	<b>1.30</b>
441	C	EXT	EXTERIOR	VERTICAL BEAMS	METAL	FAIR	BLACK	11/28/2010 6:22	Negative	0.09
442	N/A	N/A	CALIBRATE	N/A	N/A	N/A	N/A	11/28/2010 6:26	Positive	1.00
443	N/A	N/A	CALIBRATE	N/A	N/A	N/A	N/A	11/28/2010 6:29	Positive	1.00
444	N/A	N/A	CALIBRATE	N/A	N/A	N/A	N/A	11/28/2010 6:31	Positive	1.10

*Notes:*

1. XRF indicates X-Ray Fluorescence
2. mg/cm<sup>2</sup> indicates milligrams per square centimeter
3. N/A indicates this parameter was not applicable.
4. Intact indicates the paint is in good condition and not peeling, chipping, or flaking.
5. Fair indicates deteriorated paint on less than or equal to 2 square feet on large surface areas.
6. Fair indicates deteriorated paint on less than or equal to 10 percent of the total surface area of the component.
7. Fair indicates deteriorated paint on less than or equal to 20 square feet on large exterior surfaces.
8. Poor indicates deteriorated paint on greater than 2 square feet of the total surface area of the component.
9. **Bold** indicates Lead-Based paint as defined by Title X.
10. Substrate indicates the surface the paint was adhered to appeared to be damaged.

Table 3  
**Summary of XRF<sup>1</sup> Results**  
Page 1 of 16

**Project Name:** Lead-Based Paint Inspection

**Project Address:** Building 5212, United States Air Force Prep School, Colorado Springs, CO

**Project Number:** 3010128

XRF										Lead Content
Number	Side	Floor	Room	Component	Substrate	Condition	Color	Date/Time	Result	(mg/cm <sup>2</sup> ) <sup>2</sup>
1	N/A <sup>3</sup>	N/A	CALIBRATE	N/A	N/A	N/A	N/A	11/28/2010 6:26	Positive	1.00
2	N/A	N/A	CALIBRATE	N/A	N/A	N/A	N/A	11/28/2010 6:29	Positive	1.00
3	N/A	N/A	CALIBRATE	N/A	N/A	N/A	N/A	11/28/2010 6:31	Positive	1.10
4	N/A	N/A	SHUTTER CAL	N/A	N/A	N/A	N/A	11/28/2010 6:37	-	1.59
5	N/A	N/A	CALIBRATE	N/A	N/A	N/A	N/A	11/28/2010 6:40	Positive	1.00
6	N/A	N/A	CALIBRATE	N/A	N/A	N/A	N/A	11/28/2010 6:42	Positive	1.00
7	N/A	N/A	CALIBRATE	N/A	N/A	N/A	N/A	11/28/2010 6:45	Positive	1.00
8	A	EXT	EXTERIOR	DOOR	METAL	INTACT <sup>4</sup>	BLACK	11/28/2010 6:49	Negative	0.00
9	A	EXT	EXTERIOR	WNDW CASING	METAL	INTACT	BLACK	11/28/2010 6:49	Negative	0.00
10	A	EXT	EXTERIOR	VERTICAL BEAM	METAL	FAIR <sup>5</sup>	WHITE	11/28/2010 6:50	Negative	0.00
11	A	EXT	EXTERIOR	VERTICAL BEAM	METAL	FAIR	BLACK	11/28/2010 6:51	Negative	0.00
12	B	EXT	EXTERIOR	EXT. SIDING	METAL	INTACT	BLACK	11/28/2010 6:51	Negative	0.00
13	B	EXT	EXTERIOR	WNDW CASING	METAL	INTACT	BLACK	11/28/2010 6:52	Negative	0.00
<b>14<sup>6</sup></b>	<b>B</b>	<b>EXT</b>	<b>EXTERIOR</b>	<b>VERTICAL BEAM</b>	<b>METAL</b>	<b>FAIR</b>	<b>WHITE</b>	<b>11/28/2010 6:53</b>	<b>Positive</b>	<b>1.60</b>
15	C	EXT	EXTERIOR	VERTICAL BEAM	METAL	FAIR	BLACK	11/28/2010 6:53	Negative	0.10
16	C	EXT	EXTERIOR	DOOR RHT	METAL	FAIR	BLACK	11/28/2010 6:54	Negative	0.00
17	C	EXT	EXTERIOR	DOOR LFT	METAL	FAIR	BLACK	11/28/2010 6:55	Negative	0.00
18	C	EXT	EXTERIOR	EXT. SIDING	METAL	INTACT	BLACK	11/28/2010 6:56	Negative	0.00
<b>19</b>	<b>C</b>	<b>EXT</b>	<b>EXTERIOR</b>	<b>VERTICAL BEAM</b>	<b>METAL</b>	<b>FAIR</b>	<b>WHITE</b>	<b>11/28/2010 6:57</b>	<b>Positive</b>	<b>1.60</b>
20	D	EXT	EXTERIOR	VERTICAL BEAM	METAL	FAIR	BLACK	11/28/2010 6:57	Negative	0.04
21	D	EXT	EXTERIOR	EXT. SIDING	METAL	INTACT	BLACK	11/28/2010 6:58	Negative	0.00
22	D	EXT	EXTERIOR	WNDW CASING	METAL	INTACT	BLACK	11/28/2010 6:59	Negative	0.00
23	D	EXT	EXTERIOR	VERTICAL BEAM	METAL	FAIR	WHITE	11/28/2010 7:00	Negative	0.00
24	A	EXT	EXTERIOR	VERTICAL BEAM	METAL	FAIR	WHITE	11/28/2010 7:00	Negative	0.00
25	A	EXT	EXTERIOR	RAMP HAND RAIL	METAL	FAIR	BLACK	11/28/2010 7:01	Negative	0.02
26	A	EXT	EXTERIOR	WNDW CASING	METAL	INTACT	BLACK	11/28/2010 7:01	Negative	0.00
27	A	FIRST	STAIRWAY 1	DOOR	METAL	INTACT	BLACK	11/28/2010 7:03	Null	0.00
28	A	FIRST	STAIRWAY 1	DOOR	METAL	INTACT	BLACK	11/28/2010 7:03	Negative	0.00



Table 3  
**Summary of XRF<sup>1</sup> Results**  
Page 2 of 16

**Project Name:** Lead-Based Paint Inspection

**Project Address:** Building 5212, United States Air Force Prep School, Colorado Springs, CO

**Project Number:** 3010128

XRF										Lead Content
Number	Side	Floor	Room	Component	Substrate	Condition	Color	Date/Time	Result	(mg/cm <sup>2</sup> ) <sup>2</sup>
29	A	FIRST	STAIRWAY 1	DR. JAMB	METAL	FAIR <sup>7</sup>	BLACK	11/28/2010 7:04	Negative	0.00
30	C	FIRST	STAIRWAY 1	STR HAND RAIL	METAL	FAIR	BLACK	11/28/2010 7:04	Null	0.00
31	C	FIRST	STAIRWAY 1	STR HAND RAIL	METAL	FAIR	BLACK	11/28/2010 7:04	Negative	0.00
32	C	FIRST	STAIRWAY 1	STR RISER	METAL	FAIR	BLACK	11/28/2010 7:05	Negative	0.00
33	C	FIRST	STAIRWAY 1	STR STRINGER	METAL	INTACT	BLACK	11/28/2010 7:05	Negative	0.00
34	B	FIRST	STAIRWAY 1	WALL	DRYWALL	INTACT	WHITE	11/28/2010 7:06	Negative	0.00
35	C	FIRST	STAIRWAY 1	WALL	DRYWALL	FAIR <sup>8</sup>	WHITE	11/28/2010 7:06	Negative	0.00
36	D	FIRST	STAIRWAY 1	WALL	DRYWALL	INTACT	WHITE	11/28/2010 7:08	Negative	0.00
37	D	FIRST	STAIRWAY 1	WALL REGISTER	METAL	INTACT	GREY	11/28/2010 7:09	Negative	0.00
38	D	FIRST	STAIRWAY 1	DOOR RHT	METAL	INTACT	GREY	11/28/2010 7:09	Negative	0.00
39	D	FIRST	STAIRWAY 1	DR. JAMB RHT	METAL	FAIR	GREY	11/28/2010 7:10	Negative	0.00
40	C	FIRST	STAIRWAY 1	DR. JAMB LFT	METAL	FAIR	GREY	11/28/2010 7:10	Negative	0.00
41	C	FIRST	STAIRWAY 1	DOOR LFT	METAL	INTACT	GREY	11/28/2010 7:11	Negative	0.00
42	A	FIRST	STAIRWAY 1	DESK TRIM	WOOD	FAIR	STAIN	11/28/2010 7:12	Negative	0.00
43	A	FIRST	HALL 121	DOOR	METAL	FAIR	GREY	11/28/2010 7:13	Negative	0.00
44	D	FIRST	HALL 121	DOOR RM 118	METAL	FAIR	GREY	11/28/2010 7:15	Negative	0.00
45	D	FIRST	HALL 121	DR. JAMB RM 118	METAL	INTACT	GREY	11/28/2010 7:15	Negative	0.00
46	A	FIRST	HALL 121	WALL	DRYWALL	INTACT	WHITE	11/28/2010 7:16	Null	0.00
47	A	FIRST	HALL 121	WALL	DRYWALL	INTACT	WHITE	11/28/2010 7:16	Null	0.00
48	A	FIRST	HALL 121	WALL	DRYWALL	INTACT	WHITE	11/28/2010 7:16	Negative	0.00
49	B	FIRST	HALL 121	WALL	DRYWALL	INTACT	WHITE	11/28/2010 7:16	Negative	0.00
50	B	FIRST	HALL 121	WALL BY RM 111	DRYWALL	INTACT	GREEN	11/28/2010 7:17	Negative	0.00
51	C	FIRST	HALL 121	WALL	DRYWALL	INTACT	WHITE	11/28/2010 7:18	Negative	0.00
52	D	FIRST	HALL 121	WALL	DRYWALL	INTACT	WHITE	11/28/2010 7:18	Negative	0.00
53	D	FIRST	HALL 121	WALL REGISTER	METAL	INTACT	GREY	11/28/2010 7:19	Negative	0.00
54	C	FIRST	HALL 121	DOOR	METAL	INTACT	BLACK	11/28/2010 7:20	Null	0.00
55	C	FIRST	HALL 121	DOOR	METAL	INTACT	BLACK	11/28/2010 7:20	Negative	0.00
56	C	FIRST	HALL 121	DR. CASING	METAL	FAIR	BLACK	11/28/2010 7:21	Negative	0.00

Table 3  
**Summary of XRF<sup>1</sup> Results**  
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**Project Name:** Lead-Based Paint Inspection

**Project Address:** Building 5212, United States Air Force Prep School, Colorado Springs, CO

**Project Number:** 3010128

XRF										Lead Content
Number	Side	Floor	Room	Component	Substrate	Condition	Color	Date/Time	Result	(mg/cm <sup>2</sup> ) <sup>2</sup>
57	D	FIRST	HALL 121	DOOR BATH RM 115	METAL	INTACT	GREY	11/28/2010 7:22	Negative	0.00
58	D	FIRST	HALL 121	DR. JAMB RM 115	METAL	INTACT	GREY	11/28/2010 7:22	Negative	0.00
59	A	FIRST	HALL 122	WALL	DRYWALL	INTACT	WHITE	11/28/2010 7:23	Negative	0.00
60	C	FIRST	HALL 122	WALL	DRYWALL	INTACT	WHITE	11/28/2010 7:23	Negative	0.00
61	C	FIRST	HALL 120	WALL	DRYWALL	INTACT	WHITE	11/28/2010 7:24	Negative	0.00
62	D	FIRST	HALL 120	WALL	DRYWALL	FAIR	WHITE	11/28/2010 7:25	Negative	0.00
63	B	FIRST	HALL 120	WALL	DRYWALL	FAIR	WHITE	11/28/2010 7:25	Negative	0.00
64	C	FIRST	HALL 120	DOOR	METAL	FAIR	BLACK	11/28/2010 7:26	Negative	-0.65
65	C	FIRST	HALL 120	DR. JAMB	METAL	FAIR	BLACK	11/28/2010 7:27	Negative	0.00
66	B	FIRST	HALL 120	WALL REGISTER	METAL	INTACT	GREY	11/28/2010 7:27	Null	0.02
67	B	FIRST	HALL 120	WALL REGISTER	METAL	INTACT	GREY	11/28/2010 7:27	Negative	0.00
68	D	FIRST	HALL 120	DOOR STWY 2	METAL	INTACT	GREY	11/28/2010 7:28	Negative	0.00
69	D	FIRST	HALL 120	DR. JAMB STWY 2	METAL	INTACT	GREY	11/28/2010 7:29	Negative	0.00
70	B	FIRST	HALL 120	DR. JAMB BATH 115	METAL	INTACT	GREY	11/28/2010 7:30	Negative	0.00
71	A	FIRST	HALL 120	DR. JAMB BATH 116	METAL	INTACT	GREY	11/28/2010 7:30	Negative	0.00
72	A	FIRST	HALL 120	DOOR BATH 116	METAL	INTACT	GREY	11/28/2010 7:31	Negative	0.00
73	B	FIRST	HALL 120	DOOR BATH 115	METAL	INTACT	GREY	11/28/2010 7:31	Negative	0.00
74	A	FIRST	HALL 120	DOOR	METAL	FAIR	GREY	11/28/2010 7:32	Negative	0.00
75	A	FIRST	HALL 120	WALL	DRYWALL	INTACT	WHITE	11/28/2010 7:32	Negative	0.01
76	B	FIRST	HALL 120	DOOR RM 118	METAL	FAIR	GREY	11/28/2010 7:33	Negative	0.00
77	B	FIRST	HALL 120	DR. JAMB RM 118	METAL	FAIR	GREY	11/28/2010 7:33	Negative	0.00
78	A	FIRST	DAY RM 118	WALL	DRYWALL	FAIR	WHITE	11/28/2010 7:35	Negative	0.00
79	B	FIRST	DAY RM 118	WALL	DRYWALL	FAIR	WHITE	11/28/2010 7:35	Negative	0.00
80	C	FIRST	DAY RM 118	WALL	DRYWALL	FAIR	WHITE	11/28/2010 7:36	Negative	0.00
81	D	FIRST	DAY RM 118	WALL	DRYWALL	SUBSTRATE <sup>9</sup>	WHITE	11/28/2010 7:37	Negative	0.00
82	A	FIRST	DAY RM 118	WNDW CASING	METAL	INTACT	WHITE	11/28/2010 7:38	Negative	0.00
83	D	FIRST	DAY RM 118	DOOR	METAL	FAIR	GREY	11/28/2010 7:38	Negative	0.00
84	B	FIRST	DAY RM 118	DOOR	METAL	FAIR	GREY	11/28/2010 7:39	Negative	0.00

Table 3  
**Summary of XRF<sup>1</sup> Results**  
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**Project Name:** Lead-Based Paint Inspection

**Project Address:** Building 5212, United States Air Force Prep School, Colorado Springs, CO

**Project Number:** 3010128

XRF										Lead Content
Number	Side	Floor	Room	Component	Substrate	Condition	Color	Date/Time	Result	(mg/cm <sup>2</sup> ) <sup>2</sup>
85	B	FIRST	BATH RM 115	DOOR	METAL	FAIR	GREY	11/28/2010 7:40	Negative	0.00
86	D	FIRST	BATH RM 115	DOOR	METAL	INTACT	GREY	11/28/2010 7:40	Negative	0.00
87	A	FIRST	BATH RM 115	WALL	DRYWALL	INTACT	WHITE	11/28/2010 7:41	Negative	0.00
88	A	FIRST	BATH RM 115	WALL	TILE	INTACT	WHITE	11/28/2010 7:41	Negative	0.03
89	B	FIRST	BATH RM 115	WALL	TILE	INTACT	WHITE	11/28/2010 7:42	Negative	0.07
90	B	FIRST	BATH RM 115	WALL	DRYWALL	INTACT	WHITE	11/28/2010 7:42	Negative	0.00
91	C	FIRST	BATH RM 115	WALL	DRYWALL	INTACT	WHITE	11/28/2010 7:42	Negative	0.00
92	C	FIRST	BATH RM 115	WALL	TILE	INTACT	WHITE	11/28/2010 7:43	Negative	0.03
93	D	FIRST	BATH RM 115	WALL	TILE	INTACT	WHITE	11/28/2010 7:43	Negative	0.01
94	D	FIRST	BATH RM 115	WALL	DRYWALL	INTACT	WHITE	11/28/2010 7:44	Negative	0.00
95	Floor	FIRST	BATH RM 115	FLOOR	TILE	INTACT	GREY	11/28/2010 7:44	Null	0.01
96	Floor	FIRST	BATH RM 115	FLOOR	TILE	INTACT	GREY	11/28/2010 7:45	Negative	0.00
97	A	FIRST	STAIRWAY 2	WALL	DRYWALL	INTACT	WHITE	11/28/2010 7:46	Negative	0.00
98	B	FIRST	STAIRWAY 2	WALL	DRYWALL	INTACT	WHITE	11/28/2010 7:47	Negative	0.00
99	C	FIRST	STAIRWAY 2	WALL	DRYWALL	INTACT	WHITE	11/28/2010 7:47	Negative	0.01
100	D	FIRST	STAIRWAY 2	WALL	DRYWALL	INTACT	WHITE	11/28/2010 7:48	Negative	0.00
101	D	FIRST	STAIRWAY 2	WNDW SILL	METAL	INTACT	BLACK	11/28/2010 7:48	Negative	0.00
102	B	FIRST	STAIRWAY 2	WALL REGISTER	METAL	INTACT	GREY	11/28/2010 7:49	Negative	0.00
103	C	FIRST	STAIRWAY 2	SUP COL	CONCRETE	INTACT	WHITE	11/28/2010 7:50	Negative	0.00
104	C	FIRST	STAIRWAY 2	I-BEAM	METAL	INTACT	WHITE	11/28/2010 7:50	Negative	0.00
105	D	FIRST	STAIRWAY 2	STR BALUSTER	METAL	INTACT	BLACK	11/28/2010 7:51	Negative	0.00
106	D	FIRST	STAIRWAY 2	STR RISER	METAL	FAIR	BLACK	11/28/2010 7:52	Negative	0.00
107	C	FIRST	STAIRWAY 2	WALL	DRYWALL	INTACT	GREEN	11/28/2010 7:52	Negative	0.00
108	C	FIRST	STAIRWAY 2	WALL	DRYWALL	INTACT	BLUE	11/28/2010 7:53	Negative	0.01
109	B	FIRST	STAIRWAY 2	DOOR	METAL	INTACT	GREY	11/28/2010 7:53	Negative	0.00
110	C	SECOND	STAIRWAY 2	STR HAND RAIL	METAL	INTACT	BLACK	11/28/2010 7:54	Negative	0.01
111	B	SECOND	STAIRWAY 2	DOOR	METAL	INTACT	GREY	11/28/2010 7:55	Negative	0.00
112	B	SECOND	STAIRWAY 2	WALL	DRYWALL	INTACT	WHITE	11/28/2010 7:56	Negative	0.00

Table 3  
**Summary of XRF<sup>1</sup> Results**  
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**Project Name:** Lead-Based Paint Inspection

