SPECIFICATIONS
FOR
REMODEL BUILDING 2660

PROJECT NAME: REMODEL BUILDING 2660
FORT MCCOY, WI
PROJECT NUMBER: 1945

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GENERAL REQUIREMENTS

PART 1 GENERAL

1.01 SUMMARY OF THE WORK

A. GENERAL

1. All construction debris shall be cleaned up daily.

2. Secure all tools and equipment offsite at the end of each work day.

B. REMOVAL WORK: Remove all items indicated on the drawings and in the specifications and dispose of off Post at the Contractor's expense including but not limited to:

1. Building siding, windows and doors, roofing, soffit and fascia, skirting

2. Masonry chimney

3. Interior sheathing, walls, and fixtures

4. Existing plumbing, electrical, and HVAC

C. NEW WORK: Contractor shall provide all labor, equipment, materials, transportation, and supervision necessary to perform the work under this contract including but not limited to:

1. Insulation, siding, windows and doors, roofing, soffit and fascia

2. Interior walls and doors, finishes, suspended ceilings

3. Spray foam insulation between floor joists

4. Infilled flooring system and floor framing and pier foundations

5. Plumbing, electrical, and HVAC

6. Install building number sign prior to final inspection. Reinstall existing sign or install new sign provided by the government.

D. REPAIR WORK: Contractor shall repair any damages caused by this construction, including but not limited to;

1. Repair any existing construction which is damaged.

2. Repair any landscaping including trees, shrubs, flowers, and grass.

3. Repair vehicle ruts. Level the ruts, place topsoil, and seed the disturbed areas according to the specifications.

4. Infill slab where chimney is removed

1.02 BUILDINGS

A. Existing buildings will not be occupied during the performance of the contract.

B. This building will be subject to annual heat deactivation by the Government and cold weather conditions. All products used must be able to withstand freezing conditions.

1.03 ABBREVIATIONS

A. "KO" = Contracting Officer.

B. "COR" = Contracting Officer's Representative.

C. Industry Standard Abbreviations - See Section 01 42 13.

1.04 TEMPORARY UTILITIES AND FACILITIES

A. General: This section is intended to include temporary utilities and temporary construction facilities to be provided by the Contractor unless otherwise stated below.

B. 120 VAC, 60 Hz electricity and lighting is currently in the building(s) and is available for use. The electricity used will be provided by the Government at no cost to the Contractor.

1. Temporary electricity, if required, shall be provided by the Contractor by portable generator or temporary power pole. The cost of the generator and fuel and/or temporary power pole shall be the responsibility of the Contractor. The cost of electricity used if the Contractor provides a temporary power pole will be provided by the Government at no cost to the Contractor. The Contractor shall contact Xcel Energy for temporary power.

C. Temporary Heating, Cooling, and Ventilation

1. Furnish, install, and maintain all temporary systems and equipment required to maintain specified or required environmental conditions during the progress of the work. Remove upon completion of work at the expense of the Contractor.

2. Government provided electricity will not be used for heating.

D. Temporary Telephone Service

1. If the Contractor requires phone service for this project, the Contractor must contact the phone company business office:

Century Telephone

205 5th Avenue

La Crosse, Wisconsin 54601

(800) 872-4017

2. The Contractor shall pay for all telephone installation, maintenance, removal, and usage charges.

3. The Contractor is responsible for providing and paying for any and all subcontractor's calls.

4. Existing telephones owned or rented by the Government will not be used by the Contractor under any circumstances.

E. Temporary Water

1. Water for construction purposes is available from an existing water connection in the building scheduled for work to be performed. Capacity

is estimated to be not less than 10 GPM at 45 psi. Water is city water quality and contains sodium hypochlorite.

2. The Contractor shall furnish anti-siphon and backflow prevention devices on all temporary water connections. Proof of certification is required.

3. Contractor shall not cause water to be wasted or left running when not in use. Leaks will be repaired immediately. Freeze protection shall be provided by the contractor.

4. The water used will be furnished by the Government.

F. Temporary Sanitary Facilities

1. Existing sanitary facilities in Government building(s) will not be used by the Contractor's personnel.

2. The Contractor shall be responsible for providing and paying for temporary toilet and sanitary facilities. The Contractor shall pay rental fees and cleaning charges and shall remove the facilities when the project is completed.

3. The COR or Construction Inspector shall approve the site location for all temporary sanitary facilities.

4. Contractor shall maintain all such facilities used in a clean and sanitary condition.

G. Temporary Enclosures

1. Contractor shall provide temporary enclosures as necessary for this project to provide weather protection for materials, allow for temporary heating, and to prevent entry of unauthorized persons.

2. Provide temporary, weather-tight enclosure of exterior walls for successive areas of buildings as work progresses.

3. Provide temporary doors with padlocks.

4. Enclosures shall be removable as necessary and for hauling of materials.

5. Temporary partition and ceiling enclosures shall consist of framing and sheet materials which comply with the structural and fire rating requirements of applicable codes and standards.

6. Close joints between sheet materials and seal edges and intersections to prevent penetration of dust and moisture.

7. During roof shingle removal, safeguarding of roof sheathing from rain and snow is required.

H. Barriers and Fences

1. Contractor shall provide, install, maintain, and remove suitable barriers to prevent public entry and to protect the work site.

2. Such barriers shall be erected to provide a safety barrier around such portions of the project that could cause injury or destruction of property and to provide general security for the affected project site.

3. Materials to be used are at the Contractor's option and expense.

4. Barriers and fence shall be posted with appropriate warning signs. Place warning signs at the construction area perimeter designating the presence of construction hazards requiring unauthorized persons to keep out. Signs must be placed on all sides of the project, with at least one sign every 300 feet. All points of entry shall have signs designating the construction site as a hard hat area.

5. Fencing shall be provided along the construction site at all open excavations and tunnels to control access by unauthorized people. Fencing must be installed to restrain a lateral force of at least 200 pounds.

I. Security

1. The Contractor shall provide all materials, labor, and equipment to protect the project site from theft and vandalism.

2. Existing Government buildings and facilities shall be protected by the Contractor during the contract when the work involves openings into existing Government buildings. The degree of protection shall not be less than what currently exists.

3. The Contractor shall provide temporary doors, locks, and barricades to prevent unauthorized access to the construction site and existing buildings.

4. Storage of construction materials is at the risk of the Contractor.

J. Access Roads and Parking Areas

1. Contractor's private vehicles shall be parked at locations designated by the COR.

2. All construction vehicles and Contractor's private vehicles will be parked in an orderly manner at all times and will not block normal traffic in the area. Private vehicles belonging to the contract personnel will be parked in designated parking areas and in no case on grass areas, adjacent to buildings, or along streets.

3. Contractor is responsible for any snow removal required for access or site work.

K. Physical Security Statement

1. Access and General Protection/Security policy and Procedures. This provision/contract text is for contractor employees with an area performance as defined by AR 190-13, UFC, and local standard operating procedures (SOP), and will add the following language in the PWS. "The contractor and all associated subcontractors' employees shall provide all information required for background checks to meet installation access requirements to be accomplished by Director of Emergency Services Physical Security Office or the Visitor Control Center (VCC) Building 35. The contractors will be required to comply with AR 190-13 requirements and any other policy and procedures pertaining to the security of the installation. The work area must remain secure when no work is being performed. Contractor workforce must comply with all personal identity verification requirements (FAR Clause 52.204-9, Personal Identity

Verification of Contractor Personnel) as directed by DOD, HQDA, and/or local policy.

The contractor and all associated subcontractors' employees shall also comply with adjudication standards and procedures using the National Crime Information Center Interstate Identification Index (NCIC-III) and Terrorist Screening Database (TSDB) (Army Directive 2014-05/AR 190-13), applicable installation, facility and area commander installation/facility access and location security policies and procedures (provided by government representative). In addition to the changes otherwise authorized by changes clause of this contract, should the Force Protection Condition (FPCON) at any individual facility or installation change, the Government may require monthly participation in the Installation Random Antiterrorism Program."

2. Contractors Requiring Common Access Card (CAC). This provision/contract text is for contractor employees with an area of performance as defined by AR 190-13 (Installation Access Control) and local SOP that requires a Common Access Card. When applicable, add the following language into the PWS. "Before CAC issuance, the contractor employee requires, at a minimum, a favorably adjudicated National Agency Check with Inquiries (NACI) or an equivalent or higher investigation in accordance with Army Directive 2014-05. The contractor employee will be issued a CAC only if duties involve one of the following: (1) Both physical access to a DoD facility and access, via logon, to DoD networks on-site or remotely; (2) remote access via logon, to a DoD network using DoD-approved remote access procedure; or (3) Physical access to multiple DoD facilities or multiple non-DoD federally controlled facilities on behalf of the DoD on a recurring basis for a period of 6 months or more. At the discretion of the sponsoring activity, an initial CAC may be issued based on a favorable review of the FBI fingerprint check and a successfully scheduled NACI."

L. Traffic Work

1. All work around or involving roadways, to include roadway excavations and utility crossings, will be conducted in accordance with the Manual on Uniform Traffic Control Devices (MUTCD) – FHWA, Latest Edition.

2. The Contractor shall provide and ensure appropriate road closure and detour signs are established as necessary for traffic management. All road closures shall be coordinated with the Contracting Officer in advance. Road closures shall require a road closure plan showing the location of signage.

M. Waste Reporting

1. The Army has established the requirement for a 50% minimum diversion rate by weight of C&D waste from landfill disposal. In order to achieve those results the Contractor shall submit a solid waste management plan as a required submittal for projects costing over $100,000. At a minimum, the solid waste plan shall include the anticipated waste streams and disposal/recycling facilities. No work shall begin until the Contractor has an approved plan.

2. The Contractor shall submit reports to the Contracting Officer quantifying the total pounds of hazardous, universal, recycled, and non-regulated waste disposed of during the duration of the contract. Contractor shall also submit material(s) disposal location(s).

3. Reporting shall be specific to the month in which waste was disposed of and separated per waste type for Fort McCoy's reporting requirements.

4. Reporting for recycled waste shall also be specific to how much revenue the Contractor received for each type of recycled material.

N. Refuse Disposal and Recycling

1. Provide all solid waste disposal associated with this contract, including but not limited to the container delivery, removal, and disposal fees. Items included under this section are all solid wastes as defined by Wisconsin State Statute 289.01 (33). These items shall be disposed in a licensed sanitary landfill or recycling center in accordance with State of Wisconsin Administrative Code Chapter NR500 series.

2. The Contractor is allowed to use Fort McCoy recycling facilities for concrete, mixed paper, plastics (PETE#1 and HDPE#2), cardboard, trees/woody waste, metals, and aluminum cans. If materials are recycled at Fort McCoy, provide all labor and delivery to the designated recycling facilities. Materials shall be weighed and weigh slips provided to the COR to receive credit toward the 50% requirement in "Waste Reporting" above. Materials not weighed can be delivered to the designated recycling facilities, but the material will not count toward the 50% waste reporting requirement.

3. Provide for the recycling of all other construction/demolition debris including drywall, lumber, reinforcing steel, piping, wiring, brick, plaster, wall board, roofing material, insulation, plumbing fixtures, doors, and windows to the greatest extent possible . Only utilize licensed recycling facilities.

4. Provide a certificate of recycling for universal waste as defined in Wisconsin Administrative Code Chapter NR600.

O. Material Sales

1. Materials shall not be stockpiled for sale purposes on Post.

2. Public advertised sales of materials will not be permitted on Post.

3. Prior arranged sale of materials may be permitted on Post.

1.05 QUALITY CONTROL

A. The Contractor is responsible for quality control and shall establish and maintain an effective quality control system in compliance with the Contract Clause titled "Inspection of Construction." The Contractor Quality Control (CQC) Plan shall include, as a minimum, the following to cover all construction operations, both onsite and offsite, including work by subcontractors, fabricators, suppliers, and shall be keyed to the proposed construction sequence. The plan shall identify personnel, procedures, control, instructions, tests, records, and forms to be used.

The site project superintendent is responsible for the quality of work on the job and is subject to removal by the Contracting Officer for non-compliance with the quality requirements specified in the contract.

B. All plumbing work shall be performed by a state certified journeyman plumber. All plumbing work shall be supervised full time on site by a state certified Master plumber. Proof of certification is required. The cost of the work shall include all State permit fees and approval for the installation of backflow prevention devices.

C. All electrical work shall be supervised full time on site by a state certified journeyman electrician. All electrical work shall be overseen by a state certified Master electrician. Proof of certification is required.

D. All hazardous material abatement shall be supervised by a certified asbestos supervisor and a certified lead base paint supervisor.

E. All work associated with air-conditioning refrigerant shall be conducted by an Air-Conditioning Refrigerant Institute Certified Technician; Type-Universal. All work shall also be conducted in accordance with Federal Law "40 CFR Part 82 subpart F and Parts 273, 279, and 761" and U.S. Environmental Protection Agency "Clean Air Act (1990) Section 608" and all EPA final regulations associated with section 608.

1.06 APPLICABLE STANDARDS, GUIDES AND SPECIFICATIONS

A. References are made in these specifications to published codes, standards, and specifications of manufacturers' societies, associations, and other standards. All referenced documents are included in this specification as if written in their entirety.

B. Where referenced documents are not specified by date, the latest edition published as of the bid or proposal request date shall apply.

1.07 OPERATION AND MAINTENANCE MANUALS

A. Provide one (1) PDF copy of equipment maintenance and operation manuals for all major pieces of equipment and fixtures. Where the Contractor has installed entire systems or has assembled or interconnected several subsystems such as heating, ventilating, or special electrical systems, the Contractor shall include a written narrative of how each system or subsystem operates and how the overall system is intended to be operated, complete with diagrams showing flow routes or electrical interconnections.

B. Drawings:

1. Supplement product data with drawings as necessary to clearly illustrate:

a. Relations of component parts of equipment and systems.

b. Control and flow diagrams.

2. Coordinate drawings with the information in project record documents to assure correct illustration of completed installation.

C. Written text, as required to supplement product data for the particular installation:

1. Organize in consistent format under separate headings for different procedures.

2. Provide logical sequence of instructions for each procedure.

D. Content, for each unit of equipment and system, as appropriate:

1. Description of unit and component parts;

a. Function, normal operating characteristics, and limiting conditions.

b. Performance curves, engineering data, and test results.

c. Complete nomenclature and commercial number of replaceable parts.

2. Operating procedures;

a. Start-up, break-in, routine, and normal operating instructions.

b. Regulation, control, stopping, shut-down, and emergency instructions.

c. Summer and winter operating instructions.

d. Special operating instructions.

3. Maintenance procedures;

a. Routine operations.

b. Guide to "Trouble-Shooting."

c. Disassemble, repair, and reassemble.

d. Alignment, adjusting, and checking.

4. Servicing and lubrication schedule including a list of required lubricants.

5. Manufacturer's printed operating and maintenance instructions.

6. Description of sequence of operations by control manufacturer.

7. Original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance:

a. Predicted life of parts subject to wear.

b. Items recommended to be stocked as spare parts.

8. As-installed control diagrams by controls manufacturer.

9. Each Contractor's coordination drawings:

a. As-installed color coded piping diagrams.

b. As-installed color coded electrical and systems diagrams.

10. Charts of valve tag numbers, with location and function of each valve.

11. List of manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.

12. Other data as required under pertinent sections of specifications.

E. Prepare and include additional data when the need for such data becomes apparent for the training of government personnel.

1.08 DELIVERY AND STORAGE

A. Contractor shall insure that any items which are stored at the site prior to installation are stored in an environment that will not cause rusting, warping, staining, or any physical breakage or damage.