**Project Address:** Building 5212, United States Air Force Prep School, Colorado Springs, CO

**Project Number:** 3010128

XRF										Lead Content
Number	Side	Floor	Room	Component	Substrate	Condition	Color	Date/Time	Result	(mg/cm <sup>2</sup> ) <sup>2</sup>
113	A	SECOND	STAIRWAY 2	WALL	DRYWALL	INTACT	WHITE	11/28/2010 7:57	Negative	0.00
114	C	SECOND	STAIRWAY 2	WALL	DRYWALL	INTACT	WHITE	11/28/2010 7:57	Negative	0.00
115	D	SECOND	STAIRWAY 2	WNDW CASING	METAL	INTACT	BLACK	11/28/2010 7:58	Negative	0.00
116	D	THIRD	STAIRWAY 2	WALL	DRYWALL	FAIR	WHITE	11/28/2010 7:59	Negative	0.00
117	A	THIRD	STAIRWAY 2	WALL	DRYWALL	INTACT	WHITE	11/28/2010 7:59	Negative	0.00
118	B	THIRD	STAIRWAY 2	WALL	DRYWALL	INTACT	WHITE	11/28/2010 8:00	Negative	0.00
119	C	THIRD	STAIRWAY 2	WALL	DRYWALL	INTACT	WHITE	11/28/2010 8:00	Negative	0.02
120	C	THIRD	STAIRWAY 2	WALL	DRYWALL	INTACT	GOLD	11/28/2010 8:01	Negative	0.00
121	D	THIRD	STAIRWAY 2	STR HAND RAIL	METAL	INTACT	BLACK	11/28/2010 8:01	Negative	0.00
122	A	THIRD	STAIRWAY 2	ROOF LADDER	METAL	INTACT	WHITE	11/28/2010 8:02	Negative	0.00
123	B	THIRD	STAIRWAY 2	DOOR	METAL	INTACT	GREY	11/28/2010 8:03	Negative	0.00
124	B	THIRD	STAIRWAY 2	STR STRINGER	METAL	INTACT	BLACK	11/28/2010 8:04	Negative	0.00
125	C	SECOND	HALL 220	WNDW CASING	METAL	INTACT	BLACK	11/28/2010 8:05	Negative	0.00
126	C	SECOND	HALL 220	WALL REGISTER	METAL	INTACT	GREY	11/28/2010 8:05	Negative	0.00
127	C	SECOND	HALL 220	WALL	DRYWALL	INTACT	WHITE	11/28/2010 8:06	Negative	0.00
128	B	SECOND	HALL 220	WALL	DRYWALL	FAIR	WHITE	11/28/2010 8:07	Negative	0.00
129	D	SECOND	HALL 220	WALL	DRYWALL	INTACT	WHITE	11/28/2010 8:07	Negative	0.00
130	A	SECOND	HALL 220	WALL	DRYWALL	INTACT	WHITE	11/28/2010 8:07	Negative	0.00
131	A	SECOND	HALL 220	DOOR	METAL	INTACT	GREY	11/28/2010 8:08	Negative	0.00
132	B	SECOND	HALL 220	DOOR LFT RM 216	METAL	FAIR	GREY	11/28/2010 8:09	Negative	0.00
133	B	SECOND	HALL 220	DR. CSNG RM 216	METAL	FAIR	GREY	11/28/2010 8:09	Negative	0.00
134	B	SECOND	HALL 220	DR. CSNG RM 216	METAL	FAIR	GREY	11/28/2010 8:10	Negative	0.00
135	B	SECOND	HALL 220	DOOR RHT RM 216	METAL	FAIR	GREY	11/28/2010 8:10	Negative	0.00
136	B	SECOND	HALL 220	DOOR BATH RM 215	METAL	INTACT	GREY	11/28/2010 8:11	Negative	0.00
137	B	SECOND	HALL 220	DR. JAMB RM 215	METAL	FAIR	GREY	11/28/2010 8:11	Negative	0.00
138	A	SECOND	HALL 222	WALL	DRYWALL	INTACT	WHITE	11/28/2010 8:12	Negative	0.00
139	C	SECOND	HALL 222	WALL	DRYWALL	FAIR	WHITE	11/28/2010 8:13	Negative	0.00
140	D	SECOND	HALL 220	DOOR STWY 2	METAL	INTACT	GREY	11/28/2010 8:14	Negative	0.00

Table 3  
**Summary of XRF<sup>1</sup> Results**  
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**Project Name:** Lead-Based Paint Inspection

**Project Address:** Building 5212, United States Air Force Prep School, Colorado Springs, CO

**Project Number:** 3010128

XRF										Lead Content
Number	Side	Floor	Room	Component	Substrate	Condition	Color	Date/Time	Result	(mg/cm <sup>2</sup> ) <sup>2</sup>
141	D	SECOND	HALL 220	DR. JAMB STWY 2	METAL	FAIR	GREY	11/28/2010 8:14	Negative	0.00
142	C	SECOND	HALL 221	WALL	DRYWALL	INTACT	WHITE	11/28/2010 8:15	Negative	0.00
143	D	SECOND	HALL 221	WALL	DRYWALL	INTACT	WHITE	11/28/2010 8:16	Negative	0.00
144	B	SECOND	HALL 221	WALL	DRYWALL	INTACT	WHITE	11/28/2010 8:16	Negative	0.00
145	B	SECOND	HALL 221	WALL	DRYWALL	INTACT	GREEN	11/28/2010 8:16	Negative	0.00
146	A	SECOND	HALL 221	WALL	DRYWALL	INTACT	WHITE	11/28/2010 8:17	Negative	0.00
147	A	SECOND	HALL 221	DOOR	METAL	FAIR	GREY	11/28/2010 8:18	Negative	0.00
148	A	SECOND	HALL 221	DR. JAMB	METAL	FAIR	GREY	11/28/2010 8:18	Negative	0.00
149	D	SECOND	HALL 221	DOOR RHT RM 216	METAL	FAIR	GREY	11/28/2010 8:19	Negative	0.00
150	D	SECOND	HALL 221	DR. JAMB RHT	METAL	FAIR	GREY	11/28/2010 8:19	Negative	0.00
151	D	SECOND	HALL 221	DR. JAMB LFT	METAL	FAIR	GREY	11/28/2010 8:20	Negative	0.00
152	D	SECOND	HALL 221	DOOR LFT RM 216	METAL	FAIR	GREY	11/28/2010 8:22	Negative	0.00
153	D	SECOND	HALL 221	DOOR BATH RM 215	METAL	INTACT	GREY	11/28/2010 8:22	Negative	0.00
154	D	SECOND	HALL 221	DR. JAMB RM 215	METAL	INTACT	GREY	11/28/2010 8:23	Negative	0.00
155	B	SECOND	BATH RM 215	DOOR	METAL	INTACT	GREY	11/28/2010 8:24	Negative	0.00
156	D	SECOND	BATH RM 215	DOOR	METAL	INTACT	GREY	11/28/2010 8:24	Negative	0.00
157	Floor	SECOND	BATH RM 215	FLOOR	TILE	INTACT	GREY	11/28/2010 8:24	Null	0.00
158	Floor	SECOND	BATH RM 215	FLOOR	TILE	INTACT	GREY	11/28/2010 8:25	Negative	0.00
159	A	SECOND	BATH RM 215	WALL	TILE	INTACT	WHITE	11/28/2010 8:26	Negative	0.00
160	A	SECOND	BATH RM 215	WALL	TILE	INTACT	WHITE	11/28/2010 8:26	Negative	0.03
161	B	SECOND	BATH RM 215	WALL	TILE	INTACT	WHITE	11/28/2010 8:27	Negative	0.02
162	B	SECOND	BATH RM 215	WALL	DRYWALL	INTACT	WHITE	11/28/2010 8:27	Negative	0.00
163	C	SECOND	BATH RM 215	WALL	DRYWALL	INTACT	WHITE	11/28/2010 8:27	Negative	0.00
164	C	SECOND	BATH RM 215	WALL	TILE	INTACT	WHITE	11/28/2010 8:28	Negative	0.06
165	D	SECOND	BATH RM 215	WALL	TILE	INTACT	WHITE	11/28/2010 8:28	Negative	0.01
166	D	SECOND	BATH RM 215	WALL	DRYWALL	INTACT	WHITE	11/28/2010 8:29	Negative	0.00
167	A	SECOND	DAY RM 216	WALL	DRYWALL	INTACT	WHITE	11/28/2010 8:30	Negative	0.00
168	A	SECOND	DAY RM 216	WNDW CASING	METAL	INTACT	WHITE	11/28/2010 8:31	Negative	0.00

Table 3  
**Summary of XRF<sup>1</sup> Results**  
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**Project Name:** Lead-Based Paint Inspection

**Project Address:** Building 5212, United States Air Force Prep School, Colorado Springs, CO

**Project Number:** 3010128

XRF										Lead Content
Number	Side	Floor	Room	Component	Substrate	Condition	Color	Date/Time	Result	(mg/cm <sup>2</sup> ) <sup>2</sup>
169	B	SECOND	DAY RM 216	WALL	DRYWALL	INTACT	WHITE	11/28/2010 8:32	Negative	0.00
170	C	SECOND	DAY RM 216	WALL	DRYWALL	INTACT	WHITE	11/28/2010 8:32	Negative	0.02
171	D	SECOND	DAY RM 216	WALL	DRYWALL	INTACT	WHITE	11/28/2010 8:32	Negative	0.00
172	D	SECOND	DAY RM 216	SUPPORT COLUMN	CONCRETE	INTACT	WHITE	11/28/2010 8:33	Null	0.00
173	D	SECOND	DAY RM 216	SUPPORT COLUMN	CONCRETE	INTACT	WHITE	11/28/2010 8:33	Negative	0.00
174	D	SECOND	DAY RM 216	DOOR LFT	METAL	FAIR	GREY	11/28/2010 8:34	Negative	0.00
175	D	SECOND	DAY RM 216	DOOR RHT	METAL	FAIR	GREY	11/28/2010 8:34	Negative	0.00
176	B	SECOND	DAY RM 216	DOOR RHT	METAL	FAIR	GREY	11/28/2010 8:35	Negative	0.00
177	B	SECOND	DAY RM 216	DOOR LFT	METAL	FAIR	GREY	11/28/2010 8:35	Negative	0.00
178	C	SECOND	STAIRWAY 1	DOOR LFT	METAL	INTACT	GREY	11/28/2010 8:38	Negative	0.00
179	C	SECOND	STAIRWAY 1	DOOR RHT	METAL	INTACT	GREY	11/28/2010 8:38	Negative	0.00
180	A	SECOND	STAIRWAY 1	WNDW CASING	METAL	INTACT	BLACK	11/28/2010 8:39	Negative	0.00
181	A	SECOND	STAIRWAY 1	SUPPORT COLUMN	METAL	INTACT	BLACK	11/28/2010 8:40	Negative	0.00
182	A	SECOND	STAIRWAY 1	WALL REGISTER	METAL	INTACT	WHITE	11/28/2010 8:40	Negative	0.00
183	B	SECOND	STAIRWAY 1	WALL	DRYWALL	INTACT	WHITE	11/28/2010 8:41	Negative	0.00
184	C	SECOND	STAIRWAY 1	WALL	DRYWALL	INTACT	WHITE	11/28/2010 8:41	Negative	0.00
185	D	SECOND	STAIRWAY 1	WALL	DRYWALL	INTACT	WHITE	11/28/2010 8:42	Negative	0.00
186	A	SECOND	STAIRWAY 1	STR RISER	METAL	FAIR	BLACK	11/28/2010 8:43	Null	0.00
187	N/A	N/A	SHUTTER CAL	N/A	N/A	N/A	N/A	11/28/2010 8:51	-	1.50
188	N/A	N/A	CALIBRATE	N/A	N/A	N/A	N/A	11/28/2010 8:54	Positive	1.00
189	N/A	N/A	CALIBRATE	N/A	N/A	N/A	N/A	11/28/2010 8:55	Null	1.00
190	N/A	N/A	CALIBRATE	N/A	N/A	N/A	N/A	11/28/2010 8:58	Negative	0.90
191	N/A	N/A	CALIBRATE	N/A	N/A	N/A	N/A	11/28/2010 9:00	Positive	1.10
192	A	SECOND	STAIRWAY 1	STR STRINGER	METAL	INTACT	BLACK	11/28/2010 9:05	Negative	0.00
193	C	SECOND	STAIRWAY 1	STR BALUSTER	METAL	INTACT	BLACK	11/28/2010 9:06	Negative	0.00
194	C	THIRD	STAIRWAY 1	STR HAND RAIL	METAL	FAIR	BLACK	11/28/2010 9:06	Negative	0.00
195	A	THIRD	STAIRWAY 1	SUPPORT COLUMN	METAL	INTACT	BLACK	11/28/2010 9:07	Negative	0.00
196	A	THIRD	STAIRWAY 1	WNDW CASING	METAL	INTACT	BLACK	11/28/2010 9:08	Negative	0.00

Table 3  
**Summary of XRF<sup>1</sup> Results**  
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**Project Name:** Lead-Based Paint Inspection

**Project Address:** Building 5212, United States Air Force Prep School, Colorado Springs, CO

**Project Number:** 3010128

XRF										Lead Content
Number	Side	Floor	Room	Component	Substrate	Condition	Color	Date/Time	Result	(mg/cm <sup>2</sup> ) <sup>2</sup>
197	A	THIRD	STAIRWAY 1	WALL REGISTER	METAL	INTACT	WHITE	11/28/2010 9:08	Negative	0.00
198	C	THIRD	STAIRWAY 1	DOOR LFT	METAL	INTACT	GREY	11/28/2010 9:09	Negative	0.00
199	C	THIRD	STAIRWAY 1	DR. JAMB LFT	METAL	FAIR	GREY	11/28/2010 9:09	Negative	0.00
200	C	THIRD	STAIRWAY 1	DR. JAMB RHT	METAL	INTACT	GREY	11/28/2010 9:10	Negative	0.00
201	C	THIRD	STAIRWAY 1	DOOR RHT	METAL	INTACT	GREY	11/28/2010 9:10	Negative	0.00
202	C	THIRD	STAIRWAY 1	WNDW CASING	METAL	INTACT	WHITE	11/28/2010 9:11	Negative	0.00
203	B	THIRD	STAIRWAY 1	WALL	DRYWALL	INTACT	WHITE	11/28/2010 9:12	Negative	0.00
204	C	THIRD	STAIRWAY 1	WALL	DRYWALL	FAIR	WHITE	11/28/2010 9:12	Negative	0.00
205	D	THIRD	STAIRWAY 1	WALL	DRYWALL	INTACT	WHITE	11/28/2010 9:12	Negative	0.00
206	D	THIRD	STAIRWAY 1	SUPPORT COLUMN	CONCRETE	INTACT	WHITE	11/28/2010 9:13	Negative	0.00
207	A	THIRD	HALL 321	DOOR	METAL	INTACT	GREY	11/28/2010 9:14	Negative	0.00
208	D	THIRD	HALL 321	DOOR RM 316	METAL	FAIR	GREY	11/28/2010 9:17	Negative	0.00
209	D	THIRD	HALL 321	DR. JAMB RM 316	METAL	FAIR	GREY	11/28/2010 9:17	Negative	0.00
210	D	THIRD	HALL 321	DR. JAMB BATH	METAL	FAIR	GREY	11/28/2010 9:18	Negative	0.00
211	D	THIRD	HALL 321	DOOR BATH	METAL	INTACT	GREY	11/28/2010 9:18	Negative	0.00
212	C	THIRD	HALL 321	WALL	DRYWALL	INTACT	WHITE	11/28/2010 9:20	Negative	0.00
213	D	THIRD	HALL 321	WALL	DRYWALL	INTACT	WHITE	11/28/2010 9:20	Negative	0.00
214	A	THIRD	HALL 321	WALL	DRYWALL	INTACT	WHITE	11/28/2010 9:21	Negative	0.00
215	B	THIRD	HALL 321	WALL	DRYWALL	INTACT	WHITE	11/28/2010 9:21	Negative	0.00
216	B	THIRD	HALL 321	DOOR RM 313	WOOD	INTACT	VARNISH	11/28/2010 9:22	Negative	0.00
217	B	THIRD	HALL 321	DR. JAMB RM 313	METAL	INTACT	GREY	11/28/2010 9:22	Negative	0.00
218	B	THIRD	HALL 321	DR. JAMB RM 311	METAL	FAIR	GREY	11/28/2010 9:23	Negative	0.00
219	B	THIRD	HALL 321	DOOR RM 311	WOOD	INTACT	VARNISH	11/28/2010 9:24	Negative	0.00
220	B	THIRD	HALL 321	DOOR RM 308	WOOD	INTACT	VARNISH	11/28/2010 9:24	Negative	0.01
221	B	THIRD	HALL 321	DR. JAMB RM 308	METAL	FAIR	GREY	11/28/2010 9:25	Negative	0.00
222	B	THIRD	HALL 321	DR. JAMB RM 307	METAL	FAIR	GREY	11/28/2010 9:25	Negative	0.00
223	B	THIRD	HALL 321	DOOR RM 307	WOOD	INTACT	VARNISH	11/28/2010 9:26	Negative	0.00
224	D	THIRD	RM 307	DOOR	WOOD	INTACT	VARNISH	11/28/2010 9:26	Negative	0.00

Table 3  
**Summary of XRF<sup>1</sup> Results**  
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**Project Name:** Lead-Based Paint Inspection

**Project Address:** Building 5212, United States Air Force Prep School, Colorado Springs, CO

**Project Number:** 3010128

XRF										Lead Content
Number	Side	Floor	Room	Component	Substrate	Condition	Color	Date/Time	Result	(mg/cm <sup>2</sup> ) <sup>2</sup>
225	D	THIRD	RM 307	CLST DOOR LFT	WOOD	INTACT	VARNISH	11/28/2010 9:27	Negative	0.00
226	A	THIRD	RM 307	WALL	DRYWALL	INTACT	WHITE	11/28/2010 9:28	Negative	0.00
227	C	THIRD	RM 307	WALL	DRYWALL	SUBSTRATE	WHITE	11/28/2010 9:29	Negative	0.01
228	D	THIRD	RM 307	WALL	DRYWALL		WHITE	11/28/2010 9:29	Negative	0.00
229	B	THIRD	RM 307	WALL REGISTER	METAL	INTACT	GREY	11/28/2010 9:30	Negative	0.00
230	B	THIRD	RM 307	WALL REGISTER	METAL	INTACT	GREY	11/28/2010 9:30	Negative	0.00
231	B	THIRD	RM 307	WNDW CASING	METAL	INTACT	BLACK	11/28/2010 9:31	Negative	0.00
232	B	THIRD	RM 308	WNDW CASING	METAL	INTACT	BLACK	11/28/2010 9:32	Negative	0.00
233	B	THIRD	RM 308	WALL REGISTER	METAL	INTACT	GREY	11/28/2010 9:32	Negative	0.00
234	A	THIRD	RM 308	WALL	DRYWALL	INTACT	WHITE	11/28/2010 9:33	Negative	0.00
235	C	THIRD	RM 308	WALL	DRYWALL	INTACT	WHITE	11/28/2010 9:33	Negative	0.00
236	D	THIRD	RM 308	WALL	DRYWALL	FAIR	WHITE	11/28/2010 9:34	Negative	0.00
237	D	THIRD	RM 308	CLST DOOR	WOOD	INTACT	VARNISH	11/28/2010 9:34	Negative	0.00
238	D	THIRD	RM 308	DOOR	WOOD	INTACT	VARNISH	11/28/2010 9:34	Negative	0.00
239	D	THIRD	RM 311	DOOR	WOOD	INTACT	VARNISH	11/28/2010 9:36	Negative	0.00
240	D	THIRD	RM 311	CLST DOOR LFT	WOOD	INTACT	VARNISH	11/28/2010 9:36	Negative	0.00
241	A	THIRD	RM 311	WALL	DRYWALL	INTACT	WHITE	11/28/2010 9:37	Negative	0.00
242	C	THIRD	RM 311	WALL	DRYWALL	INTACT	WHITE	11/28/2010 9:37	Negative	0.00
243	D	THIRD	RM 311	WALL	DRYWALL	INTACT	WHITE	11/28/2010 9:38	Negative	0.00
244	B	THIRD	RM 311	WALL REGISTER	METAL	INTACT	GREY	11/28/2010 9:38	Negative	0.00
245	B	THIRD	RM 311	WNDW SILL	METAL	INTACT	BLACK	11/28/2010 9:39	Null	0.00
246	B	THIRD	RM 311	WNDW SILL	METAL	INTACT	BLACK	11/28/2010 9:39	Null	0.00
247	B	THIRD	RM 311	WNDW SILL	METAL	INTACT	BLACK	11/28/2010 9:39	Negative	0.00
248	B	THIRD	RM 313	WNDW SILL	METAL	INTACT	BLACK	11/28/2010 9:41	Negative	0.00
249	B	THIRD	RM 313	WALL REGISTER	METAL	INTACT	GREY	11/28/2010 9:41	Negative	0.00
250	A	THIRD	RM 313	WALL	DRYWALL	INTACT	WHITE	11/28/2010 9:42	Negative	0.00
251	A	THIRD	RM 313	SUPPORT COLUMN	CONCRETE	FAIR	WHITE	11/28/2010 9:42	Negative	0.00
252	C	THIRD	RM 313	WALL	DRYWALL	INTACT	WHITE	11/28/2010 9:43	Negative	0.00