B. All labor and equipment required for loading, unloading, transporting, and moving materials shall be provided by the Contractor.

C. Storage buildings will not be provided by the Government.

1.09 TRAILERS OR STORAGE BUILDINGS, INCLUDING OFFICE TRAILERS

A. Trailers or storage buildings will be permitted, where space is available, subject to the approval of the COR.

B. The trailers or buildings shall be in good condition, free from visible damage, rust, and deterioration, and meet all applicable safety requirements. Trailers shall be roadworthy and comply with all appropriate State and local vehicle requirements. Failure to maintain storage trailers or buildings to these standards shall result in the removal of non-complying units at the Contractor's expense.

C. A sign not smaller than 2-feet by 2-feet shall be conspicuously placed on the trailer depicting the company name, business phone number, and emergency phone number.

D. Trailers shall be anchored to resist high winds and must meet applicable state and local standards for anchoring mobile trailers.

E. Provide metal or fiberglass skirting completely around office trailers within 30 days after placement of the trailer on the lot and after being approved by the COR.

F. Grass and weeds shall be cut weekly or as needed to a height not to exceed three inches. Trash shall be picked up and disposed of properly on a daily basis.

G. The Contractor shall be responsible for the installation and removal of all temporary utility connections at no cost to the Government.

1.10 STORAGE SITE

A. All stored materials shall be neatly stacked at all times.

B. Trash shall be picked up and properly disposed of on a daily basis.

C. Grass and weeds shall be cut on a regular basis to a height not to exceed three inches. In Cantonment, uncut height shall not exceed 6 inches. Outside Cantonment, uncut height shall not exceed 12 inches.

D. Welding equipment shall be handled and stored in accordance with applicable regulations.

E. Fire extinguishers shall be provided where flammable liquids are stored.

1.11 SCHEDULING AND COORDINATING WORK

A. Contractor shall submit the proposed construction schedule, in accordance with the FAR clause entitled schedule for construction contracts. Attached to the construction schedule shall be a horizontal bar chart with a separate line for each major portion of work, identifying the first work day of each week. Distribute

copies of the approved schedule to the project site file, subcontractors, suppliers, and other concerned parties.

1. The Contractor shall at the Pre-construction Conference or if no Pre-con is held, within 20 calendar days of award, prepare and submit their schedule in the form of a Gantt Chart for approval. This schedule shall show at a minimum critical path, float, owner of float, milestones, baseline, elements of work, and duration of each significant element of work. The submitted schedule shall be approved prior to beginning work.

2. The Contractor shall maintain the original schedule/Gantt Chart throughout the life of the project and show actual schedule achievement in tandem with the original schedule and shall update the approved schedule bi-weekly to display time gained or lost against the original schedule. If in the opinion of the Contracting Officer the Contractor falls behind the approved schedule, the Contractor shall take steps necessary to improve progress, including those steps that may be required by the Contracting Officer, without additional cost to the Government. The Contracting Officer may require the Contractor to increase the number of shifts, overtime operations, days of work, and/or the amount of construction plant, and to submit for approval any supplementary schedule or schedules in chart form as the Contracting Officer deems necessary to demonstrate how the approved increased effort shall regain the original schedule of progress. FAR 52.236-15

B. The Contractor shall be specifically responsible for the coordination of all phases of work under this contract within the approved construction schedule.

C. The Contractor may be required to allow Government personnel or other Contractors to carry out work within the work site. Such work will be scheduled and coordinated through the COR.

D. The Contractor shall provide a phone number and address where a key, and/or approval, to enter may be obtained for the work sites during the work day for times when the Contractor may not be at the work site.

E. The Contractor shall provide 10 working days notice for any utility outage. Outages shall be shown on the schedule provided. Emergency utility outages shall be reviewed by the Contracting Officer/Inspector prior to utility outage. Expenses/damages caused by unscheduled or unapproved utility outages shall be chargeable to the Contractor.

1.12 WARRANTIES

A. All materials and workmanship shall be warranted by the Contractor for a period of not less than one year from the date of final acceptance by the Government, except when longer warranties are required from the Contractor as stated in each specification section.

B. For products and materials that are normally warranted by the manufacturer or supplier for more than one year, the Contractor shall provide the Government with a written warranty, or certification, indicating the manufacturer's or supplier's terms and conditions of the warranty.

C. The Contractor shall populate and submit a Warranty Item Tracking spreadsheet; that which is covered under par A. The spreadsheet shall be provided to the contractor upon request of the government COR. The spreadsheet shall outline each piece of extended warranty equipment provided. Extended warranty shall be anything beyond one calendar year from the Beneficial Occupancy Date. Item information will include the following: warranty item, equipment description, make, model, serial number, capacity, capacity unit of measure, warranty start date, warranty length, and Maintenance Information as indicated on the Provided Spreadsheet.

D. The Contractor shall develop, populate, and submit a Warranty Item Tracking spreadsheet for Equipment that has been demolished or replaced during a renovation. Demolished or removed equipment shall be reported on a Removed Item Tracking spreadsheet. The Contractor shall develop, populate, and submit the spreadsheet with equipment information to include: equipment description, make, model, serial number, capacity and capacity unit of measure.

PART 2 PRODUCTS

2.01 EXISTING MATERIALS

A. Materials to be demolished:

1. All materials identified to be demolished and removed from the existing facilities shall be the responsibility of the Contractor to remove completely from Fort McCoy.

2. Under limited conditions and as specified on the plans, deliver scrap metal/materials to a location designated by the COR. Contractor will be responsible for hauling all demolished materials to the designated locations.

B. Existing materials may only be reused/relocated as specifically allowed per the contract drawings and specifications.

2.02 NEW MATERIAL AND EQUIPMENT

A. Materials and equipment shall be essentially the standard products of a manufacturer regularly engaged in the manufacture of those products, shall meet the requirements of the specification, and shall essentially duplicate material and equipment that have been in satisfactory use.

B. All materials shall be of the latest type or model currently being produced by the manufacturer.

C. Seconds or otherwise substandard materials will not be allowed.

D. Where applicable, proposed new doors, windows, insulation, electrical, heating, cooling and plumbing equipment shall be eligible for energy efficiency incentives available through Wisconsin's Focus on Energy program. Equipment shall be proposed that meet all of Focus on Energy's requirements for incentives. Proposals shall include the appropriate corresponding incentive codes, model numbers and cut sheets for each proposed lighting component. Further information concerning Focus on Energy's requirements can be found in their lighting catalog which can be found on-line at https://focusonenergy.com.

PART 3 EXECUTION

3.01 INSPECTION

A. The Contractor shall not begin successive phases of work until an inspection has been completed and the work is accepted by the COR. Notify the COR 48 hours prior to completing a phase requiring inspection.

1. Any work that will be covered by successive work must be inspected prior to performing successive work.

2. Work to be covered includes, but is not limited to, underground utilities, utilities located behind walls, and work located below finish floors.

B. When the contractor considers the work complete, submit written certification confirming:

1. Contract documents have been reviewed.

2. Project submittals have been completed.

3. Work has been inspected by the Contractor for compliance with the contract.

4. Equipment and systems have been tested, balanced, and adjusted for proper operations.

5. Work is complete and ready for final inspection.

6. Contractor shall provide a requested date for punch list inspection to the Contracting Officer, in writing, not less than 7 working days prior to the proposed date of inspection. Punch list inspections shall be scheduled and conducted to ensure compliance with the contract completion date.

C. The COR will coordinate with the members of the inspection party and establish the punch list inspection date.

1. Should the COR consider the work incomplete or defective, a written punch list will be provided to the Contractor from the Contracting Officer.

2. The Contractor will be given 10 calendar days, unless otherwise determined by the Contracting Officer, to remedy the stated deficiencies.

3. The Contractor shall provide a second written certification and request re-inspection to be scheduled not later than the 10 calendar days, unless otherwise determined by the Contracting Officer. This re-inspection shall also be completed during the contract performance period to be in accordance with the contract.