Table 3  
**Summary of XRF<sup>1</sup> Results**  
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**Project Name:** Lead-Based Paint Inspection

**Project Address:** Building 5212, United States Air Force Prep School, Colorado Springs, CO

**Project Number:** 3010128

XRF										Lead Content
Number	Side	Floor	Room	Component	Substrate	Condition	Color	Date/Time	Result	(mg/cm <sup>2</sup> ) <sup>2</sup>
253	D	THIRD	RM 313	WALL	DRYWALL	INTACT	WHITE	11/28/2010 9:43	Negative	0.00
254	D	THIRD	RM 313	CLST DOOR LFT	WOOD	FAIR	VARNISH	11/28/2010 9:44	Negative	0.00
255	D	THIRD	RM 313		WOOD	INTACT	VARNISH	11/28/2010 9:44	Negative	0.00
256	A	THIRD	BATH RM 315		DRYWALL	INTACT	WHITE	11/28/2010 9:46	Negative	0.00
257	A	THIRD	BATH RM 315	WALL	TILE	INTACT	WHITE	11/28/2010 9:46	Negative	0.05
258	B	THIRD	BATH RM 315	WALL	TILE	INTACT	WHITE	11/28/2010 9:47	Negative	0.09
259	B	THIRD	BATH RM 315	WALL	DRYWALL	INTACT	WHITE	11/28/2010 9:47	Negative	0.00
260	C	THIRD	BATH RM 315	WALL	DRYWALL	INTACT	WHITE	11/28/2010 9:48	Negative	0.00
261	C	THIRD	BATH RM 315	WALL	TILE	INTACT	WHITE	11/28/2010 9:48	Negative	0.05
262	D	THIRD	BATH RM 315	WALL	TILE	INTACT	WHITE	11/28/2010 9:49	Negative	0.09
263	D	THIRD	BATH RM 315	WALL	DRYWALL	INTACT	WHITE	11/28/2010 9:49	Negative	0.00
264	Floor	THIRD	BATH RM 315	FLOOR	TILE	INTACT	GREY	11/28/2010 9:50	Null	0.01
265	Floor	THIRD	BATH RM 315	FLOOR	TILE	INTACT	GREY	11/28/2010 9:50	Negative	0.00
266	B	THIRD	BATH RM 315	DOOR	METAL	FAIR	GREY	11/28/2010 9:51	Negative	0.00
267	D	THIRD	BATH RM 315	DOOR	METAL	FAIR	GREY	11/28/2010 9:51	Negative	0.00
268	A	THIRD	HALL 322	WALL	DRYWALL	INTACT	WHITE	11/28/2010 9:52	Negative	0.00
269	C	THIRD	HALL 322	WALL	DRYWALL	INTACT	WHITE	11/28/2010 9:53	Negative	0.00
270	C	THIRD	HALL 320	WALL	DRYWALL	INTACT	WHITE	11/28/2010 9:54	Negative	0.00
271	D	THIRD	HALL 320	WALL	DRYWALL	INTACT	WHITE	11/28/2010 9:54	Negative	0.00
272	B	THIRD	HALL 320	WALL	DRYWALL	INTACT	WHITE	11/28/2010 9:55	Null	0.00
273	B	THIRD	HALL 320	WALL	DRYWALL	INTACT	WHITE	11/28/2010 9:55	Negative	0.00
274	A	THIRD	HALL 320	WALL	DRYWALL	INTACT	WHITE	11/28/2010 9:56	Negative	0.00
275	A	THIRD	HALL 320	DOOR	METAL	INTACT	GREY	11/28/2010 9:56	Negative	0.00
276	A	THIRD	HALL 320	DOOR RM 316	METAL	INTACT	GREY	11/28/2010 9:57	Null	0.00
277	B	THIRD	HALL 320	DOOR RM 316	METAL	INTACT	GREY	11/28/2010 9:57	Negative	0.00
278	B	THIRD	HALL 320	DR. JAMB RM 316	METAL	INTACT	GREY	11/28/2010 9:58	Negative	0.00
279	B	THIRD	HALL 320	DOOR BATH 315	METAL	FAIR	GREY	11/28/2010 9:58	Negative	0.00
280	B	THIRD	HALL 320	DR. JAMB BATH 315	METAL	INTACT	GREY	11/28/2010 9:59	Negative	0.00

Table 3  
**Summary of XRF<sup>1</sup> Results**  
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**Project Name:** Lead-Based Paint Inspection

**Project Address:** Building 5212, United States Air Force Prep School, Colorado Springs, CO

**Project Number:** 3010128

XRF										Lead Content
Number	Side	Floor	Room	Component	Substrate	Condition	Color	Date/Time	Result	(mg/cm <sup>2</sup> ) <sup>2</sup>
281	D	THIRD	HALL 320	DR. JAMB RM 301	METAL	INTACT	GREY	11/28/2010 10:00	Negative	0.00
282	D	THIRD	HALL 320	DOOR RM 301	WOOD	INTACT	VARNISH	11/28/2010 10:00	Negative	0.00
283	C	THIRD	HALL 320	WNDW CASING	METAL	INTACT	BLACK	11/28/2010 10:01	Negative	0.00
284	D	THIRD	HALL 320	DOOR STWY 2	METAL	INTACT	GREY	11/28/2010 10:02	Negative	0.00
285	B	THIRD	RM 301	DOOR	WOOD	INTACT	VARNISH	11/28/2010 10:03	Negative	0.00
286	B	THIRD	RM 301	CLST DOOR RHT	WOOD	INTACT	VARNISH	11/28/2010 10:03	Negative	0.00
287	A	THIRD	RM 301	WALL	DRYWALL	INTACT	WHITE	11/28/2010 10:04	Negative	0.00
288	B	THIRD	RM 301	WALL	DRYWALL	INTACT	WHITE	11/28/2010 10:04	Negative	0.00
289	C	THIRD	RM 301	WALL	DRYWALL	INTACT	WHITE	11/28/2010 10:04	Negative	0.01
290	D	THIRD	RM 301	WNDW CASING	METAL	INTACT	BLACK	11/28/2010 10:05	Negative	0.00
291	D	THIRD	RM 301	WALL REGISTER	METAL	INTACT	GREY	11/28/2010 10:06	Negative	0.00
292	C	THIRD	HALL 320	WALL REGISTER	METAL	INTACT	GREY	11/28/2010 10:07	Negative	0.00
293	D	THIRD	HALL 320	STWY 2 DR CSNG	METAL	FAIR	GREY	11/28/2010 10:07	Negative	0.00
294	D	THIRD	LNDY RM 316	DOOR	METAL	FAIR	GREY	11/28/2010 10:08	Negative	0.00
295	B	THIRD	LNDY RM 316	DOOR	METAL	FAIR	GREY	11/28/2010 10:08	Negative	0.00
296	A	THIRD	LNDY RM 316	WALL	DRYWALL	INTACT	WHITE	11/28/2010 10:09	Negative	0.00
297	B	THIRD	LNDY RM 316	WALL	DRYWALL	INTACT	WHITE	11/28/2010 10:10	Negative	0.00
298	C	THIRD	LNDY RM 316	WALL	DRYWALL	INTACT	WHITE	11/28/2010 10:10	Negative	0.00
299	D	THIRD	LNDY RM 316	WALL	DRYWALL	INTACT	WHITE	11/28/2010 10:11	Negative	0.00
300	D	SECOND	HALL 220	DOOR RM 206	WOOD	INTACT	VARNISH	11/28/2010 10:13	Negative	0.00
301	D	SECOND	HALL 220	DR. JAMB RM 206	METAL	INTACT	GREY	11/28/2010 10:14	Negative	0.00
302	B	SECOND	RM 206	DOOR	WOOD	INTACT	VARNISH	11/28/2010 10:15	Negative	0.00
303	B	SECOND	RM 206	CLST DOOR LFT	WOOD	FAIR	VARNISH	11/28/2010 10:15	Negative	0.00
304	A	SECOND	RM 206	WALL	DRYWALL	INTACT	WHITE	11/28/2010 10:16	Negative	0.01
305	B	SECOND	RM 206	WALL	DRYWALL	INTACT	WHITE	11/28/2010 10:16	Negative	0.00
306	C	SECOND	RM 206	WALL	DRYWALL	INTACT	WHITE	11/28/2010 10:17	Negative	0.00
307	D	SECOND	RM 206	WALL REGISTER	METAL	INTACT	GREY	11/28/2010 10:17	Negative	0.00
308	D	SECOND	RM 206	WNDW CASING	METAL	INTACT	BLACK	11/28/2010 10:18	Negative	0.00

Table 3  
**Summary of XRF<sup>1</sup> Results**  
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**Project Name:** Lead-Based Paint Inspection

**Project Address:** Building 5212, United States Air Force Prep School, Colorado Springs, CO

**Project Number:** 3010128

XRF										Lead Content
Number	Side	Floor	Room	Component	Substrate	Condition	Color	Date/Time	Result	(mg/cm <sup>2</sup> ) <sup>2</sup>
309	D	SECOND	HALL 220	DOOR RM 205	WOOD	INTACT	VARNISH	11/28/2010 10:21	Negative	0.00
310	D	SECOND	HALL 220	DR. JAMB RM 205	METAL	FAIR	GREY	11/28/2010 10:21	Negative	0.00
311	B	SECOND	RM 205	DOOR	WOOD	INTACT	VARNISH	11/28/2010 10:22	Negative	0.00
312	B	SECOND	RM 205	CLST DOOR LFT	WOOD	FAIR	VARNISH	11/28/2010 10:22	Negative	0.00
313	A	SECOND	RM 205	WALL	DRYWALL	INTACT	WHITE	11/28/2010 10:23	Negative	0.00
314	B	SECOND	RM 205	WALL	DRYWALL	INTACT	WHITE	11/28/2010 10:23	Negative	0.00
315	C	SECOND	RM 205	WALL	DRYWALL	INTACT	WHITE	11/28/2010 10:23	Negative	0.00
316	D	SECOND	RM 205	WALL REGISTER	METAL	INTACT	GREY	11/28/2010 10:24	Negative	0.00
317	D	SECOND	RM 205	WNDW CASING	METAL	INTACT	BLACK	11/28/2010 10:25	Negative	0.00
318	D	SECOND	HALL 220	DOOR RM 204	WOOD	INTACT	VARNISH	11/28/2010 10:26	Negative	0.00
319	B	SECOND	RM 204	DOOR	WOOD	INTACT	GREY	11/28/2010 10:27	Negative	0.00
320	B	SECOND	RM 204	DR. JAMB	METAL	FAIR	GREY	11/28/2010 10:28	Negative	0.00
321	D	SECOND	RM 204	WNDW CASING	METAL	INTACT	BLACK	11/28/2010 10:29	Negative	0.00
322	D	SECOND	RM 204	WALL REGISTER	METAL	INTACT	GREY	11/28/2010 10:29	Negative	0.00
323	B	SECOND	RM 204	CLST DOOR LFT	WOOD	INTACT	VARNISH	11/28/2010 10:29	Negative	0.00
324	A	SECOND	RM 204	WALL	DRYWALL	INTACT	WHITE	11/28/2010 10:30	Negative	0.00
325	B	SECOND	RM 204	WALL	DRYWALL	INTACT	WHITE	11/28/2010 10:30	Negative	0.00
326	C	SECOND	RM 204	WALL	DRYWALL	INTACT	WHITE	11/28/2010 10:31	Negative	0.00
327	A	SECOND	RM 203	WALL	DRYWALL	INTACT	WHITE	11/28/2010 10:32	Negative	0.00
328	B	SECOND	RM 203	WALL	DRYWALL	INTACT	WHITE	11/28/2010 10:33	Negative	0.00
329	C	SECOND	RM 203	WALL	DRYWALL	INTACT	WHITE	11/28/2010 10:33	Negative	0.00
330	D	SECOND	RM 203	WALL REGISTER	METAL	INTACT	GREY	11/28/2010 10:34	Negative	0.00
331	D	SECOND	RM 203	WNDW CASING	METAL	INTACT	BLACK	11/28/2010 10:34	Negative	0.00
332	B	SECOND	RM 203	CLST DOOR RHT	WOOD	FAIR	VARNISH	11/28/2010 10:35	Negative	0.00
333	B	SECOND	RM 203	DOOR	WOOD	INTACT	VARNISH	11/28/2010 10:35	Null	0.03
334	B	SECOND	RM 203	DOOR	WOOD	INTACT	VARNISH	11/28/2010 10:35	Negative	0.01
335	D	SECOND	HALL 220	DOOR RM 203	WOOD	INTACT	VARNISH	11/28/2010 10:36	Negative	0.00
336	D	SECOND	HALL 220	DR. JAMB RM 203	METAL	FAIR	GREY	11/28/2010 10:37	Negative	0.00

Table 3  
**Summary of XRF<sup>1</sup> Results**  
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**Project Name:** Lead-Based Paint Inspection

**Project Address:** Building 5212, United States Air Force Prep School, Colorado Springs, CO

**Project Number:** 3010128

XRF										Lead Content
Number	Side	Floor	Room	Component	Substrate	Condition	Color	Date/Time	Result	(mg/cm <sup>2</sup> ) <sup>2</sup>
337	B	SECOND	HALL 221	DR. JAMB RM 207	METAL	INTACT	GREY	11/28/2010 10:39	Negative	0.00
338	B	SECOND	HALL 221	DOOR RM 207	WOOD	INTACT	VARNISH	11/28/2010 10:39	Negative	0.00
339	D	SECOND	RM 207	DOOR	WOOD	INTACT	VARNISH	11/28/2010 10:40	Negative	0.00
340	D	SECOND	RM 207	CLST DOOR RHT	WOOD	INTACT	VARNISH	11/28/2010 10:40	Negative	0.00
341	A	SECOND	RM 207	WALL	DRYWALL	INTACT	WHITE	11/28/2010 10:41	Negative	0.00
342	C	SECOND	RM 207	WALL	DRYWALL	INTACT	WHITE	11/28/2010 10:41	Negative	0.00
343	D	SECOND	RM 207	WALL	DRYWALL	INTACT	WHITE	11/28/2010 10:42	Negative	0.00
344	B	SECOND	RM 207	WALL REGISTER	METAL	INTACT	GREY	11/28/2010 10:42	Negative	0.00
345	B	SECOND	RM 207	WNDW CASING	METAL	INTACT	BLACK	11/28/2010 10:43	Negative	0.00
346	B	SECOND	HALL 221	DR. JAMB RM 208	METAL	INTACT	GREY	11/28/2010 10:44	Negative	0.00
347	B	SECOND	HALL 221	DOOR RM 208	WOOD	INTACT	VARNISH	11/28/2010 10:45	Negative	0.00
348	D	SECOND	RM 208	DOOR	WOOD	INTACT	VARNISH	11/28/2010 10:46	Negative	0.00
349	D	SECOND	RM 208	CLST DOOR LFT	WOOD	FAIR	VARNISH	11/28/2010 10:46	Negative	0.00
350	A	SECOND	RM 208	WALL	DRYWALL	INTACT	WHITE	11/28/2010 10:46	Negative	0.00
351	C	SECOND	RM 208	WALL	DRYWALL	INTACT	WHITE	11/28/2010 10:47	Negative	0.00
352	D	SECOND	RM 208	WALL	DRYWALL	INTACT	WHITE	11/28/2010 10:47	Negative	0.00
353	A	SECOND	RM 208	WALL	CONCRETE	INTACT	WHITE	11/28/2010 10:48	Negative	0.00
354	B	SECOND	RM 208	WALL REGISTER	METAL	INTACT	GREY	11/28/2010 10:48	Negative	0.00
355	B	SECOND	RM 208	WNDW CASING	METAL	INTACT	BLACK	11/28/2010 10:49	Negative	0.00
356	B	FIRST	HALL 121	DOOR RM 113	WOOD	INTACT	VARNISH	11/28/2010 10:52	Negative	0.00
357	B	FIRST	HALL 121	DR. JAMB RM 113	METAL	INTACT	GREY	11/28/2010 10:52	Negative	0.00
358	D	FIRST	RM 113	DOOR	WOOD	INTACT	VARNISH	11/28/2010 10:53	Negative	0.00
359	D	FIRST	RM 113	CLST DOOR LFT	WOOD	INTACT	VARNISH	11/28/2010 10:54	Negative	0.00
360	A	FIRST	RM 113	WALL	DRYWALL	INTACT	WHITE	11/28/2010 10:54	Negative	0.00
361	C	FIRST	RM 113	WALL	DRYWALL	INTACT	WHITE	11/28/2010 10:55	Negative	0.00
362	D	FIRST	RM 113	WALL	DRYWALL	INTACT	WHITE	11/28/2010 10:55	Negative	0.00
363	B	FIRST	RM 113	WNDW CASING	METAL	INTACT	BLACK	11/28/2010 10:56	Negative	0.00
364	B	FIRST	RM 113	WALL REGISTER	METAL	INTACT	GREY	11/28/2010 10:56	Negative	0.00

Table 3  
**Summary of XRF<sup>1</sup> Results**  
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**Project Name:** Lead-Based Paint Inspection

**Project Address:** Building 5212, United States Air Force Prep School, Colorado Springs, CO

**Project Number:** 3010128

XRF										Lead Content
Number	Side	Floor	Room	Component	Substrate	Condition	Color	Date/Time	Result	(mg/cm <sup>2</sup> ) <sup>2</sup>
365	B	FIRST	HALL 121	DOOR RM 111	WOOD	INTACT	VARNISH	11/28/2010 10:57	Negative	0.00
366	B	FIRST	HALL 121	DR. JAMB RM 111	METAL	FAIR	GREY	11/28/2010 10:58	Negative	0.00
367	B	FIRST	RM 111	WALL REGISTER	METAL	INTACT	GREY	11/28/2010 10:59	Negative	0.00
368	B	FIRST	RM 111	WNDW CASING	METAL	INTACT	BLACK	11/28/2010 10:59	Negative	0.00
369	D	FIRST	RM 111	DOOR	WOOD	INTACT	VARNISH	11/28/2010 11:00	Negative	0.00
370	D	FIRST	RM 111	CLST DOOR RHT	WOOD	INTACT	VARNISH	11/28/2010 11:00	Negative	0.00
371	A	FIRST	RM 111	WALL	DRYWALL	INTACT	WHITE	11/28/2010 11:01	Negative	0.00
372	C	FIRST	RM 111	WALL	DRYWALL	INTACT	WHITE	11/28/2010 11:01	Negative	0.00
373	D	FIRST	RM 111	WALL	DRYWALL	INTACT	WHITE	11/28/2010 11:01	Negative	0.00
374	D	FIRST	HALL 120	DOOR RM 101	WOOD	INTACT	VARNISH	11/28/2010 11:05	Negative	0.00
375	D	FIRST	HALL 120	DR. JAMB RM 101	METAL	INTACT	GREY	11/28/2010 11:05	Negative	0.00
376	B	FIRST	RM 101	DOOR RM	WOOD	INTACT	VARNISH	11/28/2010 11:06	Negative	0.00
377	B	FIRST	RM 101	CLST DOOR RHT	WOOD	INTACT	VARNISH	11/28/2010 11:06	Negative	0.00
378	A	FIRST	RM 101	WALL	DRYWALL	INTACT	WHITE	11/28/2010 11:07	Negative	0.00
379	C	FIRST	RM 101	WALL	DRYWALL	INTACT	WHITE	11/28/2010 11:07	Negative	0.02
380	B	FIRST	RM 101	WALL	DRYWALL	INTACT	WHITE	11/28/2010 11:08	Negative	0.00
381	D	FIRST	RM 101	WNDW CASING	METAL	INTACT	BLACK	11/28/2010 11:09	Negative	0.00
382	D	FIRST	RM 101	WALL REGISTER	METAL	INTACT	GREY	11/28/2010 11:10	Negative	0.00
383	N/A	N/A	CALIBRATE	N/A	N/A	N/A	N/A	11/28/2010 11:14	Negative	0.90
384	N/A	N/A	CALIBRATE	N/A	N/A	N/A	N/A	11/28/2010 11:17	Negative	0.90
385	N/A	N/A	CALIBRATE	N/A	N/A	N/A	N/A	11/28/2010 11:19	Positive	1.00
386	N/A	N/A	SHUTTER CAL	N/A	N/A	N/A	N/A	12/7/2010 10:32	-	1.51
387	N/A	N/A	CALIBRATE	N/A	N/A	N/A	N/A	12/7/2010 10:48	Null	1.00
388	N/A	N/A	CALIBRATE	N/A	N/A	N/A	N/A	12/7/2010 10:50	Positive	1.00
389	N/A	N/A	CALIBRATE	N/A	N/A	N/A	N/A	12/7/2010 10:53	Positive	1.00
390	N/A	N/A	CALIBRATE	N/A	N/A	N/A	N/A	12/7/2010 10:55	Positive	1.10
391	D	FIRST	HALL 220	DOOR	WOOD	INTACT	VARNISH	12/7/2010 11:21	Negative	0.00
392	B	FIRST	RM 106	DOOR	WOOD	INTACT	VARNISH	12/7/2010 11:21	Negative	0.00