4. If any further re-inspections are required the Contractor may be charged the additional cost of the inspections.

5. Final acceptance of the work occurs upon the Contracting Officer's acceptance of the work subsequent to successful final inspection by the COR and receipt of all contract requirements.

6. If final acceptance does not occur prior to the contract completion date, liquidated damages may be applicable in accordance with the liquidated damaged clause.

D. If the Government requires beneficial occupancy of the facility prior to completion of the work by the Contractor, an inspection shall be conducted by the COR to determine the completed work, and either accept or document any work not complete. The Contractor will then complete the remaining work and correct any deficiencies.

3.02 TRANSITION FROM EXISTING TO NEW WORK

A. When new work abuts or finishes flush with existing work, make a smooth transition. Patched work shall match existing adjacent work in texture and appearance.

B. When finished surfaces are cut in such a way that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division and provide trim appropriate to the finished surface.

3.03 OPERATING TESTS

A. After equipment installations are completed, the Contractor shall conduct an operating test for approval. The test shall demonstrate that the operating and installation requirements of the specifications have been met. The test shall be performed in the presence of the COR.

3.04 ENVIRONMENTAL CONSIDERATIONS

A. Migratory Bird Nesting Season and Northern Long-Eared Bat

1. In order to reduce potential impacts to migratory birds during their nesting season and to the northern long-eared bat (a federally threatened species), Fort McCoy is making all reasonable attempts to complete land clearing activities for construction, maintenance and repair activities between October 1 – March 31. If the contractor intends to disturb or clear any project area of undeveloped land or demolish any grasslands, trees, bushes or potential nesting sites between April 1 and September 30, they shall submit a Deconfliction Notification a minimum of 14 days prior to scheduled land clearing activities. The notification shall state: "This project is subject to the Migratory Bird Treaty Act and Endangered Species Act. Request that Fort McCoy, DPW, Natural Resources Branch approve the land clearing activities as required by the project specifications." The Natural Resources Branch will respond within 14 days of receipt of the notification informing the contractor when they can proceed with land clearing activities.

B. Invasive Species

1. The Natural Resources Branch is conducting management to control over 30 species of invasive plants on the installation. In order to prevent the introduction of new species, or the spread of existing species throughout the installation, the contractor shall do the following: document the cleaning of equipment prior to arrival on Fort McCoy; and ensure that any fill material transported to the work site is free of invasive weeds and/or seeds to the greatest extent practical. Equipment shall be cleaned using a high pressure washer or air pressure to the extent needed to remove all soil or plant debris from the equipment.

C. Oak Wilt Season

1. Contractor shall not perform tree removal during the oak wilt season (April 1 thru July 15) for tree removal. If tree removal is required during oak wilt season any oak trees not scheduled for removal shall be protected from damage. If non-scheduled live trees are damaged, tree wound dressing shall be immediately applied to the damaged area. All trees and/or stumps that require removal shall be transported to the stump disposal site on South Post or removed from the installation.

D. Cultural Resources

1. Notify the COR at least 2 business days before performing mechanical ground disturbance in an area within 50 feet of a protected cultural resource area. A qualified member of the Fort McCoy Cultural Resources staff will be present to monitor activity whenever mechanical ground disturbance is in progress within these identified areas. If potentially significant archaeological or cultural artifacts are encountered, disturbance in this area will be stopped to allow the monitor to evaluate the artifacts or remains. If archaeological or cultural artifacts are encountered when a site monitor is not present, work in this area must stop and the COR and KO shall be notified. In the event that human remains or items covered under the Native American Graves Protection and Repatriation Act (NAGPRA) are encountered, all activity in this area will cease for at least 30 days. Human remains shall not be disturbed. If any delays are encountered, the contractor has the right to submit for an equitable adjustment.

3.05 OBJECTS AFFECTING NAVIGABLE AIRSPACE

A. FAA notification is required IAW CFR 14 part 77, Objects Affecting Navigable Airspace for the following:

1. Definition of Construction /Objects

a. Any object of natural growth, terrain, of permanent or temporary construction or alteration, including equipment or materials used therein, and apparatus of a permanent or temporary character..

b. Any alteration of any permanent or temporary existing structure by a change in its height (including appurtenances, or lateral dimensions, including equipment or materials used therein.

2. Any construction/object or alteration of more than 200 feet in height above the ground level at its site.

3. Any construction/object or alteration of greater height than an imaginary surface extending outward and upward at the following slopes:

a. 100 to 1 for a horizontal distance of 50,000 feet from the nearest point of the nearest runway of each airport with at least one runway more than 3,200 feet in actual length, excluding heliports.

b. 50 to 1 for a horizontal distance of 10,000 feet from the nearest point of the nearest runway of each airport with at least one runway more than 3,200 feet in actual length, excluding heliports.

c. 25 to 1 for a horizontal distance of 5,000 feet from the nearest point of the nearest landing and takeoff area of each heliport (helipad).

4. Notification to the Airfield is required in addition to FAA notification of any object of permanent or temporary construction or alteration, including equipment or materials used therein:

a. Greater than 25 feet in open areas (open areas are defined as an area that does not contain other objects within 300 feet).

b. 50 feet in all other areas.

c.

5. Objects shall be marked/lighted when greater that the above criteria as follows:

a. A red beacon for nighttime (or inclement weather conditions)

b. Either a beacon or checkered flag for daytime.

c.

6. Objects lowered below the above criteria during nighttime shall only require marking.

3.06 HOT WORK PERMIT

A. Hot work permits shall be required when performing activities which generate or

1. have the potential to generate heat, sparks, or open flames, such as abrasive blasting, burning, brazing, cutting, grinding, powder-actuated tools, hot riveting, soldering, thawing, activities, welding, or any similar operations capable of initiating fires or explosions.

B. The Contractor shall obtain a Hot Work Permit prior to performing any of the activities in Paragraph 3.06 A. This permit may be obtained from the Fire Department in Building 1680. The non-emergency telephone number is 608-388-4151.

C. The Contractor shall submit copy of the Hot Work Permit in accordance with Section 01 33 00.

3.07 CLEANING

A. During Construction

1. The Contractor shall at all times keep the work area, including storage areas, free from accumulations of waste materials. The Contractor shall ensure all affected areas are “broom clean” at the end of each work day. Before completing the work, the Contractor shall remove from the work and premises, any rubbish, tools, scaffolding, equipment, and materials that are not the property of the government. Upon completing the work, the Contractor shall leave the work area in a fully cleaned, neat, and orderly condition, satisfactory to the Contracting Officer. FAR 52.236-12.

B. Dust Control

1. Clean interior spaces prior to the start of finish coatings and continue cleaning on an as-needed basis until coatings are finished.

2. Schedule operations so that dust and other contaminants resulting from the cleaning process will not fall on wet or newly-coated surfaces.

3. The amount of dust resulting from demolition shall be controlled to prevent the spread of dust and to avoid creation of a nuisance in the surrounding areas. The use of water will not be permitted when it will create or result in hazardous or objectionable conditions such as ice, flooding, and pollution.

4. All buildings, materials, and equipment, including ductwork and diffusers, shall be cleaned of all dust and dirt resulting from the performance of the work under this contract.

C. Final Cleaning

1. Final cleaning shall be performed and completed prior to punch list inspection.

2. Clean interior and exterior surfaces exposed to view.

a. Remove temporary labels, stains, and foreign substances.

b. Polish transparent and glossy surfaces.

c. Vacuum carpeted and soft surfaces. Mop floors.

d. Wash windows and dust walls and trim.

e. Clean equipment and fixtures to a sanitary condition.

f. Clean or replace filters of mechanical equipment.

g. Clean roofs, gutters, downspouts, and drainage systems.

3. Clean project site.

a. Sweep paved areas.

b. Rake clean other surfaces.