Table 3  
**Summary of XRF<sup>1</sup> Results**  
Page 15 of 16

**Project Name:** Lead-Based Paint Inspection

**Project Address:** Building 5212, United States Air Force Prep School, Colorado Springs, CO

**Project Number:** 3010128

XRF										Lead Content
Number	Side	Floor	Room	Component	Substrate	Condition	Color	Date/Time	Result	(mg/cm <sup>2</sup> ) <sup>2</sup>
393	B	FIRST	RM 106	DR. JAMB	METAL	INTACT	GREY	12/7/2010 11:22	Negative	0.00
394	A	FIRST	RM 106	WALL	DRYWALL	INTACT	WHITE	12/7/2010 11:22	Null	0.00
395	A	FIRST	RM 106	WALL	DRYWALL	INTACT	WHITE	12/7/2010 11:23	Negative	0.00
396	B	FIRST	RM 106	WALL	DRYWALL	INTACT	WHITE	12/7/2010 11:23	Negative	0.00
397	C	FIRST	RM 106	WALL	DRYWALL	INTACT	WHITE	12/7/2010 11:23	Negative	0.00
398	B	FIRST	RM 106	CLST DOOR RHT	WOOD	INTACT	VARNISH	12/7/2010 11:24	Negative	0.00
399	D	FIRST	RM 106	WALL REGISTER	METAL	INTACT	GREY	12/7/2010 11:24	Negative	0.00
400	D	FIRST	RM 106	WNDW CASING	METAL	INTACT	BLACK	12/7/2010 11:25	Negative	0.00
401	C	FIRST	BATH RM 116	DOOR	METAL	INTACT	GREY	12/7/2010 11:26	Negative	0.00
402	A	FIRST	BATH RM 116	WALL	TILE	INTACT	WHITE	12/7/2010 11:26	Negative	0.04
403	B	FIRST	BATH RM 116	WALL	TILE	INTACT	WHITE	12/7/2010 11:27	Negative	0.07
404	C	FIRST	BATH RM 116	WALL	TILE	INTACT	WHITE	12/7/2010 11:27	Negative	0.03
405	D	FIRST	BATH RM 116	WALL	TILE	INTACT	WHITE	12/7/2010 11:27	Negative	0.02
406	Floor	FIRST	BATH RM 116	FLOOR	TILE	INTACT	GREY	12/7/2010 11:28	Negative	0.01
407	B	SECOND	HALL 221	DOOR	WOOD	INTACT	VARNISH	12/7/2010 11:29	Negative	0.00
408	D	SECOND	RM 213	DR. JAMB	METAL	INTACT	GREY	12/7/2010 11:30	Negative	0.00
409	B	SECOND	HALL 221	DOOR	WOOD	INTACT	VARNISH	12/7/2010 11:31	Negative	0.00
410	D	SECOND	RM 213	DOOR	WOOD	INTACT	VARNISH	12/7/2010 11:31	Negative	0.00
411	D	SECOND	RM 213	CLST DOOR LFT	WOOD	INTACT	VARNISH	12/7/2010 11:32	Negative	0.00
412	A	SECOND	RM 213	WALL	DRYWALL	INTACT	WHITE	12/7/2010 11:32	Negative	0.00
413	C	SECOND	RM 213	WALL	DRYWALL	INTACT	WHITE	12/7/2010 11:33	Negative	0.00
414	D	SECOND	RM 213	WALL	DRYWALL	INTACT	WHITE	12/7/2010 11:33	Negative	0.00
415	B	SECOND	RM 213	WALL REGISTER	METAL	INTACT	GREY	12/7/2010 11:33	Negative	0.00
416	B	SECOND	RM 213	WNDW CASING	METAL	INTACT	BLACK	12/7/2010 11:34	Negative	0.00
417	A	FIRST	HALL 120	WALL	DRYWALL	INTACT	WHITE	12/7/2010 11:35	Negative	0.00
418	C	FIRST	HALL 120	WALL	DRYWALL	INTACT	WHITE	12/7/2010 11:36	Negative	0.00
419	N/A	N/A	CALIBRATE	N/A	N/A	N/A	N/A	12/7/2010 11:38	Null	1.00
420	N/A	N/A	CALIBRATE	N/A	N/A	N/A	N/A	12/7/2010 11:41	Positive	1.00

Table 3  
**Summary of XRF<sup>1</sup> Results**  
Page 16 of 16

**Project Name:** Lead-Based Paint Inspection

**Project Address:** Building 5212, United States Air Force Prep School, Colorado Springs, CO

**Project Number:** 3010128

XRF										Lead Content
Number	Side	Floor	Room	Component	Substrate	Condition	Color	Date/Time	Result	(mg/cm <sup>2</sup> ) <sup>2</sup>
421	N/A	N/A	CALIBRATE	N/A	N/A	N/A	N/A	12/7/2010 11:42	Null	1.00
422	N/A	N/A	CALIBRATE	N/A	N/A	N/A	N/A	12/7/2010 11:43	Null	1.00
423	N/A	N/A	CALIBRATE	N/A	N/A	N/A	N/A	12/7/2010 11:46	Positive	1.00
424	N/A	N/A	CALIBRATE	N/A	N/A	N/A	N/A	12/7/2010 11:49	Positive	1.00

*Notes:*

1. XRF indicates X-Ray Fluorescence
2. mg/cm<sup>2</sup> indicates milligrams per square centimeter
3. N/A indicates this parameter was not applicable.
4. Intact indicates the paint is in good condition and not peeling, chipping, or flaking.
5. Fair indicates deteriorated paint on less than or equal to 20 square feet on large exterior surfaces.
6. **Bold** indicates Lead-Based paint as defined by Title X.
7. Fair indicates deteriorated paint on less than or equal to 10 percent of the total surface area of the component.
8. Fair indicates deteriorated paint on less than or equal to 2 square feet on large surface areas.
9. Substrate indicates the surface the paint was adhered to appeared to be damaged.

Table 4  
**Summary of XRF<sup>1</sup> Results**  
Page 1 of 15

**Project Name:** Lead-Based Paint Inspection

**Project Address:** Building 5214, United States Air Force Prep School, Colorado Springs, CO

**Project Number:** 3010128

XRF										Lead Content (mg/cm <sup>2</sup> ) <sup>2</sup>
Number	Side	Floor	Room	Component	Substrate	Condition	Color	Date/Time	Result	
1	N/A <sup>3</sup>	N/A	CALIBRATE	N/A	N/A	N/A	N/A	11/28/2010 11:14	Negative	0.90
2	N/A	N/A	CALIBRATE	N/A	N/A	N/A	N/A	11/28/2010 11:17	Negative	0.90
3	N/A	N/A	CALIBRATE	N/A	N/A	N/A	N/A	11/28/2010 11:19	Positive	1.00
4	C	EXT	EXTERIOR	DOOR	METAL	INTACT <sup>4</sup>	BLACK	11/28/2010 11:45	Negative	0.00
5	C	EXT	EXTERIOR	WNDW CASING	METAL	INTACT	BLACK	11/28/2010 11:45	Negative	0.00
6	C	EXT	EXTERIOR	HORIZONTAL BEAM	METAL	FAIR <sup>5</sup>	BLACK	11/28/2010 11:46	Negative	0.00
7	C	EXT	EXTERIOR	VERTICAL BEAM	METAL	FAIR	WHITE	11/28/2010 11:47	Negative	0.00
8	C	EXT	EXTERIOR	VERTICAL BEAM	METAL	FAIR	BLACK	11/28/2010 11:48	Negative	0.00
9	B	EXT	EXTERIOR	EXT. SIDING	METAL	INTACT	BLACK	11/28/2010 11:48	Negative	0.00
10	B	EXT	EXTERIOR	WNDW CASING	METAL	INTACT	BLACK	11/28/2010 11:49	Negative	0.00
<b>11<sup>6</sup></b>	<b>B</b>	<b>EXT</b>	<b>EXTERIOR</b>	<b>VERTICAL BEAM</b>	<b>METAL</b>	<b>FAIR</b>	<b>WHITE</b>	<b>11/28/2010 11:50</b>	<b>Positive</b>	<b>1.30</b>
12	B	EXT	EXTERIOR	VERTICAL BEAM	METAL	FAIR	BLACK	11/28/2010 11:50	Negative	0.12
13	A	EXT	EXTERIOR	DOOR LFT	METAL	INTACT	BLACK	11/28/2010 11:51	Negative	0.00
14	A	EXT	EXTERIOR	DOOR RHT	METAL	INTACT	BLACK	11/28/2010 11:52	Negative	0.00
15	A	EXT	EXTERIOR	WALL VENT	METAL	INTACT	BLACK	11/28/2010 11:53	Negative	-0.85
16	A	EXT	EXTERIOR	WNDW CASING	METAL	INTACT	BLACK	11/28/2010 11:53	Null	0.00
17	A	EXT	EXTERIOR	WNDW CASING	METAL	INTACT	BLACK	11/28/2010 11:54	Negative	0.00
18	D	EXT	EXTERIOR	WNDW CASING	METAL	INTACT	BLACK	11/28/2010 11:54	Null	0.00
19	D	EXT	EXTERIOR	WNDW CASING	METAL	INTACT	BLACK	11/28/2010 11:55	Negative	0.00
<b>20</b>	<b>A</b>	<b>EXT</b>	<b>EXTERIOR</b>	<b>VERTICAL BEAM</b>	<b>METAL</b>	<b>FAIR</b>	<b>WHITE</b>	<b>11/28/2010 11:56</b>	<b>Positive</b>	<b>2.80</b>
21	A	EXT	EXTERIOR	VERTICAL BEAM	METAL	FAIR	BLACK	11/28/2010 11:56	Negative	0.11
22	D	EXT	EXTERIOR	EXT. SIDING	METAL	INTACT	BLACK	11/28/2010 11:57	Negative	0.00
23	D	EXT	EXTERIOR	EXT. SIDING	METAL	INTACT	BLACK	11/28/2010 11:57	Negative	0.00
24	D	EXT	EXTERIOR	VERTICAL BEAM	METAL	FAIR	WHITE	11/28/2010 11:58	Negative	0.00
25	C	EXT	EXTERIOR	VERTICAL BEAM	METAL	FAIR	BLACK	11/28/2010 11:58	Negative	0.00
26	C	EXT	EXTERIOR	RAMP HAND RAIL	METAL	INTACT	BLACK	11/28/2010 11:59	Negative	0.05
27	C	FIRST	STAIRWAY 1	DOOR	METAL	INTACT	BLACK	11/28/2010 12:06	Negative	0.00
28	C	FIRST	STAIRWAY 1	DR. JAMB	METAL	FAIR <sup>7</sup>	BLACK	11/28/2010 12:06	Negative	0.00



Table 4  
**Summary of XRF<sup>1</sup> Results**  
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**Project Name:** Lead-Based Paint Inspection

**Project Address:** Building 5214, United States Air Force Prep School, Colorado Springs, CO

**Project Number:** 3010128

XRF										Lead Content (mg/cm <sup>2</sup> ) <sup>2</sup>
Number	Side	Floor	Room	Component	Substrate	Condition	Color	Date/Time	Result	
29	C	FIRST	STAIRWAY 1	SUPPORT COLUMN	METAL	INTACT	BLACK	11/28/2010 12:07	Negative	0.00
30	C	FIRST	STAIRWAY 1	WNDW CASING	METAL	INTACT	BLACK	11/28/2010 12:08	Negative	0.00
31	A	FIRST	STAIRWAY 1	STR BALUSTER	METAL	FAIR	BLACK	11/28/2010 12:08	Negative	0.00
32	A	FIRST	STAIRWAY 1	WNDW CASING	METAL	INTACT	WHITE	11/28/2010 12:09	Null	0.00
33	A	FIRST	STAIRWAY 1	WNDW CASING	METAL	INTACT	WHITE	11/28/2010 12:09	Negative	0.00
34	A	FIRST	STAIRWAY 1	DOOR RHT	METAL	INTACT	GREY	11/28/2010 12:10	Negative	0.00
35	A	FIRST	STAIRWAY 1	DOOR LFT	METAL	INTACT	GREY	11/28/2010 12:11	Negative	0.00
36	A	FIRST	STAIRWAY 1	DR. JAMB LFT	METAL	INTACT	GREY	11/28/2010 12:11	Negative	0.00
37	A	FIRST	STAIRWAY 1	DR. JAMB RHT	METAL	FAIR	GREY	11/28/2010 12:12	Null	0.00
38	A	FIRST	STAIRWAY 1	DR. JAMB RHT	METAL	FAIR	GREY	11/28/2010 12:12	Negative	0.00
39	A	FIRST	STAIRWAY 1	WALL	DRYWALL	INTACT	WHITE	11/28/2010 12:13	Negative	0.00
40	B	FIRST	STAIRWAY 1	WALL	DRYWALL	INTACT	WHITE	11/28/2010 12:14	Negative	0.00
41	D	FIRST	STAIRWAY 1	WALL	DRYWALL	INTACT	WHITE	11/28/2010 12:14	Negative	0.00
42	D	FIRST	STAIRWAY 1	WALL REGISTER	METAL	INTACT	GREY	11/28/2010 12:15	Negative	0.00
43	A	SECOND	STAIRWAY 1	WALL	DRYWALL	INTACT	WHITE	11/28/2010 12:15	Negative	0.00
44	B	SECOND	STAIRWAY 1	WALL	DRYWALL	INTACT	WHITE	11/28/2010 12:16	Negative	0.00
45	D	SECOND	STAIRWAY 1	WALL	DRYWALL	INTACT	WHITE	11/28/2010 12:16	Negative	0.00
46	C	SECOND	STAIRWAY 1	SUPPORT COLUMN	DRYWALL	INTACT	BLACK	11/28/2010 12:17	Negative	0.00
47	C	SECOND	STAIRWAY 1	WNDW CASING	METAL	INTACT	BLACK	11/28/2010 12:17	Negative	0.00
48	C	SECOND	STAIRWAY 1	WALL REGISTER	METAL	INTACT	GREY	11/28/2010 12:18	Negative	0.00
49	A	SECOND	STAIRWAY 1	STR HAND RAIL	METAL	FAIR	BLACK	11/28/2010 12:18	Negative	0.00
50	A	SECOND	STAIRWAY 1	DOOR RHT	METAL	INTACT	GREY	11/28/2010 12:19	Negative	0.00
51	A	SECOND	STAIRWAY 1	DR. JAMB RHT	METAL	FAIR	GREY	11/28/2010 12:19	Negative	0.00
52	A	SECOND	STAIRWAY 1	DR. JAMB LFT	METAL	INTACT	GREY	11/28/2010 12:20	Null	0.04
53	A	SECOND	STAIRWAY 1	DR. JAMB LFT	METAL	INTACT	GREY	11/28/2010 12:20	Negative	0.00
54	A	SECOND	STAIRWAY 1	DOOR	METAL	FAIR <sup>8</sup>	GREY	11/28/2010 12:20	Negative	0.00
55	A	THIRD	STAIRWAY 1	DOOR LFT	METAL	INTACT	GREY	11/28/2010 12:21	Negative	0.00
56	A	THIRD	STAIRWAY 1	DR. JAMB LFT	METAL	FAIR	GREY	11/28/2010 12:22	Negative	0.00

Table 4  
**Summary of XRF<sup>1</sup> Results**  
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**Project Name:** Lead-Based Paint Inspection

**Project Address:** Building 5214, United States Air Force Prep School, Colorado Springs, CO

**Project Number:** 3010128

XRF										Lead Content (mg/cm <sup>2</sup> ) <sup>2</sup>
Number	Side	Floor	Room	Component	Substrate	Condition	Color	Date/Time	Result	
57	A	THIRD	STAIRWAY 1	DR. JAMB RHT	METAL	FAIR	GREY	11/28/2010 12:22	Negative	0.00
58	A	THIRD	STAIRWAY 1	DOOR RHT	METAL	INTACT	GREY	11/28/2010 12:23	Negative	0.00
59	C	THIRD	STAIRWAY 1	WNDW CASING	METAL	INTACT	BLACK	11/28/2010 12:24	Negative	0.00
60	C	THIRD	STAIRWAY 1	SUPPORT COLUMN	METAL	INTACT	BLACK	11/28/2010 12:24	Negative	0.00
61	C	THIRD	STAIRWAY 1	WALL REGISTER	METAL	INTACT	GREY	11/28/2010 12:25	Negative	0.00
62	A	THIRD	STAIRWAY 1	WALL	DRYWALL	INTACT	WHITE	11/28/2010 12:25	Negative	0.00
63	B	THIRD	STAIRWAY 1	WALL	DRYWALL	INTACT	WHITE	11/28/2010 12:26	Negative	0.00
64	D	THIRD	STAIRWAY 1	WALL	DRYWALL	INTACT	WHITE	11/28/2010 12:26	Negative	0.00
65	A	THIRD	STAIRWAY 1	STR HAND RAIL	METAL	FAIR	BLACK	11/28/2010 12:27	Negative	0.00
66	A	THIRD	STAIRWAY 1	STR STRINGER	METAL	FAIR	BLACK	11/28/2010 12:27	Negative	0.00
67	C	FIRST	HALL 120	DOOR	METAL	INTACT	GREY	11/28/2010 12:29	Negative	0.00
68	D	FIRST	HALL 120	DOOR RM 112	WOOD	INTACT	VARNISH	11/28/2010 12:29	Negative	0.00
69	D	FIRST	HALL 120	DR. JAMB RM 112	METAL	FAIR	GREY	11/28/2010 12:30	Negative	0.00
70	D	FIRST	HALL 120	DR. JAMB RM 110	METAL	INTACT	GREY	11/28/2010 12:31	Negative	0.00
71	D	FIRST	HALL 120	DOOR RM 110	WOOD	INTACT	VARNISH	11/28/2010 12:31	Negative	0.00
72	D	FIRST	HALL 120	DOOR RM 111	WOOD	INTACT	VARNISH	11/28/2010 12:32	Negative	0.00
73	D	FIRST	HALL 120	DR. JAMB RM 111	METAL	INTACT	GREY	11/28/2010 12:33	Negative	0.00
74	D	FIRST	HALL 120	DOOR RM 111	WOOD	INTACT	VARNISH	11/28/2010 12:33	Negative	0.00
75	B	FIRST	HALL 120	DOOR RM 118	WOOD	FAIR	GREY	11/28/2010 12:34	Negative	0.00
76	B	FIRST	HALL 120	DR. JAMB RM 118	METAL	FAIR	GREY	11/28/2010 12:35	Negative	0.00
77	B	FIRST	HALL 120	DR. JAMB BATH	METAL	INTACT	GREY	11/28/2010 12:36	Negative	0.00
78	B	FIRST	HALL 120	DOOR BATH	METAL	INTACT	GREY	11/28/2010 12:36	Null	0.00
79	B	FIRST	HALL 120	DOOR BATH	METAL	INTACT	GREY	11/28/2010 12:36	Negative	0.00
80	D	FIRST	HALL 120	DOOR RM 108	WOOD	INTACT	VARNISH	11/28/2010 12:37	Negative	0.00
81	D	FIRST	HALL 120	DR. JAMB RM 108	METAL	INTACT	GREY	11/28/2010 12:38	Negative	0.00
82	A	FIRST	HALL 120	DR. JAMB	METAL	FAIR	BLACK	11/28/2010 12:38	Negative	0.00
83	A	FIRST	HALL 120	DOOR	METAL	INTACT	BLACK	11/28/2010 12:39	Negative	-0.21
84	A	FIRST	HALL 120	WALL	DRYWALL	INTACT	WHITE	11/28/2010 12:39	Negative	0.00
85	B	FIRST	HALL 120	WALL	DRYWALL	INTACT	WHITE	11/28/2010 12:40	Negative	0.00