4. Remove waste and surplus materials, rubbish, and construction facilities from the project and from the site.

3.08 RECORD AND ASBUILT DRAWINGS

A. AsBuilt Drawings:

1. With red pencil or red ink, neatly inscribe all COR approved changes to show final locations and types of partitions, walls, doors, electrical, fire alarm system, communication system, plumbing, heating, ventilating, air conditioning services and equipment, and similar work.

2. With red pencil or red ink, neatly inscribe the location of all existing and new exterior utilities. The locating may be accomplished by traditional survey methods or by global positioning system (GPS) satellite equipment supplemented by traditional methods where required. Include the size, material, and depth.

3. With red pencil or red ink, neatly inscribe the location of all new wire routing of electrical and fire alarm, layout and size of the plumbing, valves and duct access points.

4. Locations may be from existing buildings or from base monument system. Any existing structures used as a survey reference must be checked for conformity to NAD 83 surveying coordinates.

5. Contractor shall keep two sets of redlined Asbuilt drawings on the job site at all times during construction. Both sets shall be updated frequently. Immediately upon completion of construction, both sets shall be turned over to the COR.

3.09 PROJECT COMPLETION

A. Fourteen (14) calendar days prior to the final inspection, submit invoices showing the installed cost of each of the following for the Government to apply for Focus on Energy rebates:

1. Water Heater
2. Air-curtains
3. Air Economizer
4. Energy Recovery Unit
5. Furnace
6. Condensing Units
7. Air Handlers or Rooftop Units
8. Variable Frequency Drives
9. HW Boilers
10. Light Fixtures
11. Lamps
12. Ballasts

B. Fourteen (14) calendar days prior to the final inspection, submit invoices showing the installed cost of each of the following for the Government to apply for Focus on Energy rebates: ADD MATERIALS CERTIFICATION LETTER FOR ALL BUILDING REHAB PROJECTS.

1. See Appendix A; Materials Certification Letter.

END OF SECTION

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SECTION 01 12 10

CONTRACT CONSIDERATIONS

PART 1 GENERAL

1.01 COMPLETION

A. This contract shall have a scheduled completion date. The method of determining completion time shall be as follows:

ITEM	ALLOTTED COMPLETION TIME
Total Project Performance Period	365 Days

B. Liquidated damages will apply for this project. See the contract documents for more information.

PART 2 PRODUCT – NOT USED

PART 3 EXECUTION – NOT USED

END OF SECTION

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SECTION 01 30 00

SUBMITTALS

PART 1 GENERAL

1.01 SUBMITTALS

The following paragraphs summarize the requirements for submittals required by the Contractor. All items listed in the Schedule of Material Submittals shall be submitted to meet the requirements of the following paragraphs.

A. At all times the Contractor remains responsible for verifying and ensuring that all work is performed in strict accordance with Contract and other specification requirements. Inadvertent errors on the part of the Government does not at any time relieve the Contractor at any time of the responsibility to meet all Contract requirements. When a non-conforming submittal is inadvertently accepted or inadvertently approved by the Government, the Contractor is not relieved of responsibility to meet all Contract requirements, and remains responsible at all times to perform all work and provide submittals in strict compliance with Contract and specification requirements.

B. Approval by the Contracting Officer does not relieve the Contractor from responsibility for any errors or omissions in the submittals, nor from the responsibility of complying with Contract requirements.

C. Variations and deviations from the Contract requirements are not authorized at any time without prior written approval from the Contracting Officer.

D. Requests for variations or deviations from the Contract requirements must be submitted in writing to the Contracting Officer prior to the start of construction. The Contractor must not proceed to construction of variances or deviations until approval is received in writing from the Contracting Officer. All requests for variations or deviations from the Contract requirements must be completed in strict accordance with the procedures set forth in the Code of Federal Regulations, 48CFR 52.236-21, Specifications and Drawings for Construction clause, paragraph (f).

E. The Contracting Officer's Representative or designated Government representative is the reviewing authority for all product data submittals, and for all project documents including design drawings and specifications.

F. Definitions

1. Submittal - General term that includes any item that is required to be provided by the Contractor to the Government to identify product descriptive literature, drawings, sketches, and schematics that indicate and show a fabrication or installation method or technique; or any other model or sample of actual items or methods to include product data sheets, shop drawings, or samples.

2. Product Data - Descriptive literature or data that describes the physical properties of a product or material item that the Contractor intends to use in doing the work. Such descriptive data should enable the Contracting Officer to verify that the intended item meets the necessary requirements of the specifications.

3. Shop Drawings - A sketch, drawing, or schematic that is prepared by or for the Contractor that illustrates or shows how certain products or material items will be assembled, installed, interconnected, or fabricated for this contract.

4. Sample - An actual piece of material, product, or equipment that the Contractor intends to furnish, use, or install on the project.

1.02 PRODUCT DATA

A. Preparation

1. List each product separately on ENG Form 4025-R. Organize the product data documentation in order of list as indicated on ENG Form 4025-R.

2. Clearly mark product data documentation for proper identification of specific products or models. Product data documentation for equipment must include complete catalog and model numbers.

3. Clearly mark product data documentation to indicate conformance with requirements including performance characteristics, salient characteristics, and ratings.

4. Provide certification marks on product data documentation for each product.

5. Prior to the transmittal of each submittal, each product for installation must be reviewed, verified, and approved by the Contractor's Quality Control (CQC) System Manager. The CQC System Manager must note each action taken on the Submittal Register.

6. Provide complete product data documentation including shop drawings, schematics, controls, wiring and piping diagrams; operations and maintenance, and manufacturer's published data, instructions, and recommendations.

7. Product data documentation must include sufficient details to determine that all requirements are met.

B. Mark or modify drawings and diagrams to delete information that is not applicable to the work.

C. Supplement standard information to provide information specifically applicable to the product or work.

1.03 SHOP DRAWINGS

A. Provide shop drawings in a clear, complete, and organized manner.

B. Provide shop drawings including dimensions, details, schematics, and wiring diagrams.

C. Verify notes, references, and data are accurate between drawings, specifications, and shop drawings. Provide references on design drawings for details on shop drawings.

1.04 SAMPLES

A. Provide samples upon request of the Contracting Officer of sufficient size and quantity (unless a size is specified) to clearly illustrate:

1. Functional characteristics of the product with integrally related parts and attachment devices.

2. Full range of color, texture, and pattern.

B. Provide field samples and mock-ups upon request of the Contracting Officer to meet the following requirements.

1. Sufficient size and quantity for the Contracting Officer's purpose.

2. Fabricate each sample and mock-up complete and finished.

1.05 CONTRACTOR RESPONSIBILITIES

A. Provide submittals promptly in accordance with the approved schedule in such sequence as to cause avoid delays in the work or in the work of any contractor.

B. Provide all submittals through the General Contractor. The General Contractor remains responsible at all times for all submittals. Do not provide submittals through any type of sub-contractor. Submittals from sub-contractors do not meet Contract requirements.

C. All products for installation must submitted for approval as product data submittals. Any equipment or products that are not approved for installation by the Government shall be removed at Contractor's expense and replaced with only Government approved equipment or products (no additional cost to the Government).

D. Do not submit for review or install any products (equipment or materials) that do not meet all Contract requirements including specifications and drawings.

E. Review all submittals prior to submission including product data and shop drawings to verify compliance with all Contract requirements. Provide coordination for each submittal to meet performance, work and Contract requirements.

F. Provide field verification of existing site conditions including field measurements and utilities. Provide field verification to meet the following requirements.

1. Field measurements, construction criteria; status and locations of existing utilities both visually and not visually accessible; building systems, and conformance with final approved design specifications and drawings.

1.06 SUBMISSION REQUIREMENTS

A. Provide submittals promptly in accordance with an approved schedule in sequential order to avoid any type of scheduling delay in the completion of work and to avoid delaying the work of any contractor. Provide submittals to meet all requirements including specifications and drawings.

B. Prepare a complete list of preconstruction, construction, and post construction submittals to develop the submittal register. The initial submittal register list may not be all inclusive, and additional submittals may be required.