Table 4  
**Summary of XRF<sup>1</sup> Results**  
Page 4 of 15

**Project Name:** Lead-Based Paint Inspection

**Project Address:** Building 5214, United States Air Force Prep School, Colorado Springs, CO

**Project Number:** 3010128

XRF										Lead Content (mg/cm <sup>2</sup> ) <sup>2</sup>
Number	Side	Floor	Room	Component	Substrate	Condition	Color	Date/Time	Result	
86	C	FIRST	HALL 120	WALL	DRYWALL	INTACT	WHITE	11/28/2010 12:40	Negative	0.01
87	D	FIRST	HALL 120	WALL	DRYWALL	INTACT	WHITE	11/28/2010 12:41	Negative	0.00
88	A	FIRST	DAY RM 118	WALL	DRYWALL	INTACT	WHITE	11/28/2010 12:42	Negative	0.00
89	B	FIRST	DAY RM 118	WALL	DRYWALL	INTACT	WHITE	11/28/2010 12:42	Negative	0.00
90	C	FIRST	DAY RM 118	WALL	DRYWALL	INTACT	WHITE	11/28/2010 12:43	Negative	0.00
91	D	FIRST	DAY RM 118	WALL	DRYWALL	INTACT	WHITE	11/28/2010 12:43	Negative	0.00
92	C	FIRST	DAY RM 118	WALL REGISTER	METAL	INTACT	WHITE	11/28/2010 12:43	Negative	0.00
93	C	FIRST	DAY RM 118	WNDW CASING	METAL	INTACT	WHITE	11/28/2010 12:44	Negative	0.00
94	C	FIRST	DAY RM 118	SUPPORT COLUMN	CONCRETE	INTACT	WHITE	11/28/2010 12:45	Negative	0.00
95	D	FIRST	DAY RM 118	DOOR	METAL	FAIR	GREY	11/28/2010 12:45	Negative	0.00
96	B	FIRST	DAY RM 118	DOOR	METAL	FAIR	GREY	11/28/2010 12:46	Negative	0.00
97	B	FIRST	BATH RM 115	DOOR	METAL	INTACT	GREY	11/28/2010 12:47	Negative	0.00
98	D	FIRST	BATH RM 115	DOOR	METAL	INTACT	GREY	11/28/2010 12:47	Negative	0.00
99	B	FIRST	BATH RM 115	DR. JAMB	METAL	INTACT	GREY	11/28/2010 12:47	Negative	0.00
100	Floor	FIRST	BATH RM 115	FLOOR	TILE	INTACT	GREY	11/28/2010 12:48	Negative	0.00
101	A	FIRST	BATH RM 115	WALL	TILE	INTACT	WHITE	11/28/2010 12:49	Negative	0.02
102	A	FIRST	BATH RM 115	WALL	DRYWALL	INTACT	WHITE	11/28/2010 12:49	Negative	0.01
103	B	FIRST	BATH RM 115	WALL	DRYWALL	INTACT	WHITE	11/28/2010 12:50	Negative	0.00
104	B	FIRST	BATH RM 115	WALL	TILE	INTACT	WHITE	11/28/2010 12:50	Negative	0.02
105	C	FIRST	BATH RM 115	WALL	TILE	INTACT	WHITE	11/28/2010 12:51	Negative	0.07
106	C	FIRST	BATH RM 115	WALL	DRYWALL	INTACT	WHITE	11/28/2010 12:51	Negative	0.00
107	D	FIRST	BATH RM 115	WALL	DRYWALL	INTACT	WHITE	11/28/2010 12:51	Negative	0.00
108	D	FIRST	BATH RM 115	WALL	TILE	INTACT	WHITE	11/28/2010 12:52	Negative	0.02
109	A	FIRST	RM 112	WALL	DRYWALL	INTACT	WHITE	11/28/2010 12:53	Negative	0.00
110	B	FIRST	RM 112	WALL	DRYWALL	INTACT	WHITE	11/28/2010 12:54	Negative	0.00
111	C	FIRST	RM 112	WALL	DRYWALL	INTACT	WHITE	11/28/2010 12:54	Negative	0.00
112	D	FIRST	RM 112	WNDW CASING	METAL	INTACT	BLACK	11/28/2010 12:55	Negative	0.00
113	D	FIRST	RM 112	WALL REGISTER	METAL	INTACT	GREY	11/28/2010 12:55	Null	0.02
114	D	FIRST	RM 112	WALL REGISTER	METAL	INTACT	GREY	11/28/2010 12:56	Negative	0.00

Table 4  
**Summary of XRF<sup>1</sup> Results**  
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**Project Name:** Lead-Based Paint Inspection

**Project Address:** Building 5214, United States Air Force Prep School, Colorado Springs, CO

**Project Number:** 3010128

XRF										Lead Content (mg/cm <sup>2</sup> ) <sup>2</sup>
Number	Side	Floor	Room	Component	Substrate	Condition	Color	Date/Time	Result	
115	B	FIRST	RM 112	CLST DOOR LFT	WOOD	INTACT	VARNISH	11/28/2010 12:56	Negative	0.00
116	B	FIRST	RM 112	DOOR	WOOD	INTACT	VARNISH	11/28/2010 12:57	Negative	0.00
117	B	FIRST	RM 111	DOOR	WOOD	INTACT	VARNISH	11/28/2010 12:58	Negative	0.00
118	B	FIRST	RM 111	CLST DOOR RHT	WOOD	INTACT	VARNISH	11/28/2010 12:59	Negative	0.00
119	D	FIRST	RM 111	WALL REGISTER	WOOD	INTACT	GREY	11/28/2010 12:59	Negative	0.00
120	D	FIRST	RM 111	WNDW CASING	METAL	INTACT	BLACK	11/28/2010 13:00	Negative	0.00
121	A	FIRST	RM 111	WALL	DRYWALL	INTACT	WHITE	11/28/2010 13:00	Negative	0.00
122	B	FIRST	RM 111	WALL	DRYWALL	INTACT	WHITE	11/28/2010 13:01	Negative	0.00
123	C	FIRST	RM 111	WALL	DRYWALL	INTACT	WHITE	11/28/2010 13:01	Negative	0.00
124	A	FIRST	RM 110	WALL	DRYWALL	INTACT	WHITE	11/28/2010 13:03	Negative	0.00
125	B	FIRST	RM 110	WALL	DRYWALL	INTACT	WHITE	11/28/2010 13:03	Negative	0.01
126	C	FIRST	RM 110	WALL	DRYWALL	INTACT	WHITE	11/28/2010 13:03	Negative	0.00
127	D	FIRST	RM 110	WALL REGISTER	METAL	INTACT	GREY	11/28/2010 13:04	Negative	0.00
128	D	FIRST	RM 110	WNDW CASING	METAL	INTACT	BLACK	11/28/2010 13:05	Negative	0.00
129	B	FIRST	RM 110	CLST DOOR LFT	WOOD	INTACT	VARNISH	11/28/2010 13:05	Negative	0.00
130	B	FIRST	RM 110	DOOR	WOOD	INTACT	VARNISH	11/28/2010 13:06	Negative	0.00
131	B	FIRST	RM 108	DOOR	WOOD	INTACT	VARNISH	11/28/2010 13:07	Negative	0.00
132	B	FIRST	RM 108	CLST DOOR RHT	WOOD	INTACT	VARNISH	11/28/2010 13:08	Negative	0.01
133	A	FIRST	RM 108	WALL	DRYWALL	INTACT	WHITE	11/28/2010 13:08	Negative	0.01
134	B	FIRST	RM 108	WALL	DRYWALL	INTACT	WHITE	11/28/2010 13:09	Negative	0.00
135	C	FIRST	RM 108	WALL	DRYWALL	INTACT	WHITE	11/28/2010 13:09	Negative	0.00
136	D	FIRST	RM 108	WALL REGISTER	METAL	INTACT	GREY	11/28/2010 13:10	Negative	0.00
137	D	FIRST	RM 108	WNDW SILL	METAL	INTACT	BLACK	11/28/2010 13:10	Negative	0.00
138	A	FIRST	HALL 122	WALL	DRYWALL	INTACT	WHITE	11/28/2010 13:12	Negative	0.00
139	C	FIRST	HALL 122	WALL	DRYWALL	INTACT	WHITE	11/28/2010 13:12	Negative	0.00
140	A	FIRST	HALL 121	WALL	DRYWALL	INTACT	WHITE	11/28/2010 13:13	Negative	0.00
141	B	FIRST	HALL 121	WALL	DRYWALL	INTACT	WHITE	11/28/2010 13:14	Negative	0.00
142	B	FIRST	HALL 121	WALL	DRYWALL	INTACT	WHITE	11/28/2010 13:14	Negative	0.00
143	D	FIRST	HALL 121	WALL	DRYWALL	INTACT	WHITE	11/28/2010 13:15	Negative	0.00

Table 4  
**Summary of XRF<sup>1</sup> Results**  
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**Project Name:** Lead-Based Paint Inspection

**Project Address:** Building 5214, United States Air Force Prep School, Colorado Springs, CO

**Project Number:** 3010128

XRF										Lead Content (mg/cm <sup>2</sup> ) <sup>2</sup>
Number	Side	Floor	Room	Component	Substrate	Condition	Color	Date/Time	Result	
144	C	FIRST	HALL 121	DOOR	METAL	FAIR	GREY	11/28/2010 13:15	Negative	0.01
145	D	FIRST	HALL 121	DOOR RM 118	METAL	FAIR	GREY	11/28/2010 13:16	Negative	0.00
146	D	FIRST	HALL 121	DR. JAMB RM 118	METAL	FAIR	GREY	11/28/2010 13:16	Negative	0.00
147	B	FIRST	HALL 121	DR. JAMB RM 104	METAL	FAIR	GREY	11/28/2010 13:17	Negative	0.00
148	B	FIRST	HALL 121	DOOR RM 104	WOOD	SUBSTRATE <sup>9</sup>	VARNISH	11/28/2010 13:18	Negative	0.01
149	D	FIRST	HALL 121	DOOR BATH RM 115	METAL	INTACT	GREY	11/28/2010 13:19	Negative	0.00
150	C	FIRST	HALL 121	DR. CASING BATH 116	METAL	INTACT	GREY	11/28/2010 13:20	Negative	0.00
151	C	FIRST	HALL 121	DOOR BATH RM 116	METAL	INTACT	GREY	11/28/2010 13:20	Negative	0.00
152	N/A	N/A	SHUTTER CAL	N/A	N/A	N/A	N/A	11/28/2010 13:27	-	1.61
153	N/A	N/A	CALIBRATE	N/A	N/A	N/A	N/A	11/28/2010 13:36	Positive	1.10
154	N/A	N/A	CALIBRATE	N/A	N/A	N/A	N/A	11/28/2010 13:38	Positive	1.00
155	N/A	N/A	CALIBRATE	N/A	N/A	N/A	N/A	11/28/2010 13:41	Positive	1.00
156	C	FIRST	HALL 121	WALL	DRYWALL	INTACT	WHITE	11/28/2010 13:43	Negative	0.00
157	A	FIRST	BATH RM 116	WALL	TILE	INTACT	WHITE	11/28/2010 13:44	Negative	0.09
158	B	FIRST	BATH RM 116	WALL	TILE	INTACT	WHITE	11/28/2010 13:45	Negative	0.01
159	C	FIRST	BATH RM 116	WALL	TILE	INTACT	WHITE	11/28/2010 13:45	Negative	0.01
160	D	FIRST	BATH RM 116	WALL	TILE	INTACT	WHITE	11/28/2010 13:45	Negative	0.03
161	A	FIRST	BATH RM 116	DOOR	METAL	INTACT	GREY	11/28/2010 13:46	Negative	0.00
162	Floor	FIRST	BATH RM 116	FLOOR	TILE	INTACT	GREY	11/28/2010 13:46	Negative	0.00
163	B	FIRST	HALL 121	DOOR RM 104	WOOD	INTACT	VARNISH	11/28/2010 13:48	Negative	0.00
164	B	FIRST	HALL 121	DR. JAMB RM 104	METAL	FAIR	GREY	11/28/2010 13:48	Negative	0.00
165	D	FIRST	RM 104	DOOR	WOOD	INTACT	VARNISH	11/28/2010 13:49	Negative	0.00
166	D	FIRST	RM 104	CLST DOOR LFT	WOOD	INTACT	VARNISH	11/28/2010 13:50	Negative	0.00
167	A	FIRST	RM 104	WALL	DRYWALL	INTACT	WHITE	11/28/2010 13:50	Negative	0.00
168	C	FIRST	RM 104	WALL	DRYWALL	INTACT	WHITE	11/28/2010 13:51	Negative	0.00
169	D	FIRST	RM 104	WALL	DRYWALL	INTACT	WHITE	11/28/2010 13:51	Negative	0.00
170	B	FIRST	RM 104	WNDW CASING	METAL	INTACT	BLACK	11/28/2010 13:52	Negative	0.00
171	B	FIRST	RM 104	WALL REGISTER	METAL	INTACT	GREY	11/28/2010 13:53	Negative	0.00

Table 4  
**Summary of XRF<sup>1</sup> Results**  
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**Project Name:** Lead-Based Paint Inspection

**Project Address:** Building 5214, United States Air Force Prep School, Colorado Springs, CO

**Project Number:** 3010128

XRF										Lead Content (mg/cm <sup>2</sup> ) <sup>2</sup>
Number	Side	Floor	Room	Component	Substrate	Condition	Color	Date/Time	Result	
172	B	FIRST	HALL 121	DOOR RM 102	WOOD	INTACT	VARNISH	11/28/2010 13:54	Negative	0.00
173	B	FIRST	HALL 121	DR. JAMB RM 102	METAL	INTACT	GREY	11/28/2010 13:54	Negative	0.00
174	B	FIRST	RM 102	WNDW CASING	METAL	INTACT	BLACK	11/28/2010 13:56	Negative	0.00
175	B	FIRST	RM 102	WALL REGISTER	METAL	INTACT	GREY	11/28/2010 13:56	Negative	0.00
176	A	FIRST	RM 102	WALL	DRYWALL	INTACT	WHITE	11/28/2010 13:57	Negative	0.00
177	C	FIRST	RM 102	WALL	DRYWALL	INTACT	WHITE	11/28/2010 13:57	Negative	0.00
178	D	FIRST	RM 102	WALL	DRYWALL	INTACT	WHITE	11/28/2010 13:58	Negative	0.00
179	D	FIRST	RM 102	DOOR	WOOD	INTACT	VARNISH	11/28/2010 13:58	Negative	0.00
180	D	FIRST	RM 102	CLST DOOR LFT	WOOD	INTACT	VARNISH	11/28/2010 13:59	Negative	0.00
181	B	FIRST	HALL 121	STWY 2 DOOR	METAL	INTACT	GREY	11/28/2010 14:00	Negative	0.00
182	B	FIRST	HALL 121	STWY 2 DR. JAMB	METAL	FAIR	GREY	11/28/2010 14:01	Negative	0.00
183	A	FIRST	STAIRWAY 2	WALL	DRYWALL	INTACT	WHITE	11/28/2010 14:02	Negative	0.01
184	A	FIRST	STAIRWAY 2	WALL	DRYWALL	INTACT	YELLOW	11/28/2010 14:02	Negative	0.00
185	A	FIRST	STAIRWAY 2	WALL	DRYWALL	INTACT	BLACK	11/28/2010 14:02	Negative	0.01
186	A	FIRST	STAIRWAY 2	WALL	DRYWALL	INTACT	BLUE	11/28/2010 14:03	Negative	0.02
187	B	FIRST	STAIRWAY 2	WALL	DRYWALL	INTACT	WHITE	11/28/2010 14:04	Negative	0.00
188	C	FIRST	STAIRWAY 2	WALL	DRYWALL	INTACT	WHITE	11/28/2010 14:04	Negative	0.00
189	D	FIRST	STAIRWAY 2	WALL	DRYWALL	INTACT	WHITE	11/28/2010 14:04	Negative	0.00
190	D	FIRST	STAIRWAY 2	WALL	DRYWALL	INTACT	ORANGE	11/28/2010 14:05	Null	0.00
191	D	FIRST	STAIRWAY 2	WALL	DRYWALL	INTACT	ORANGE	11/28/2010 14:05	Null	0.00
192	D	FIRST	STAIRWAY 2	WALL	DRYWALL	INTACT	ORANGE	11/28/2010 14:05	Negative	0.00
193	B	FIRST	STAIRWAY 2	STR HAND RAIL	METAL	INTACT	BLACK	11/28/2010 14:06	Negative	0.00
194	C	FIRST	STAIRWAY 2	STR RISER	METAL	FAIR	BLACK	11/28/2010 14:06	Negative	0.00
195	B	SECOND	STAIRWAY 2	STR BALUSTER	METAL	INTACT	BLACK	11/28/2010 14:07	Negative	0.00
196	A	SECOND	STAIRWAY 2	WALL	DRYWALL	INTACT	BLUE	11/28/2010 14:08	Negative	0.00
197	A	SECOND	STAIRWAY 2	WALL	DRYWALL	INTACT	RED	11/28/2010 14:09	Negative	0.00
198	A	SECOND	STAIRWAY 2	WALL	DRYWALL	INTACT	BLACK	11/28/2010 14:09	Negative	0.00
199	A	SECOND	STAIRWAY 2	WALL	DRYWALL	INTACT	GREEN	11/28/2010 14:10	Negative	0.00
200	A	SECOND	STAIRWAY 2	WALL	DRYWALL	INTACT	ORANGE	11/28/2010 14:10	Null	0.00

Table 4  
**Summary of XRF<sup>1</sup> Results**  
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**Project Name:** Lead-Based Paint Inspection

**Project Address:** Building 5214, United States Air Force Prep School, Colorado Springs, CO

**Project Number:** 3010128

XRF										Lead Content (mg/cm <sup>2</sup> ) <sup>2</sup>
Number	Side	Floor	Room	Component	Substrate	Condition	Color	Date/Time	Result	
201	A	SECOND	STAIRWAY 2	WALL	DRYWALL	INTACT	ORANGE	11/28/2010 14:10	Negative	0.01
202	A	SECOND	STAIRWAY 2	WALL	DRYWALL	INTACT	WHITE	11/28/2010 14:11	Negative	0.00
203	C	SECOND	STAIRWAY 2	WALL	DRYWALL	INTACT	WHITE	11/28/2010 14:12	Negative	0.00
204	C	SECOND	STAIRWAY 2	WALL	DRYWALL	INTACT	PURPLE	11/28/2010 14:12	Negative	0.00
205	C	SECOND	STAIRWAY 2	WALL	DRYWALL	INTACT	BROWN	11/28/2010 14:13	Negative	0.00
206	D	SECOND	STAIRWAY 2	STR STRINGER	METAL	INTACT	BLACK	11/28/2010 14:13	Negative	0.00
207	D	SECOND	STAIRWAY 2	WALL	DRYWALL	INTACT	WHITE	11/28/2010 14:14	Negative	0.00
208	D	SECOND	STAIRWAY 2	DOOR	METAL	INTACT	GREY	11/28/2010 14:14	Negative	0.00
209	D	SECOND	STAIRWAY 2	DR. JAMB	METAL	FAIR	GREY	11/28/2010 14:15	Negative	0.00
210	A	SECOND	STAIRWAY 2	I-BEAM	METAL	INTACT	WHITE	11/28/2010 14:15	Negative	0.00
211	B	THIRD	STAIRWAY 2	STR BALUSTER	METAL	INTACT	BLACK	11/28/2010 14:17	Negative	0.00
212	B	THIRD	STAIRWAY 2	WALL	DRYWALL	INTACT	WHITE	11/28/2010 14:18	Negative	0.00
213	B	THIRD	STAIRWAY 2	WALL	DRYWALL	INTACT	BLUE	11/28/2010 14:18	Negative	0.00
214	C	THIRD	STAIRWAY 2	WALL	DRYWALL	INTACT	WHITE	11/28/2010 14:19	Negative	0.00
215	D	THIRD	STAIRWAY 2	WALL	DRYWALL	INTACT	WHITE	11/28/2010 14:19	Negative	0.00
216	A	THIRD	STAIRWAY 2	WALL	DRYWALL	INTACT	WHITE	11/28/2010 14:20	Negative	0.00
217	C	THIRD	STAIRWAY 2	LADDER	METAL	FAIR	WHITE	11/28/2010 14:21	Negative	0.00
218	D	THIRD	STAIRWAY 2	DOOR	METAL	INTACT	GREY	11/28/2010 14:21	Negative	0.00
219	D	THIRD	STAIRWAY 2	DR. JAMB	METAL	INTACT	GREY	11/28/2010 14:22	Negative	0.01
220	D	THIRD	STAIRWAY 2	STR STRINGER	METAL	FAIR	BLACK	11/28/2010 14:22	Negative	0.00
221	D	FIRST	STAIRWAY 2	DOOR	METAL	INTACT	GREY	11/28/2010 14:23	Negative	0.00
222	C	SECOND	HALL 220	DOOR	METAL	INTACT	GREY	11/28/2010 14:27	Negative	0.00
223	C	SECOND	HALL 220	WALL	DRYWALL	INTACT	WHITE	11/28/2010 14:27	Negative	0.00
224	D	SECOND	HALL 220	WALL	DRYWALL	INTACT	WHITE	11/28/2010 14:28	Negative	0.00
225	B	SECOND	HALL 220	WALL	DRYWALL	INTACT	WHITE	11/28/2010 14:28	Negative	0.00
226	A	SECOND	HALL 220	WALL	DRYWALL	INTACT	WHITE	11/28/2010 14:29	Negative	0.00
227	B	SECOND	HALL 220	DOOR BATH RM 215	METAL	FAIR	GREY	11/28/2010 14:29	Negative	0.00
228	B	SECOND	HALL 220	DR. JAMB RM 215	METAL	FAIR	GREY	11/28/2010 14:30	Negative	0.00
229	D	SECOND	BATH RM 215	DOOR	METAL	INTACT	GREY	11/28/2010 14:30	Negative	0.00

Table 4  
**Summary of XRF<sup>1</sup> Results**  
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**Project Name:** Lead-Based Paint Inspection

**Project Address:** Building 5214, United States Air Force Prep School, Colorado Springs, CO

**Project Number:** 3010128

XRF										Lead Content (mg/cm <sup>2</sup> ) <sup>2</sup>
Number	Side	Floor	Room	Component	Substrate	Condition	Color	Date/Time	Result	
230	B	SECOND	BATH RM 215	DOOR	METAL	INTACT	GREY	11/28/2010 14:31	Negative	0.00
231	A	SECOND	BATH RM 215	WALL	DRYWALL	INTACT	WHITE	11/28/2010 14:31	Negative	0.00
232	A	SECOND	BATH RM 215	WALL	TILE	INTACT	WHITE	11/28/2010 14:32	Negative	0.10
233	B	SECOND	BATH RM 215	WALL	TILE	INTACT	WHITE	11/28/2010 14:32	Negative	0.09
234	B	SECOND	BATH RM 215	WALL	DRYWALL	INTACT	WHITE	11/28/2010 14:33	Negative	0.00
235	C	SECOND	BATH RM 215	WALL	DRYWALL	INTACT	WHITE	11/28/2010 14:33	Negative	0.00
236	C	SECOND	BATH RM 215	WALL	TILE	INTACT	WHITE	11/28/2010 14:34	Negative	0.07
237	D	SECOND	BATH RM 215	WALL	TILE	INTACT	WHITE	11/28/2010 14:34	Negative	0.03
238	D	SECOND	BATH RM 215	WALL	DRYWALL	INTACT	WHITE	11/28/2010 14:34	Negative	0.00
239	D	SECOND	BATH RM 215	DOOR PIPE CHASE	METAL	INTACT	WHITE	11/28/2010 14:35	Negative	0.00
240	Floor	SECOND	BATH RM 215	FLOOR	TILE	INTACT	GREY	11/28/2010 14:36	Negative	0.02
241	B	SECOND	HALL 220	DOOR LFT RM 216	METAL	FAIR	GREY	11/28/2010 14:37	Negative	0.01
242	B	SECOND	HALL 220	DR. JAMB LFT RM 216	METAL	INTACT	GREY	11/28/2010 14:38	Negative	0.00
243	B	SECOND	HALL 220	DR. JAMB RHT RM 216	METAL	FAIR	GREY	11/28/2010 14:39	Negative	0.00
244	B	SECOND	HALL 220	DOOR RHT RM 216	METAL	FAIR	GREY	11/28/2010 14:39	Negative	0.00
245	D	SECOND	DAY RM 216	DOOR LFT	METAL	FAIR	GREY	11/28/2010 14:40	Negative	0.00
246	B	SECOND	DAY RM 216	DOOR RHT	METAL	FAIR	GREY	11/28/2010 14:40	Negative	0.00
247	B	SECOND	DAY RM 216	DR. CASING RHT	METAL	FAIR	GREY	11/28/2010 14:41	Negative	0.00
248	B	SECOND	DAY RM 216	DOOR LFT	METAL	INTACT	GREY	11/28/2010 14:41	Negative	0.00
249	B	SECOND	DAY RM 216	DR. CASING LFT	METAL	FAIR	GREY	11/28/2010 14:42	Negative	0.00
250	D	SECOND	DAY RM 216	DOOR RHT	METAL	INTACT	GREY	11/28/2010 14:43	Negative	0.00
251	A	SECOND	DAY RM 216	WALL	DRYWALL	INTACT	WHITE	11/28/2010 14:43	Negative	0.00
252	B	SECOND	DAY RM 216	WALL	DRYWALL	INTACT	WHITE	11/28/2010 14:44	Negative	0.00
253	C	SECOND	DAY RM 216	WALL	DRYWALL	INTACT	WHITE	11/28/2010 14:44	Negative	0.00
254	D	SECOND	DAY RM 216	WALL	DRYWALL	INTACT	WHITE	11/28/2010 14:45	Negative	0.00
255	C	SECOND	DAY RM 216	WNDW CASING	METAL	INTACT	WHITE	11/28/2010 14:46	Negative	0.00
256	D	SECOND	HALL 220	DOOR RM 212	WOOD	INTACT	VARNISH	11/28/2010 14:47	Negative	0.00
257	D	SECOND	HALL 220	DR. JAMB RM 212	METAL	INTACT	GREY	11/28/2010 14:48	Negative	0.00
258	D	SECOND	HALL 220	DR. JAMB RM 209	METAL	FAIR	GREY	11/28/2010 14:49	Negative	0.00



Table 4  
**Summary of XRF<sup>1</sup> Results**  
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**Project Name:** Lead-Based Paint Inspection

**Project Address:** Building 5214, United States Air Force Prep School, Colorado Springs, CO

**Project Number:** 3010128

XRF										Lead Content (mg/cm <sup>2</sup> ) <sup>2</sup>
Number	Side	Floor	Room	Component	Substrate	Condition	Color	Date/Time	Result	
259	D	SECOND	HALL 220	DOOR RM 209	WOOD	INTACT	VARNISH	11/28/2010 14:49	Negative	0.00
260	B	SECOND	RM 212	DOOR	WOOD	INTACT	VARNISH	11/28/2010 14:51	Negative	0.00
261	B	SECOND	RM 212	CLST DR RHT	WOOD	INTACT	VARNISH	11/28/2010 14:51	Negative	0.01
262	A	SECOND	RM 212	WALL	DRYWALL	INTACT	WHITE	11/28/2010 14:52	Negative	0.01
263	B	SECOND	RM 212	WALL	DRYWALL	INTACT	WHITE	11/28/2010 14:52	Negative	0.00
264	C	SECOND	RM 212	WALL	DRYWALL	INTACT	WHITE	11/28/2010 14:53	Negative	0.00
265	D	SECOND	RM 212	WALL REGISTER	METAL	INTACT	GREY	11/28/2010 14:53	Negative	0.00
266	D	SECOND	RM 212	WNDW CASING	METAL	INTACT	BLACK	11/28/2010 14:54	Negative	0.00
267	B	SECOND	RM 209	DOOR	WOOD	INTACT	VARNISH	11/28/2010 14:55	Negative	0.00
268	B	SECOND	RM 209	CLST DOOR RHT	WOOD	INTACT	VARNISH	11/28/2010 14:55	Null	0.00
269	B	SECOND	RM 209	CLST DOOR RHT	WOOD	INTACT	VARNISH	11/28/2010 14:56	Negative	0.00
270	A	SECOND	RM 209	WALL	DRYWALL	INTACT	WHITE	11/28/2010 14:56	Negative	0.00
271	B	SECOND	RM 209	WALL	DRYWALL	INTACT	WHITE	11/28/2010 14:57	Negative	0.00
272	C	SECOND	RM 209	WALL	DRYWALL	INTACT	WHITE	11/28/2010 14:57	Negative	0.00
273	D	SECOND	RM 209	WALL REGISTER	METAL	INTACT	GREY	11/28/2010 14:58	Negative	0.00
274	D	SECOND	RM 209	WNDW CASING	METAL	INTACT	BLACK	11/28/2010 14:59	Negative	0.00
275	B	SECOND	HALL 220	DOOR 214	WOOD	INTACT	VARNISH	11/28/2010 15:02	Negative	0.00
276	B	SECOND	HALL 220	DR. JAMB RM 214	METAL	INTACT	GREY	11/28/2010 15:02	Negative	0.00
277	D	SECOND	RM 214	DOOR	WOOD	INTACT	VARNISH	11/28/2010 15:03	Negative	0.00
278	D	SECOND	RM 214	CLST DOOR LFT	WOOD	INTACT	VARNISH	11/28/2010 15:03	Negative	0.00
279	A	SECOND	RM 214	WNDW SILL	METAL	INTACT	BLACK	11/28/2010 15:04	Negative	0.00
280	A	SECOND	RM 214	WALL REGISTER	METAL	INTACT	GREY	11/28/2010 15:05	Negative	0.00
281	B	SECOND	RM 214	WALL	DRYWALL	INTACT	WHITE	11/28/2010 15:05	Negative	0.00
282	C	SECOND	RM 214	WALL	DRYWALL	INTACT	WHITE	11/28/2010 15:06	Negative	0.00
283	D	SECOND	RM 214	WALL	DRYWALL	INTACT	WHITE	11/28/2010 15:06	Negative	0.00
284	A	SECOND	HALL 222	WALL	DRYWALL	INTACT	WHITE	11/28/2010 15:07	Negative	0.00
285	C	SECOND	HALL 222	WALL	DRYWALL	INTACT	WHITE	11/28/2010 15:08	Negative	0.00
286	A	SECOND	HALL 221	WALL	DRYWALL	INTACT	WHITE	11/28/2010 15:08	Negative	0.00
287	B	SECOND	HALL 221	WALL	DRYWALL	INTACT	WHITE	11/28/2010 15:09	Negative	0.00

Table 4  
**Summary of XRF<sup>1</sup> Results**  
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**Project Name:** Lead-Based Paint Inspection

**Project Address:** Building 5214, United States Air Force Prep School, Colorado Springs, CO

**Project Number:** 3010128

XRF										Lead Content (mg/cm <sup>2</sup> ) <sup>2</sup>
Number	Side	Floor	Room	Component	Substrate	Condition	Color	Date/Time	Result	
288	C	SECOND	HALL 221	WALL	DRYWALL	INTACT	WHITE	11/28/2010 15:09	Negative	0.00
289	D	SECOND	HALL 221	WALL	DRYWALL	INTACT	WHITE	11/28/2010 15:10	Negative	0.01
290	C	SECOND	HALL 221	DOOR	METAL	INTACT	GREY	11/28/2010 15:10	Negative	0.00
291	D	SECOND	HALL 221	DOOR RHT RM 216	METAL	FAIR	GREY	11/28/2010 15:11	Negative	0.00
292	D	SECOND	HALL 221	DOOR LFT RM 216	METAL	FAIR	GREY	11/28/2010 15:11	Negative	0.00
293	D	SECOND	HALL 221	DOOR BATH RM 215	METAL	FAIR	GREY	11/28/2010 15:12	Negative	0.00
294	D	SECOND	HALL 221	DR. JAMB RM 215	METAL	FAIR	GREY	11/28/2010 15:12	Negative	0.00
295	B	SECOND	HALL 221	DOOR STWY 2	METAL	INTACT	GREY	11/28/2010 15:13	Negative	0.00
296	A	SECOND	HALL 221	WNDW CASING	METAL	INTACT	BLACK	11/28/2010 15:14	Negative	0.00
297	A	SECOND	HALL 221	WALL REGISTER	METAL	INTACT	GREY	11/28/2010 15:14	Negative	0.00
298	B	SECOND	HALL 221	DOOR RM 203	WOOD	INTACT	VARNISH	11/28/2010 15:15	Negative	0.00
299	B	SECOND	HALL 221	DOOR RM 204	WOOD	INTACT	VARNISH	11/28/2010 15:16	Negative	0.00
300	B	SECOND	HALL 221	DOOR RM 205	WOOD	INTACT	VARNISH	11/28/2010 15:16	Negative	0.00
301	B	SECOND	HALL 221	DOOR RM 206	WOOD	INTACT	VARNISH	11/28/2010 15:17	Negative	0.00
302	B	SECOND	HALL 221	DR. JAMB 206	METAL	FAIR	GREY	11/28/2010 15:17	Negative	0.00
303	B	SECOND	HALL 221	DR. JAMB 205	METAL	FAIR	GREY	11/28/2010 15:18	Negative	0.00
304	B	SECOND	HALL 221	DR. JAMB 204	METAL	FAIR	GREY	11/28/2010 15:18	Negative	0.00
305	B	SECOND	HALL 221	DR. JAMB 203	METAL	FAIR	GREY	11/28/2010 15:19	Negative	0.00
306	B	SECOND	HALL 221	WALL	DRYWALL	INTACT	WHITE	11/28/2010 15:19	Negative	0.00
307	D	SECOND	RM 203	DOOR	WOOD	INTACT	VARNISH	11/28/2010 15:20	Negative	0.00
308	D	SECOND	RM 203	CLST DOOR RHT	WOOD	INTACT	VARNISH	11/28/2010 15:21	Negative	0.00
309	A	SECOND	RM 203	WALL	DRYWALL	INTACT	WHITE	11/28/2010 15:21	Negative	0.00
310	C	SECOND	RM 203	WALL	DRYWALL	INTACT	WHITE	11/28/2010 15:22	Negative	0.00
311	D	SECOND	RM 203	WALL	DRYWALL	INTACT	WHITE	11/28/2010 15:22	Negative	0.00
312	B	SECOND	RM 203	WALL REGISTER	METAL	INTACT	GREY	11/28/2010 15:22	Negative	0.00
313	B	SECOND	RM 203	WNDW CASING	METAL	INTACT	BLACK	11/28/2010 15:23	Negative	0.00
314	B	SECOND	RM 204	WNDW CASING	METAL	INTACT	BLACK	11/28/2010 15:24	Negative	0.00
315	B	SECOND	RM 204	WALL REGISTER	METAL	INTACT	GREY	11/28/2010 15:24	Null	0.00
316	B	SECOND	RM 204	WALL REGISTER	METAL	INTACT	GREY	11/28/2010 15:25	Negative	0.00

Table 4  
**Summary of XRF<sup>1</sup> Results**  
Page 12 of 15

**Project Name:** Lead-Based Paint Inspection

**Project Address:** Building 5214, United States Air Force Prep School, Colorado Springs, CO

**Project Number:** 3010128

XRF										Lead Content (mg/cm <sup>2</sup> ) <sup>2</sup>
Number	Side	Floor	Room	Component	Substrate	Condition	Color	Date/Time	Result	
317	D	SECOND	RM 204	DOOR	WOOD	INTACT	VARNISH	11/28/2010 15:25	Null	0.00
318	D	SECOND	RM 204	DOOR	WOOD	INTACT	VARNISH	11/28/2010 15:25	Negative	0.00
319	D	SECOND	RM 204	CLST DOOR LFT	WOOD	INTACT	VARNISH	11/28/2010 15:26	Negative	0.00
320	A	SECOND	RM 204	WALL	DRYWALL	INTACT	WHITE	11/28/2010 15:26	Negative	0.00
321	C	SECOND	RM 204	WALL	DRYWALL	INTACT	WHITE	11/28/2010 15:27	Negative	0.00
322	D	SECOND	RM 204	WALL	DRYWALL	INTACT	WHITE	11/28/2010 15:27	Negative	0.00
323	D	SECOND	RM 205	WALL	DRYWALL	INTACT	WHITE	11/28/2010 15:28	Negative	0.00
324	A	SECOND	RM 205	WALL	DRYWALL	INTACT	WHITE	11/28/2010 15:28	Negative	0.00
325	C	SECOND	RM 205	WALL	DRYWALL	INTACT	WHITE	11/28/2010 15:29	Negative	0.00
326	D	SECOND	RM 205	CLST DOOR RHT	WOOD	INTACT	VARNISH	11/28/2010 15:29	Negative	0.01
327	D	SECOND	RM 205	DOOR	WOOD	INTACT	VARNISH	11/28/2010 15:30	Negative	0.00
328	B	SECOND	RM 205	WNDW CASING	METAL	INTACT	BLACK	11/28/2010 15:30	Negative	0.00
329	B	SECOND	RM 205	WALL REGISTER	METAL	INTACT	GREY	11/28/2010 15:31	Negative	0.00
330	B	SECOND	RM 206	WALL REGISTER	METAL	INTACT	GREY	11/28/2010 15:32	Negative	0.00
331	B	SECOND	RM 206	WNDW CASING	METAL	INTACT	BLACK	11/28/2010 15:33	Negative	0.00
332	B	SECOND	RM 206	WALL REGISTER	METAL	INTACT	GREY	11/28/2010 15:33	Negative	0.00
333	A	SECOND	RM 206	WALL	DRYWALL	INTACT	WHITE	11/28/2010 15:34	Negative	0.00
334	C	SECOND	RM 206	WALL	DRYWALL	INTACT	WHITE	11/28/2010 15:35	Negative	0.00
335	D	SECOND	RM 206	WALL	DRYWALL	INTACT	WHITE	11/28/2010 15:35	Negative	0.00
336	D	SECOND	RM 206	CLST DOOR LFT	WOOD	FAIR	VARNISH	11/28/2010 15:35	Negative	0.00
337	D	SECOND	RM 206	DOOR	WOOD	FAIR	VARNISH	11/28/2010 15:36	Negative	0.00
338	D	THIRD	RM 316	DOOR	METAL	FAIR	GREY	11/28/2010 15:37	Negative	0.00
339	B	THIRD	RM 316	DOOR	METAL	FAIR	GREY	11/28/2010 15:38	Negative	0.01
340	B	THIRD	RM 316	DR. JAMB	METAL	INTACT	GREY	11/28/2010 15:38	Negative	0.00
341	D	THIRD	RM 316	DR. JAMB	METAL	FAIR	GREY	11/28/2010 15:39	Negative	0.00
342	A	THIRD	RM 316	WALL	DRYWALL	INTACT	WHITE	11/28/2010 15:39	Negative	0.00
343	B	THIRD	RM 316	WALL	DRYWALL	INTACT	WHITE	11/28/2010 15:40	Negative	0.00
344	C	THIRD	RM 316	WALL	DRYWALL	FAIR	WHITE	11/28/2010 15:40	Negative	0.00
345	D	THIRD	RM 316	WALL	DRYWALL	INTACT	WHITE	11/28/2010 15:41	Negative	0.00