C. Use the initial submittal register list to prepare a submittal register in the same format as the Schedule of Material Submittals attached at the end of this section. Use the Schedule of Material Submittals at the end of this section to develop the preliminary submittal register and to schedule submittals.

D. The Designer of Record is responsible to update the submittal register for scheduling and completeness, to complete any corrections, and to add additional submittals. The Designer of Record is responsible to verify the completeness of the Submittal Register and to verify that each submittal is properly reviewed prior to each submission.

E. Provide transmittal of the Submittal Register to the Contracting Officer for review in accordance with Schedule of Material Submittals. After acceptance is received from the Government, insert the approved Submittal Register into an Excel spreadsheet suitable for use by the contractor and Government.

F. Use the approved/accepted Submittal Register as a scheduling document for submittals, to record required data, and to control submittal actions throughout the contract period. Provide scheduling coordination for the submittal register between submittal register dates, dates in the contractor's progress schedule, and any other dates that may impact the work.

G. Provide monthly updates to the submittal register list in accordance with Contract and specifications requirements. Provide monthly updates to the Submittal Register including codes; required dates of submittal; actual dates of submittals; current status for each submittal, and final status of each submittal. Provide corrections to submittals until each submittal is satisfactorily completed.

H. Provide updates to the Submittal Register when the progress schedule is revised and submit to the Contractor Officer for review.

I. Provide additional submittals upon request from the Contracting Officer. The Contracting Officer may request other submittals in addition to those specified in the Contract documents when deemed necessary to adequately describe the work. Units of weights and measures shown in all submittal documents must be the same as those shown on the approved drawings, as shown in the approved specifications, and in accordance with Contract documents.

J. Each submittal must be complete to meet all requirements with sufficient detail and documentation to allow for ready determination of compliance with all requirements and all Contract documents.

K. Each submittal product or item must be reviewed, verified, and approved by the Contractor's Quality Control (CQC) System Manager. The CQC System Manager must note each action taken on the Submittal Register.

L. All preconstruction submittals including product data and design submittals must be completed prior to the start of construction. All product data submittals must be completed prior the 100% design submittal.

M. Provide written requests to the Contracting Officer for any variations or deviations from the Contract requirements prior to the start of construction. Do not proceed to construction of any type of variances or deviations until approval is received in writing from the Contracting Officer.

N. Types of submittals required:

1. Shop Drawings: Provide complete shop drawings to demonstrate compliance with the contract drawings. Shop drawings must include complete details for the installation of the work. Submit one copy of shop drawings in PDF format.

2. Product Data: Provide complete product data documentation to demonstrate compliance with all Contract documents. Do not order any type of product prior to verification that each product meets all requirements. Do not order any product prior to receiving approval in writing from the COR. Provide one complete copy of product data documentation for each product item submitted for review.

3. Samples: Submit the number of samples in accordance with each specification, or as requested by the Contracting Officer. Samples submitted will not be returned to the Contractor for incorporation into the project. Samples retained by the Government will be used for comparison of materials installed on site.

4. Design Drawings and Specifications. For design projects, provide 100% final design drawings and specifications stamped by a currently licensed engineer, or currently registered architect.

5. Construction Redlines: Provide two sets of 100% final design drawings for use as construction redlines. Use the final construction redlines for the development and completion of as-built and record drawings.

6. As-Built and Record Drawings. Provide incorporation of final construction redlines and project conditions into as-built drawings. Provide complete as-built drawing sets and record drawings sets on compact disks in both DWG and PDF formats. Mark all as-built drawings with “”As-Built” and mark all record drawings with “Record Drawing.” Provide complete project details using the Fort McCoy standard title block and in accordance with the Fort McCoy CAD standards.

7. Operations and Maintenance. Provide complete manufacturer’s published data, including instructions, manuals and recommendations for each approved product for installation.

8. Send submittals directly to DPW electronically. Provide email notification to the COR when electronic submission is not possible and include details about hard copy submission. When a submittal is too large for electronic transmission, provide submittal with complete product data documentation on a properly labeled CD, place the CD in a protective cover and attach the CD to the transmittal document. Do not duplicate the submittals already transmitted. Use email to communicate with the COR regarding the status of submittals. For hard copy submittals and CD submittals, provide delivery in person at the main entrance desk inside Building 2171 and place inside the Directorate of Public Works submittals box. After delivery of submittals, notify the COR via email.

   a. Send electronic submissions to: usarmy.mccoy.imcom-central.mbx.dpw-inspections@mail.mil .

O. Provide submittals to meet all of the following additional requirements.

1. Transmittal cover sheet, ENG FORM 4025-R, Mar 2012.

2. The date of submission and the dates of any previous submissions.

3. The project title and number.

4. Contract identification.

5. The printed name of :

   a. Contractor.

   b. Supplier.

   c. Manufacturer.

6. Identification of each product with the specification section number.

7. Field data and dimensions (clearly identified).

8. Standards, design guides, manuals, codes, markings and certifications in accordance with the Contract documents, and final design specifications and drawings.

9. Documentation of approval in writing from the Contracting Officer for all requests for variances or deviations from the Contract Documents.

10. Identification of revision number for each re-submittal.

11. Printed name and signature of the Contractor representative prepares and provides each submittal.

P. Resubmission Requirements:

1. Do not re-submit products that have been determined not to meet Contract requirements.

2. Provide corrections or changes to submittals and re-submission until each submittal is approved and satisfactorily completed to meet Contract requirements.

SECTION 01 33 00

SCHEDULE OF MATERIAL SUBMITTALS

A. To be submitted 20 calendar days or sooner after the Notice to Proceed is issued.

B. To be submitted 20 days or sooner after installation or completion of the work.

C. To be submitted at the Pre-Construction Conference.

D. To be submitted 14 days before Final Inspection.

PROJECT DESCRIPTION: TBD Fort McCoy, WI				PROJECT NUMBER: FILE#				
ITEM NO.	SECTION, PARA NO, LETTER	DESCRIPTION OF MATERIAL	DATE REQ	DATE Received	DATE Returned	SUBMIT NO.	CODE	COMMENT
1.00	01 10 10, 1.07 A	Operation & Maintenance Manuals (manufacturer's published data & product data documentation)	D					
1.00	01 10 10, 1.07 B	Operation & Maintenance Manuals (shop drawings)	D					
2.00	01 10 10, 1.11 C, D, E	Operation & Maintenance Manuals (operating procedures; maintenance procedures; controls and settings)	D					
3.00	01 10 10, 1.12 A, B, C, & D	Material Warranties	D					
3.00	01 10 10, 3.07 A	As Built Drawings	D					
4.00	01 10 10, 3.07 B	Record Drawings (includes all authorized as built redlines & design)	D					
5.00	01 35 26, 1.03 A	Accident Prevention Plan	C					
6.00	23 52 10, 1.03, B	Product Data (shop drawings; manufacturer's published data; certifications)	A					
6.00	23 52 10, 1.03, C	Test Reports (Start up, testing, & commissioning)	B					

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SECTION 01 35 26

SPECIAL SAFETY REQUIREMENTS

PART 1 GENERAL

1.01 SUMMARY

A. This section provides guidelines for the preparation of accident prevention plans and the implementation of the accident prevention clause which includes this specification, Federal Acquisition Regulation (FAR) clause 52.236-13, and the U.S. Army Corps of Engineers Safety and Health Requirements Manual, EM 385-1-1. The required Accident Prevention Plan shall be developed using Appendix A of the latest edition of the EM-385-1-1.

B. The U.S. Army Corps of Engineers Safety and Health Requirements Manual, EM 385-1-1 is available from Government bookstores operated by the Government Printing Office. Government bookstores are located in most major cities including Milwaukee, Chicago, Kansas City, Denver, and Pueblo, Colorado. An electronic copy of the EM 385-1-1 is available at: http://www.usace.army.mil/SafetyandOccupationalHealth/SafetyandHealthRequirementsManual.aspx

1.02 PRECONSTRUCTION CONFERENCE

A. A preconstruction conference will be scheduled prior to beginning of site work at which time the Contracting Officer will review and discuss requirements relative to planning and administration of the overall safety program.