Table 4  
**Summary of XRF<sup>1</sup> Results**  
Page 13 of 15

**Project Name:** Lead-Based Paint Inspection

**Project Address:** Building 5214, United States Air Force Prep School, Colorado Springs, CO

**Project Number:** 3010128

XRF										Lead Content (mg/cm <sup>2</sup> ) <sup>2</sup>
Number	Side	Floor	Room	Component	Substrate	Condition	Color	Date/Time	Result	
346	A	THIRD	HALL 320	WALL	DRYWALL	INTACT	WHITE	11/28/2010 15:42	Negative	0.00
347	B	THIRD	HALL 320	WALL	DRYWALL	INTACT	WHITE	11/28/2010 15:43	Negative	0.00
348	C	THIRD	HALL 320	WALL	DRYWALL	INTACT	WHITE	11/28/2010 15:43	Negative	0.00
349	D	THIRD	HALL 320	WALL	DRYWALL	FAIR	WHITE	11/28/2010 15:43	Null	0.00
350	D	THIRD	HALL 320	WALL	DRYWALL	FAIR	WHITE	11/28/2010 15:44	Negative	0.00
351	C	THIRD	HALL 320	DOOR	METAL	INTACT	GREY	11/28/2010 15:44	Negative	0.00
352	B	THIRD	HALL 320	DOOR LAUNDRY 316	METAL	FAIR	GREY	11/28/2010 15:45	Negative	0.00
353	B	THIRD	HALL 320	DOOR BATH RM 315	METAL	FAIR	GREY	11/28/2010 15:46	Negative	0.00
354	B	THIRD	HALL 320	DR. JAMB RM 315	METAL	INTACT	GREY	11/28/2010 15:46	Negative	0.00
355	B	THIRD	HALL 320	DR. JAMB RM 314	METAL	INTACT	GREY	11/28/2010 15:47	Negative	0.00
356	B	THIRD	HALL 320	DOOR RM 314	WOOD	INTACT	VARNISH	11/28/2010 15:49	Negative	0.00
357	A	THIRD	RM 314	WALL REGISTER	METAL	INTACT	GREY	11/28/2010 15:50	Negative	0.00
358	A	THIRD	RM 314	WNDW CASING	METAL	INTACT	BLACK	11/28/2010 15:51	Negative	0.00
359	B	THIRD	RM 314	WALL	DRYWALL	INTACT	WHITE	11/28/2010 15:51	Null	0.00
360	B	THIRD	RM 314	WALL	DRYWALL	INTACT	WHITE	11/28/2010 15:52	Negative	0.00
361	C	THIRD	RM 314	WALL	DRYWALL	INTACT	WHITE	11/28/2010 15:52	Negative	0.00
362	D	THIRD	RM 314	WALL	DRYWALL	INTACT	WHITE	11/28/2010 15:52	Negative	0.00
363	D	THIRD	RM 314	CLST DOOR RHT	WOOD	INTACT	WHEAT	11/28/2010 15:53	Negative	0.00
364	D	THIRD	RM 314	DOOR	WOOD	INTACT	VARNISH	11/28/2010 15:54	Negative	0.00
365	D	THIRD	BATH RM 315	DOOR	METAL	FAIR	GREY	11/28/2010 15:55	Negative	0.00
366	B	THIRD	BATH RM 315	DOOR	METAL	INTACT	GREY	11/28/2010 15:56	Negative	0.00
367	Floor	THIRD	BATH RM 315	FLOOR	TILE	INTACT	GREY	11/28/2010 15:56	Negative	0.00
368	A	THIRD	BATH RM 315	WALL	TILE	INTACT	WHITE	11/28/2010 15:57	Negative	0.02
369	A	THIRD	BATH RM 315	WALL	DRYWALL	INTACT	WHITE	11/28/2010 15:57	Negative	0.00
370	B	THIRD	BATH RM 315	WALL	DRYWALL	INTACT	WHITE	11/28/2010 15:59	Negative	0.00
371	B	THIRD	BATH RM 315	WALL	TILE	INTACT	WHITE	11/28/2010 15:59	Negative	0.01
372	C	THIRD	BATH RM 315	WALL	TILE	INTACT	WHITE	11/28/2010 15:59	Negative	0.03
373	C	THIRD	BATH RM 315	WALL	DRYWALL	INTACT	WHITE	11/28/2010 16:00	Null	0.00
374	C	THIRD	BATH RM 315	WALL	DRYWALL	INTACT	WHITE	11/28/2010 16:00	Negative	0.00

Table 4  
**Summary of XRF<sup>1</sup> Results**  
Page 14 of 15

**Project Name:** Lead-Based Paint Inspection

**Project Address:** Building 5214, United States Air Force Prep School, Colorado Springs, CO

**Project Number:** 3010128

XRF										Lead Content (mg/cm <sup>2</sup> ) <sup>2</sup>
Number	Side	Floor	Room	Component	Substrate	Condition	Color	Date/Time	Result	
375	D	THIRD	BATH RM 315	WALL	DRYWALL	INTACT	WHITE	11/28/2010 16:00	Negative	0.00
376	D	THIRD	BATH RM 315	WALL	TILE	INTACT	WHITE	11/28/2010 16:01	Negative	0.04
377	B	THIRD	BATH RM 315	DOOR	METAL	FAIR	GREY	11/28/2010 16:02	Negative	0.02
378	B	THIRD	HALL 320	DR. CSNG LNDRY RM	METAL	FAIR	GREY	11/28/2010 16:03	Negative	0.00
379	A	THIRD	HALL 322	WALL	DRYWALL	INTACT	WHITE	11/28/2010 16:04	Negative	0.00
380	C	THIRD	HALL 322	WALL	DRYWALL	INTACT	WHITE	11/28/2010 16:04	Negative	0.00
381	A	THIRD	HALL 321	WALL	DRYWALL	INTACT	WHITE	11/28/2010 16:05	Negative	0.00
382	B	THIRD	HALL 321	WALL	DRYWALL	INTACT	WHITE	11/28/2010 16:05	Negative	0.00
383	B	THIRD	HALL 321	WALL	DRYWALL	INTACT	WHITE	11/28/2010 16:06	Negative	0.03
384	D	THIRD	HALL 321	WALL	DRYWALL	INTACT	WHITE	11/28/2010 16:06	Negative	0.00
385	C	THIRD	HALL 321	DOOR	METAL	INTACT	GREY	11/28/2010 16:07	Negative	0.00
386	B	THIRD	HALL 321	DOOR 303	WOOD	INTACT	VARNISH	11/28/2010 16:07	Negative	0.00
387	B	THIRD	HALL 321	DOOR JB 303	METAL	FAIR	GREY	11/28/2010 16:08	Negative	0.00
388	D	THIRD	HALL 321	DOOR RM 316	METAL	INTACT	GREY	11/28/2010 16:09	Negative	0.00
389	D	THIRD	HALL 321	DOOR JB. BATH	METAL	INTACT	GREY	11/28/2010 16:09	Negative	0.00
390	D	THIRD	HALL 321	DOOR BATH	METAL	FAIR	GREY	11/28/2010 16:10	Negative	0.00
391	B	THIRD	HALL 321	DOOR SE STWY	METAL	INTACT	GREY	11/28/2010 16:11	Negative	0.00
392	A	THIRD	HALL 321	WNDW CASING	METAL	INTACT	BLACK	11/28/2010 16:11	Negative	0.00
393	A	THIRD	HALL 321	WALL REGISTER	METAL	INTACT	GREY	11/28/2010 16:12	Negative	0.00
394	B	THIRD	RM 303	WALL REGISTER	METAL	INTACT	GREY	11/28/2010 16:13	Null	0.00
395	B	THIRD	RM 303	WALL REGISTER	METAL	INTACT	GREY	11/28/2010 16:13	Negative	0.00
396	B	THIRD	RM 303	WNDW CASING	METAL	INTACT	BLACK	11/28/2010 16:14	Negative	0.00
397	A	THIRD	RM 303	WALL	DRYWALL	INTACT	WHITE	11/28/2010 16:14	Negative	0.00
398	C	THIRD	RM 303	WALL	DRYWALL	INTACT	WHITE	11/28/2010 16:15	Null	0.00
399	C	THIRD	RM 303	WALL	DRYWALL	INTACT	WHITE	11/28/2010 16:15	Negative	0.01
400	D	THIRD	RM 303	WALL	DRYWALL	INTACT	WHITE	11/28/2010 16:15	Negative	0.00
401	D	THIRD	RM 303	CLST DOOR LFT	WOOD	INTACT	VARNISH	11/28/2010 16:16	Negative	0.01
402	D	THIRD	RM 303	DOOR	WOOD	INTACT	VARNISH	11/28/2010 16:16	Negative	0.00
403	D	THIRD	STAIRWAY 1	WALL	DRYWALL	INTACT	GREY	11/28/2010 16:18	Negative	0.00

Table 4  
**Summary of XRF<sup>1</sup> Results**  
Page 15 of 15

**Project Name:** Lead-Based Paint Inspection

**Project Address:** Building 5214, United States Air Force Prep School, Colorado Springs, CO

**Project Number:** 3010128

XRF										Lead Content (mg/cm <sup>2</sup> ) <sup>2</sup>
Number	Side	Floor	Room	Component	Substrate	Condition	Color	Date/Time	Result	
404	D	THIRD	STAIRWAY 1	WALL	DRYWALL	INTACT	BLUE	11/28/2010 16:18	Negative	0.00
405	D	THIRD	STAIRWAY 1	WALL	DRYWALL	INTACT	YELLOW	11/28/2010 16:19	Negative	0.00
406	D	THIRD	STAIRWAY 1	WALL	DRYWALL	INTACT	WHITE	11/28/2010 16:19	Negative	0.00
407	N/A	N/A	CALIBRATE	N/A	N/A	N/A	N/A	11/28/2010 16:23	Positive	1.00
408	N/A	N/A	CALIBRATE	N/A	N/A	N/A	N/A	11/28/2010 16:26	Positive	1.00
409	N/A	N/A	CALIBRATE	N/A	N/A	N/A	N/A	11/28/2010 16:28	Positive	1.00

*Notes:*

1. XRF indicates X-Ray Fluorescence
2. mg/cm<sup>2</sup> indicates milligrams per square centimeter
3. N/A indicates this parameter was not applicable.
4. Intact indicates the paint is in good condition and not peeling, chipping, or flaking.
5. Fair indicates deteriorated paint on less than or equal to 20 square feet on large exterior surfaces.
6. **Bold** indicates Lead-Based paint as defined by Title X.
7. Fair indicates deteriorated paint on less than or equal to 10 percent of the total surface area of the component.
8. Fair indicates deteriorated paint on less than or equal to 2 square feet on large surface areas.
9. Substrate indicates the surface the paint was adhered to appeared to be damaged.

**APPENDIX F**

**LBP FIGURES**

**TAB 1**  
**BUILDING 5210**



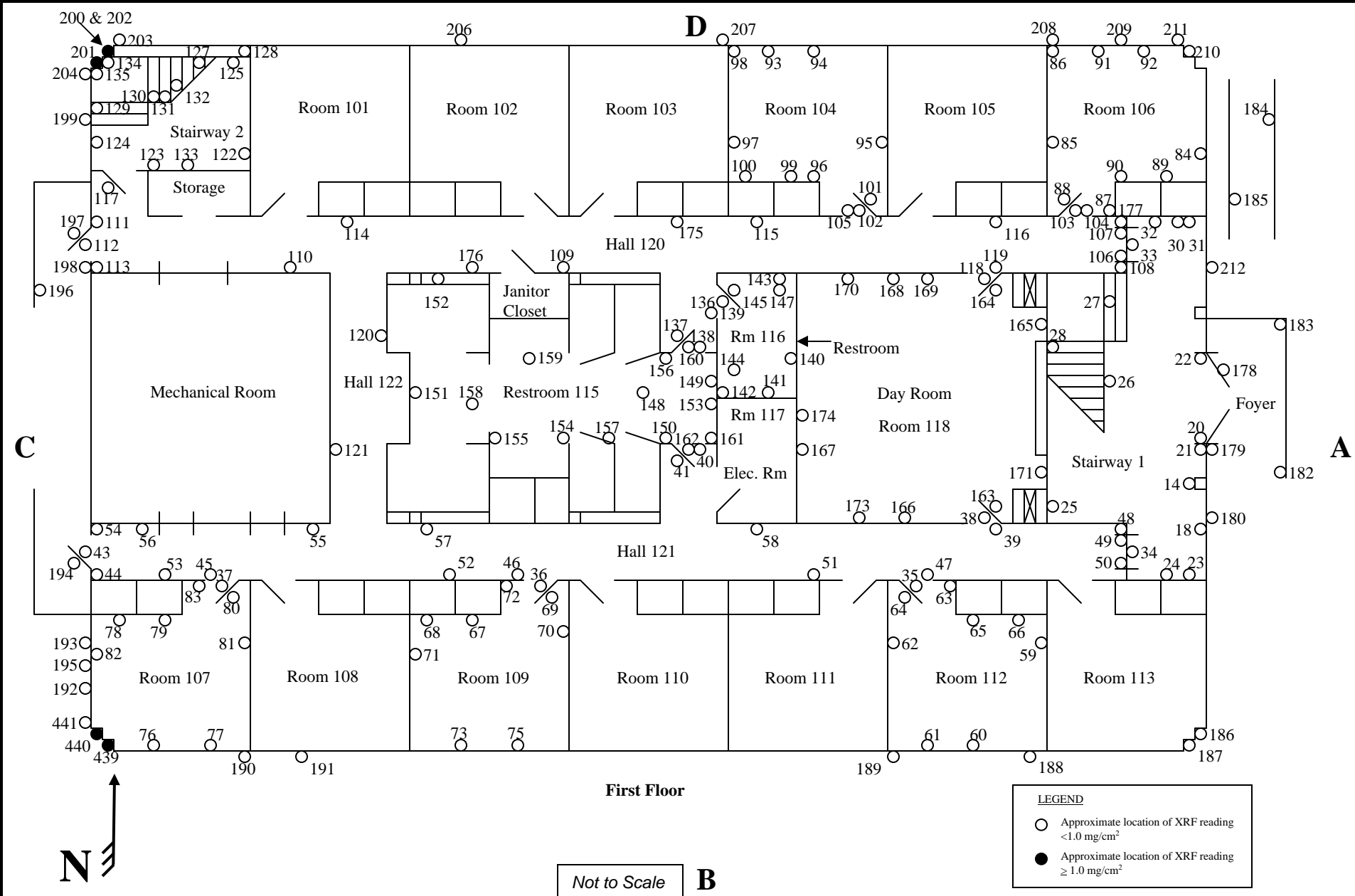


Figure 1 of 3 - Site Diagram

Project # 3010128

Drawn by FW  
Drawn Dec. 2010

Limited Lead - Based Paint Inspection

USAFA Prep School, Building 5210  
APPENDIX F  
Colorado Springs, Colorado

**Empirical Environmental, LLC**

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**D****C****A****Second Floor***Not to Scale***B****LEGEND**

- Approximate location of XRF reading  
<1.0 mg/cm<sup>2</sup>
- Approximate location of XRF reading  
≥ 1.0 mg/cm<sup>2</sup>

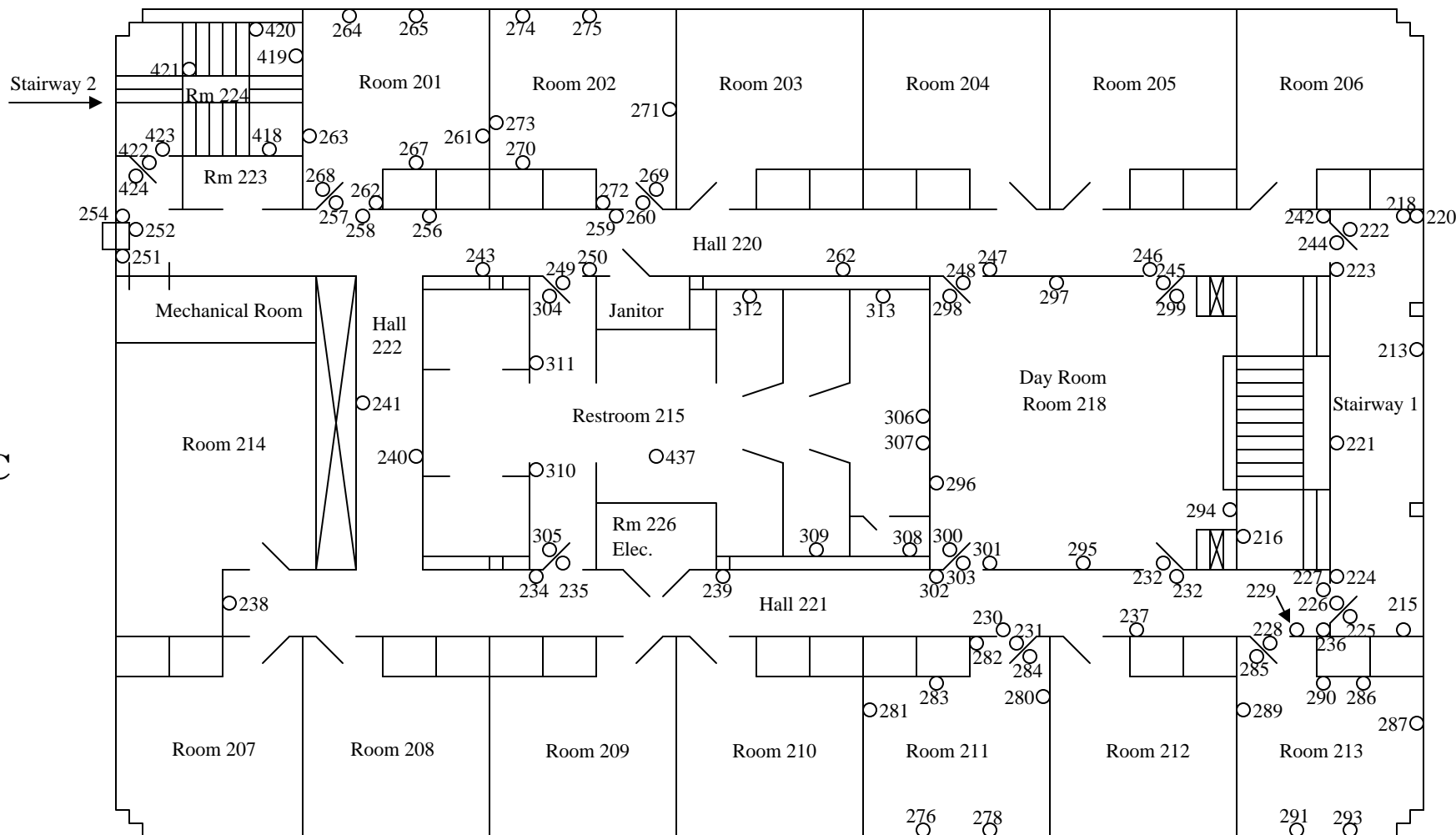


Figure 2 of 3 - Site Diagram

Project # 3010128

Limited Lead - Based Paint Inspection

USAFA Prep School, Building 5210

Colorado Springs, Colorado

**Empirical Environmental, LLC**

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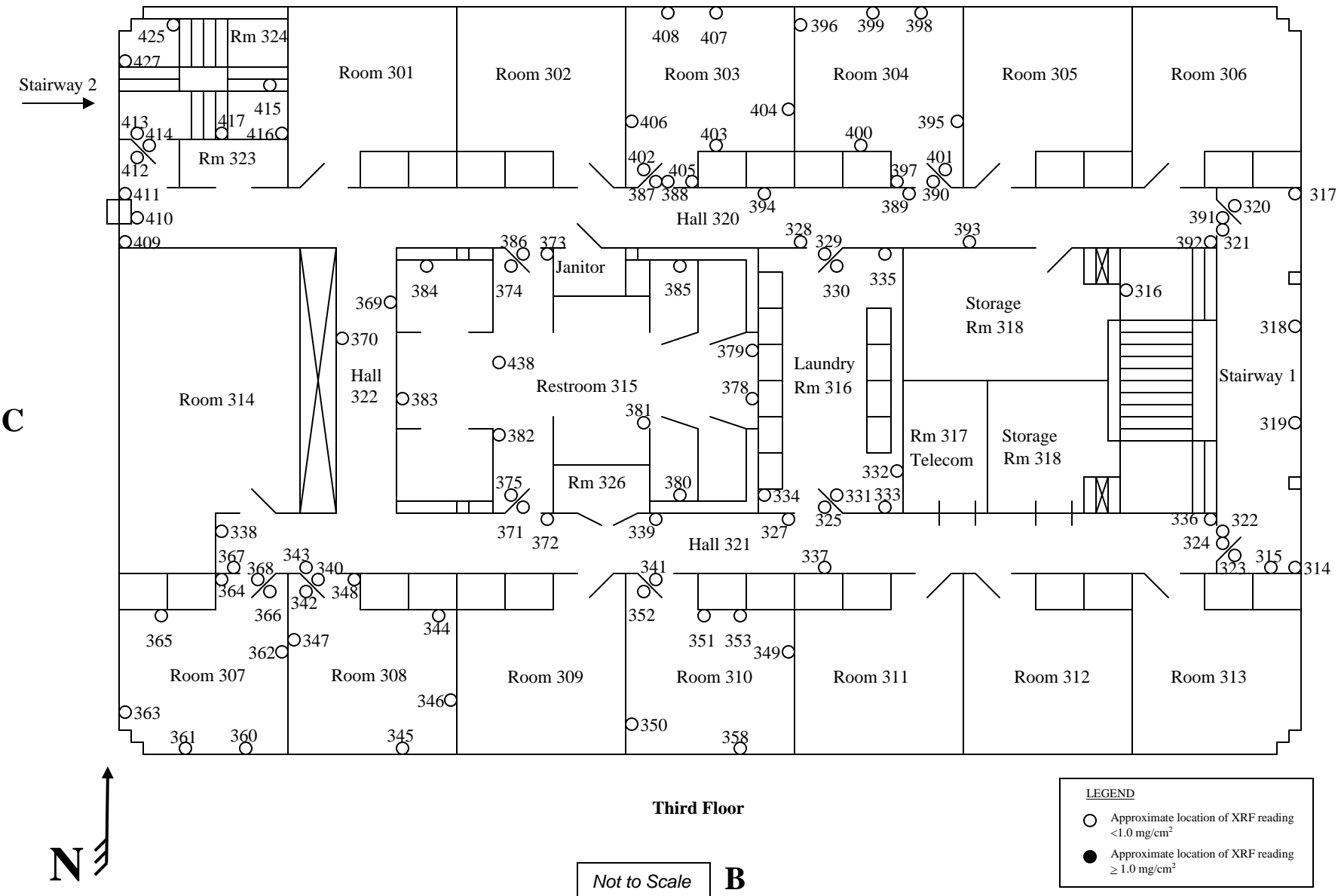
Fax (719) 749-0238

Drawn by FW

Drawn Dec. 2010

**APPENDIX F**

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**D**

**TAB 2**  
**BUILDING 5212**

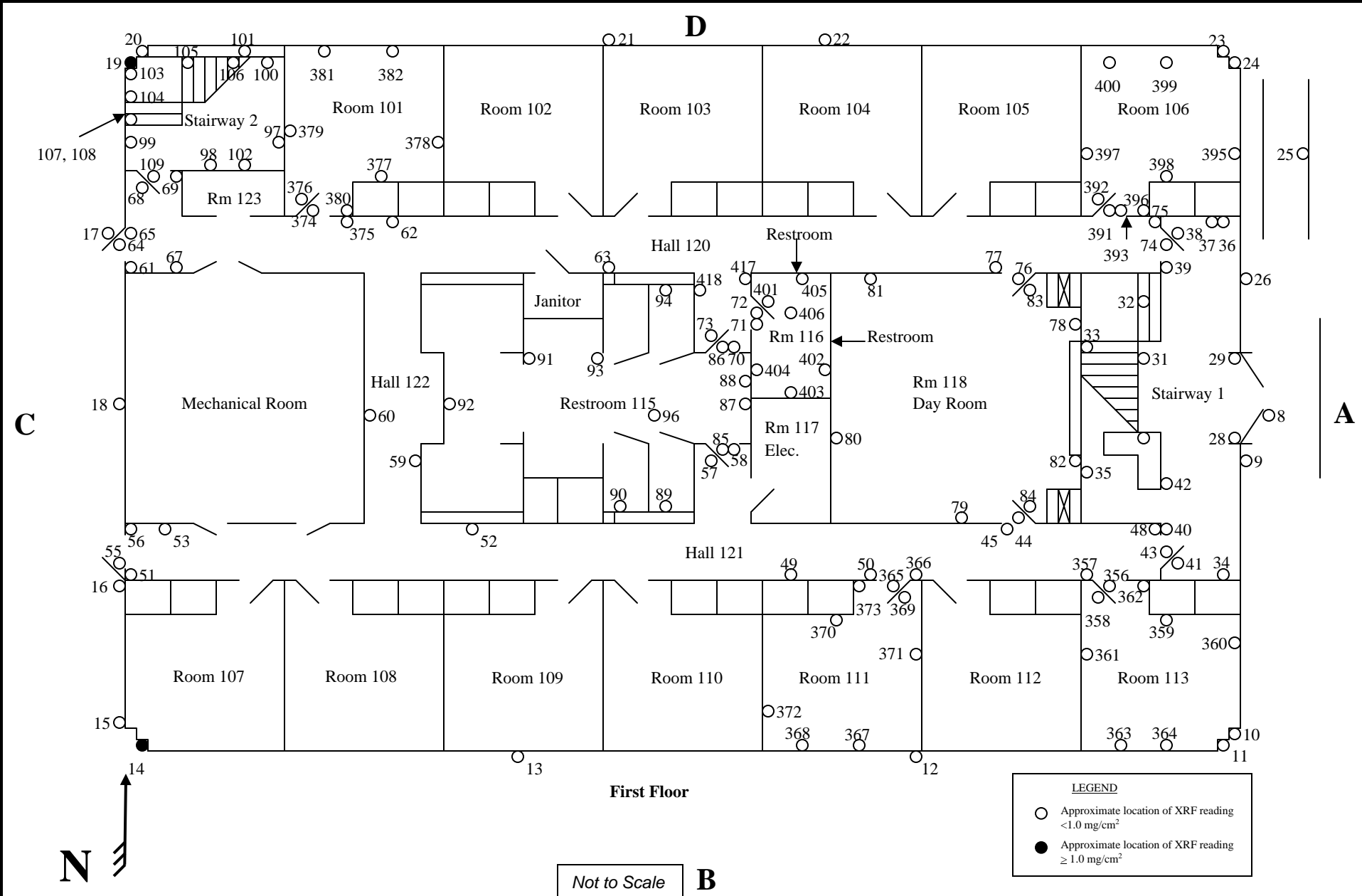


Figure 1 of 3 - Site Diagram

Project # 3010128

Drawn by FW

Drawn December 2010

Limited Lead-Based Paint Inspection

USAFA Prep School Building 5212

Colorado Springs, Colorado

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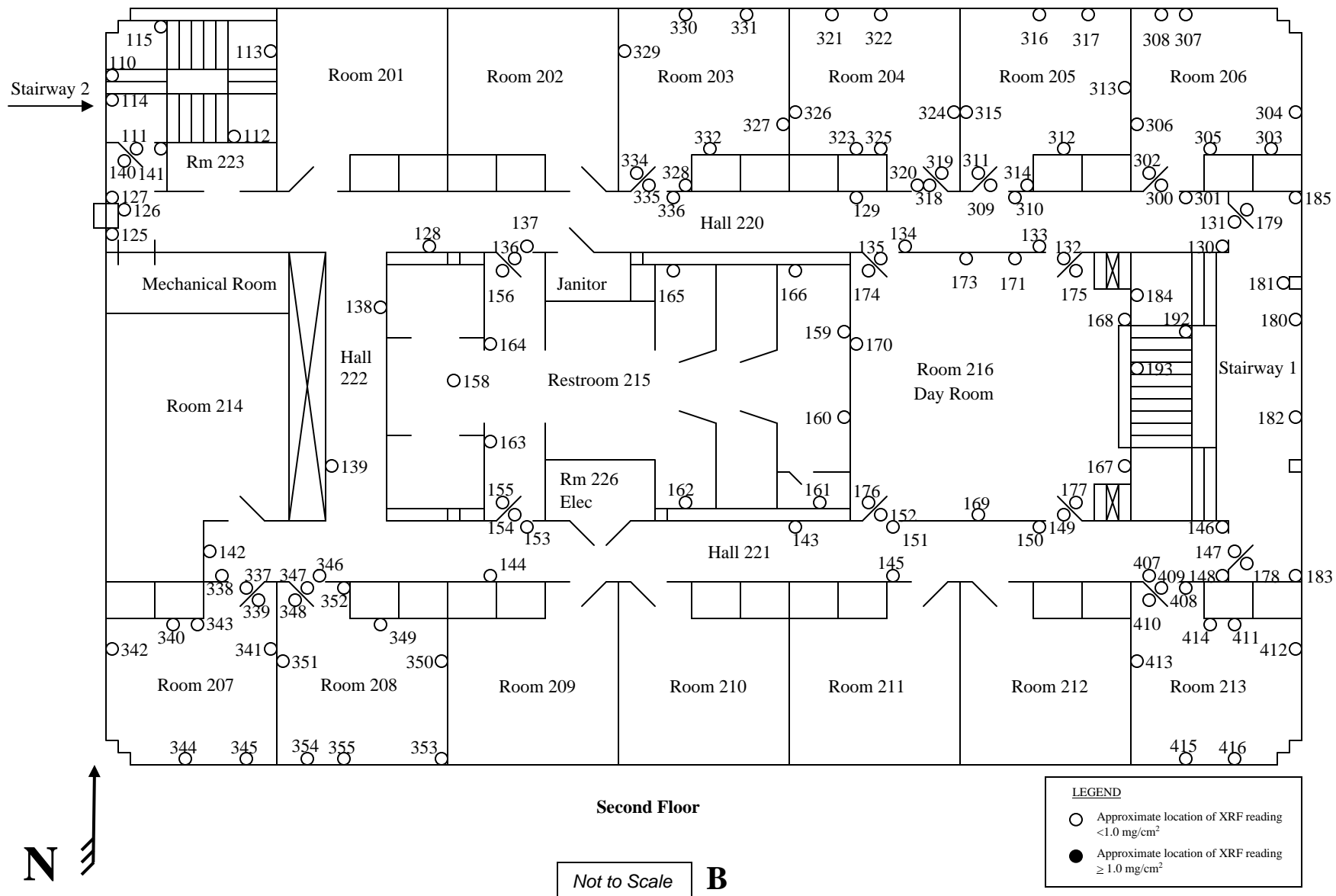
**D**

Figure 2 of 3 - Site Diagram

Project # 3010128

Limited Lead - Based Paint Inspection

**Empirical Environmental, LLC**

Drawn by FW  
 Drawn Dec. 2010

USAFA Prep School, Building 5212  
 COLORADO SPRINGS  
 COLORADO

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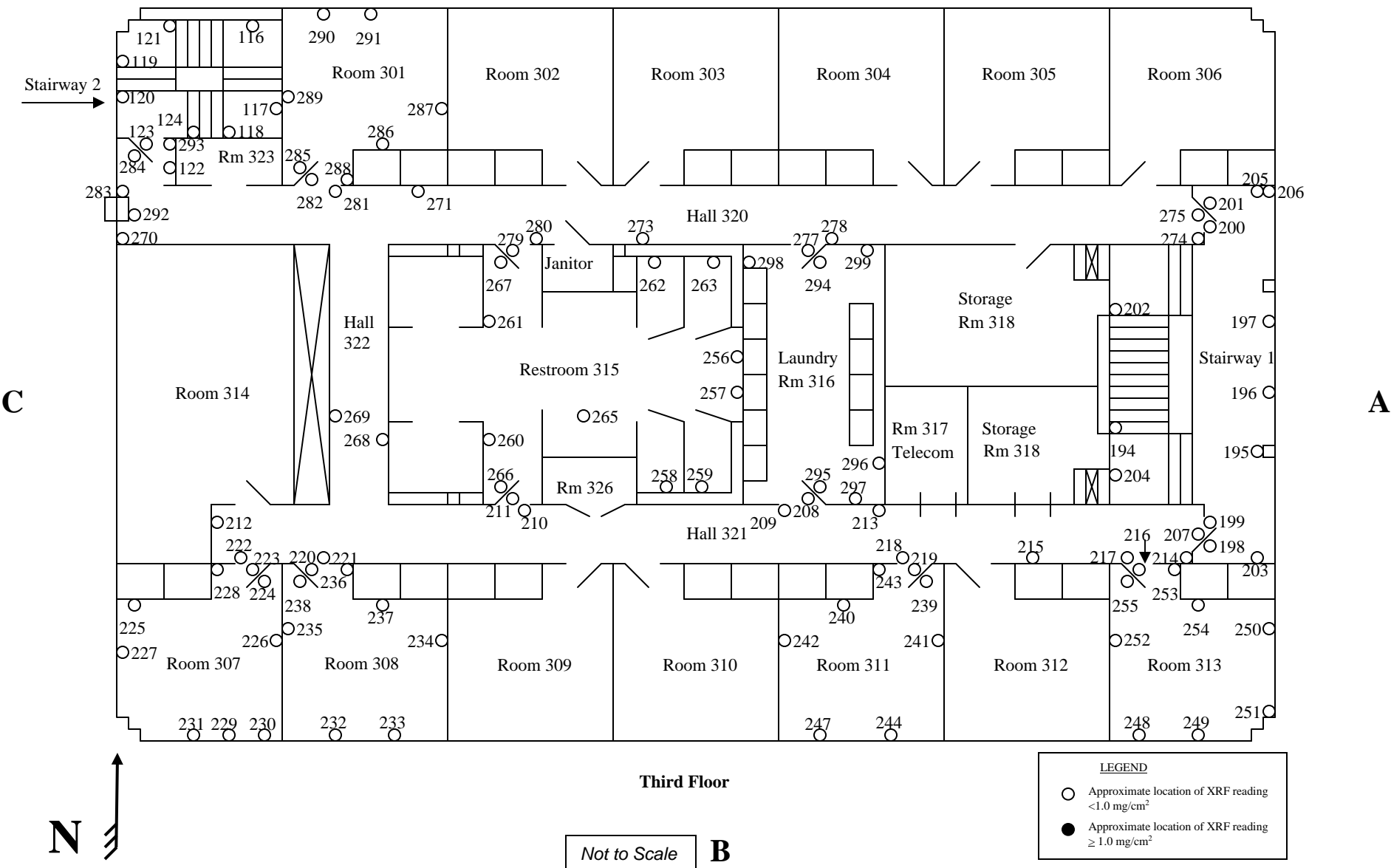
**D**

Figure 3 of 3 - Site Diagram

Project # 3010128

Limited Lead - Based Paint Inspection

**Empirical Environmental, LLC**

Drawn by FW  
 Drawn Dec. 2010

USAFA Prep School, Building 5212  
**APPENDIX F**  
 Colorado Springs, Colorado

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**TAB 3**

**BUILDING 5214**



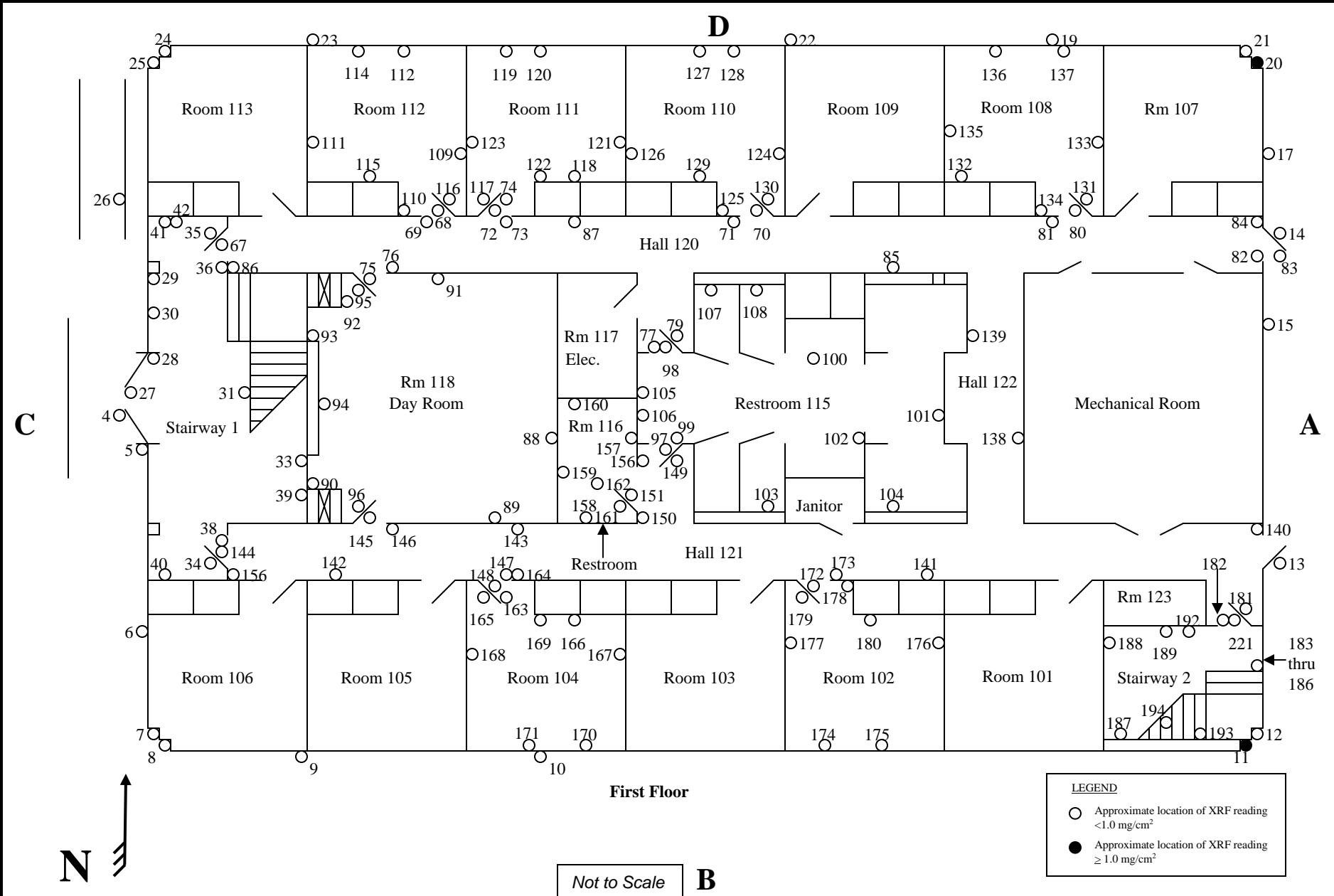


Figure 1 of 3 - Site Diagram

Project # 3010128

Drawn by FW  
Drawn Dec. 2010

Limited Lead-Based Paint Inspection  
USAFA Prep School Building 5214  
APPENDIX F  
Colorado Springs, Colorado

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**APPENDIX G – USAFA INSTALLATION  
FACILITIES STANDARD  
(provided under separate cover)**



**CONSOLIDATE PREP SCHOOL DORMITORIES**

**PNXQPZ104002**

**US AIR FORCE ACADEMY, COLORADO**



US ARMY CORPS OF ENGINEERS  
OMAHA DISTRICT

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*BUILDING STRONG!*



**US Army Corps  
of Engineers** ®

Omaha District