1.03 SUBMITTALS

A. The following shall be submitted in accordance with Section 01 33 00 Submittals:

1. Accident Prevention Plan

2. Contractor's Safety Manager Qualifications

1.04 ACCIDENT PREVENTION PLAN

A. Shall be developed by a qualified person.

B. Shall be job specific.

C. Shall be site specific for each delivery order.

D. Shall interface with the contractor's overall safety and health program.

E. Shall meet the minimum basic requirements of an Accident Prevention Plan found in Appendix A of the latest edition of the EM 385-1-1.

1. The Accident Prevention Plan shall be approved and accepted by the KO/COR prior to any field operations. The Contractor's Accident Prevention Plan shall not be a copy of the EM 385-1-1. The EM 385-1-1 is NOT a safety plan. Failure to provide a timely approved Accident Prevention Plan shall not be grounds for the Contractor to request or be granted extended time, overhead, or profit.

2. The approved Accident Prevention Plan and a copy of the EM 385-1-1 shall be readily available on the work site at all times. Copies may be in electronic or printed.

1.05 SAFETY MANAGER

A. The Contractor shall provide a qualified Safety Manager to ensure and monitor safety and accident prevention in accordance with the approved Accident Prevention Plan. The Safety Manager may also function as the Site Superintendent, but may not share other project responsibilities without written approval by the COR/KO.

B. The Contractor shall provide documentation to the COR/KO demonstrating the qualifications of the assigned Safety Manager to fully demonstrate no less than five years as Safety Manager for the type, scope, and value of this project. Documentation shall be provided ten working days prior to the Preconstruction Meeting.

C. The Safety Manager shall be on site at any time any worker is on site or any activity is being performed.

D. The Government reserves the right to reject the Contractor's selection of Safety Manager based on level, type, depth, or scope of experience.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION

3.01 SUMMARY

A. All work performed under this contract is subject to the safety requirements found in the most recent edition of EM 385-1-1 and OSHA 1926/1910 CFR.

B. At all times during the performance of this contract and until the work is completed and accepted, the Contractor shall directly supervise the work or provide a competent superintendent on each project site who is acceptable to the Contracting Officer and is given the authority to act on behalf of the Contractor. FAR clause 52.236-6 as incorporated by reference in the basic contract.

END OF SECTION

SECTION 01 42 13

INDUSTRY STANDARD ABBREVIATIONS AND CODES

PART 1 GENERAL

A. INDUSTRY STANDARD

1. Organizations and/or published documents representing Industry Standards are referred to throughout the Project Specifications by the following abbreviations.

2. Names are believed to be accurate and up-to-date as of the date of the Contract Documents, but are subject to change.

B. APPLICABLE CODES

1. The Ft McCoy Army installation has adopted the Wisconsin Administrative Code (WAC) as the primary building code.

a. The following web link provides an index on each specific construction disciplines codes presently adopted and enforced by DPW. The code as published on the date the contract is awarded shall be enforced. https://docs.legis.wisconsin.gov/code/prefaces/toc

2. Apply all state and local codes in addition to those listed and referenced in specifications.

3. Apply the most stringent criteria where there is a conflict between codes, standards and publications.

C. ABBREVIATIONS

1. Abbreviations used throughout the Specifications and in Contract documents are:

AA	Aluminum Association
AAMA	Architectural Aluminum Manufacturer's Association
AAN	American Association of Nurserymen
AASHTO	American Association of State Highway and Transportation Officials
ABA	Architectural Barriers Act
ACI	American Concrete Institute
ADA	Americans with Disabilities Act
AGA	American Gas Association
AHRI	Air Conditioning, Heating and Refrigeration Institute (AHRI)
AI	Asphalt Institute
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
ANSI	American National Standards Institute

ARI	Air-conditioning Refrigerant Institute
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AVATI	Asphalt and Vinyl Asbestos Tile Institute
AWI	Architectural Woodwork Institute
AWS	American Welding Society
AWPA	American Wood Preservers Association
AWPB	American Wood Preservers Bureau
AWPI	American Wood Preservers Institute
AWWA	American Water Works Association
CRSI	Concrete Reinforcing Steel Institute
CS	Commercial Standards of U.S. Department of Standards
DOE	Department of Energy
EIA	Electronic Industries Alliance
EPA	Environmental Protection Agency
EWA	Engineered Wood Association (formerly APA)
FEMP	Federal Energy Management Program
FGJA	Flat Glass Jobbers Association
FM	Factory Mutual
FRP	Fiber Reinforced Plastic
FS	Federal Specifications
GA	Gypsum Association
IBC	International Building Code
IEEE	Institute of Electrical and Electronic Engineers
ISO	International Organization for Standardization
MICA	Midwest Insulation Contractors Association
MSS	Manufacturer's Standardization Society
NAAMM	National Association of Architectural Metal Manufacturers
NAIMA	North American Insulation Manufacturers Association
NBIC	National Board Inspection Code

NBBPVI	National Board of Boiler and Pressure Vessel Inspectors
NBS	National Bureau of Standards
NBFU	National Bureau of Fire Underwriters
NCMA	National Concrete Masonry Association
NEC	National Electric Code
NECA	National Electrical Contractors Association
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NFPA	National Forest Products Association
NPC	National Plumbing Code
NRCA	National Roofing Contractors Association
NRMCA	National Ready Mixed Concrete Association
NWMA	National Woodwork Manufacturing Association
NWAHHA	National Warm Air Heating and Air Conditioning Association
OSHA	Occupational Safety and Health Administration
PCA	Portland Cement Association
PPI	Plastic Pipe Institute
PS	Product Standard of NBS
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SNAP	Significant New Alternatives Policy
SPIB	Southern Pine Inspection Bureau
SSPC	Steel Structures Painting Council
TIA	Telecommunications Industry Association
UFC	Unified Facilities Criteria
UFGS	Unified Facilities Guide Specification
UL	Underwriters Laboratories
USAS	United States of American Standards (formerly ASA)
WCLIB	West Coast Lumber Inspection Bureau
WDNR	Wisconsin Department of Natural Resources
WWPA	Western Wood Products Association (WPA and WCLA)

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 02 41 19

SELECTIVE BUILDING DEMOLITION

PART 1 GENERAL

1.01 SCOPE

A. Remove and dispose of all items as shown on contract drawings.

1.02 REGULATORY REQUIREMENTS

A. Do not close or obstruct roadways, sidewalks, or hydrants without prior approval of the COR.

PART 2 PRODUCTS – NOT USED

PART 3 EXCECUTION

3.01 PROTECTION

A. Temporary Protection of Building: Contractor shall be responsible for protecting building from damage due to the elements and construction operations. Any damage to Government property resulting from operations or failure to provide adequate protective structure shall be promptly repaired and/or replaced at Contractor's expense. Such remedial work shall be subject to approval of Contracting Officer.

1. Protective structures shall be capable of withstanding normal jobsite conditions.

2. Damage to jobsite resulting from Contractor's operations shall be repaired and/or replaced at no additional cost to the Government.

B. Deteriorated conditions indicating need for correction, shall be resolved immediately and before such conditions are disturbed. The contractor will notify the Inspector and measure the area of concern.

C. The Contractor shall make the building watertight at the end of each day.

3.02 PREPARATION

A. The Contractor shall stop work and notify the construction inspector when differing site conditions or deteriorated materials are encountered.

B. Provide, erect, and maintain temporary barriers and security devices.

C. Protect existing surfaces, utilities, floors, partitions, ceilings, equipment, etc. that are not scheduled for demolition.

D. Repair damage to existing improvements due to excess dust infiltration, abuse, abrasion, scarring, denting, structural deflection or collapse.

E. Notification

1. Contractor shall arrange for shutdown of utility lines in areas requiring demolition.

F. Regulatory Requirements

1. Do not close or obstruct roadways, sidewalks and hydrants without prior approval of the COR

3.03 DEMOLITION REQUIREMENTS

A. Conduct demolition to minimize interference with adjacent structures.

B. Maintain egress and access at all times.

3.04 WASTE REMOVAL

A. All dumpster and accumulated trash shall be removed by the Contractor.

B. Do not burn or bury materials on site. Leave site in clean condition.

C. All dumpsters to be paid for by Contractor.

D. Remove demolished materials from site.

END OF SECTION

SECTION 02 80 01

HAZARDOUS MATERIAL ABATEMENT

PART 1 GENERAL

1.01 SCOPE

A. This section describes the requirements for the handling, removal, and recycling/disposal of any and all friable and non-friable asbestos, lead based paint; PCB containing materials, universal wastes, and Contractor generated hazardous or other regulated waste.

B. The Contractor shall furnish all labor, materials, services, insurance, tools, transportation, personal protective equipment, supervision, and equipment necessary to remove and dispose of all items generated under this contract.

1.02 SUBMITTALS

A. Asbestos Project Notification: Asbestos removal projects greater than 260 linear feet of pipe insulation or 160 square feet of other ACM requires that an "Asbestos Project Notification", Department Health Services (DHS) Form DHS 159, be filed with the state. A copy of the notification must be submitted. The notification must be postmarked at least 10 days prior to the project starting.

B. Asbestos Waste Tracking Record: Asbestos shipping records shall be signed by the asbestos contractor, the transporter, and the receiving facility and submitted. The shipping record shall include the information specified in the Wisconsin Administrative Code NR 477.13 Paragraph (4).

C. Universal Waste Disposal: A copy of the "Certificate of Recycling" shall be submitted for all universal waste materials recycled under this contract.

D. Hazardous Material Inventory: A hazardous material inventory for all products requiring a Safety Data Sheet (SDS) or Material Safety Data Sheet (MSDS) shall be provided to the Contracting Office and Environmental Division prior to the start of work. The MSDS must be on file at the work site.

E. Hazardous Waste: The Contractor is considered the "generator" for all hazardous waste generated under this contract. The Contractor shall obtain an EPA Hazardous Waste Generator Identification Number and is responsible for the labeling, disposal, transporting, manifesting and reporting of all hazardous waste they create under this contract. A signed copy by the generator, transporter and TSDF of EPA Form 8700-22, UNIFORM HAZARDOUS WASTE MANIFEST will be submitted.

F. Permits: Notification of Demolition and/or Renovation and Application for Permit Exemption (Form 4500-113 Rev 06-05).

G. Laboratory results: Submit a copy of all laboratory results including, but not limited to, asbestos and lead-based paint analysis.

H. Clearance sample results: Submit a copy of all clearance sample results for asbestos and lead-based paint.

I. Personnel Roster: Provide a personnel roster of all employees conducting asbestos and/or Lead-based paint work and their associated Certification and Licenses that will be working on this project.

J. Receiving Facility/Landfill Certification: The Contractor shall provide a copy of the receiving facility's "Operating Licenses" indicating that they are certified to receive the materials being sent to them for all waste generated under this contract.

1.03 PROJECT CONDITIONS

A. There is the potential that non-friable asbestos, friable asbestos, mercury containing items, PCBs and/or lead based paint exist within the materials scheduled to be removed as part of this contract.

B. Work may affect, but is not limited to, the following items:

1. Cement asbestos siding.

2. Smoke stacks and miscellaneous wood framing around stacks clad with asbestos fireboard.

3. Lead based paint on windows, door frames, and trim.

4. Flooring material.

5. Roofing material.

6. Fluorescent bulbs and light ballasts.

1.04 ENVIRONMENTAL REQUIREMENTS AND SPECIAL PROCEDURES

A. Compliance with Environmental Regulations: The Contractor shall comply, and ensure that their subcontractors comply, with all applicable Federal, State, and local laws and DOD and Army regulations, ordinances and standards related to environmental matters. The Contractor shall also comply with, and ensure that all subcontractors comply with, all specific instructions or directions given to the Contractor by the Fort McCoy Directorate of Public Works Environmental Division (DPWE) regarding environmental matters. All communication shall be submitted through the KO or directly to the DPWE with the KO's approval.

B. Air Emissions: The Contractor shall comply with all U.S. Environmental Protection Agency (USEPA) Clean Air Act (CAA) National Ambient Air Quality Standards (NAAQS) emission standards for hazardous air pollutants (40 CFR 61). Further, no person may cause, allow, or permit particulate matter to be emitted into the ambient air which substantially contributes to exceeding of an air standard, or creates air pollution in accordance with the Wisconsin Administrative Code NR 415.03. The Contractor shall not cause, allow, or permit any materials to be handled, transported, or stored without taking precautions to prevent particulate matter from becoming airborne, nor may the Contractor allow a structure, a parking lot, or a road to be used, constructed, altered, repaired, sand blasted, or demolished without taking such precautions. Such precautions shall be in accordance with Wisconsin Administrative Code NR 415.04 and the Fort McCoy Title V Operating Permit and will include, but not be limited to the following:

1. Use, where possible, water or Government approved chemicals for the control of dust in the demolition of existing buildings or structures or construction operations.

2. Application of asphalt, water, plastic covering, or approved chemicals on dirt roads, material stockpiles, and other surfaces which can create airborne dust, provided such application does not create a hydrocarbon, odor, or water pollution problem.

3. Install and use hoods, fans, and air cleaning devices to enclose and vent the areas where dusty materials are handled.

4. Covering or securing of materials likely to become airborne while being moved on public roads, railroads, or crossing navigable waters.

C. Asbestos Containing Material (ACM): Asbestos Containing Material (ACM) is considered any material with an asbestos content greater than 1 %. Prior to demolition and/or renovation, the Contractor is required under ch. NR 447, Wisconsin Admin Code to have the structure inspected for the presence of asbestos by an inspector licensed by the Wisconsin Department of Health and Family Services. Removal and disposal shall be in accordance with the OSHA, EPA, state and local regulation. The ACM Contractor is responsible to remove all layers of ACM, including the celetex material on the sub floor which is not ACM. The "sub floor" is the last layer above the floor joists. To the best of the Government's knowledge, friable and non-friable ACM will be disturbed by this type of work.

Should the Contractor encounter additional, previously unidentified, or suspected ACM which must be disturbed to comply with the contract documents, the Contractor shall cease that work on those areas and immediately notify the Contracting Officer. The COR will work with the KO to arrange for a contract modification as required.

Asbestos Containing Waste: Asbestos containing waste shall be identified, characterized, containerized, and disposed of in strict accordance with Federal guidelines found in 40 CFR part 61 subpart M. An asbestos waste shipment record shall be used by the Contractor to document all parties and locations involved in the transportation, storage, and disposal of all ACM waste. A copy of the manifest shall be signed by the receiver of the waste and submitted to the Contracting Officer not later than forty-five days after disposal has taken place.

D. Lead: To the best of the Government's knowledge, lead-based paint exists on windows, door frames, and trim. Any surface which contains lead and requires cutting, demolition, or repair shall be isolated to prevent access. Objects shall be removed from the isolated areas and the floor and fixed objects shall be covered with 4 mil plastic sheeting. Lightly wet or mist the work area to reduce the airborne concentrations of dust. After completion of work, containerize the plastic sheeting and wet wipe walls and floors with a tri-sodium phosphate detergent. Carpeted floors shall be thoroughly vacuumed with a vacuum which has a HEPA filter. A wipe sample shall be collected and a clearance of lead in dust levels shall be below the abatement clearance criteria before the work area is released back to the Government. Workers shall comply with OSHA 29 CFR 1926.62 Subpart D... Air monitoring in conformance with OSHA standards shall be accomplished by the Contractor to ensure the level of protection provided to the workers is adequate. Lead debris identified by the Government as hazardous waste shall be properly disposed of in conformance with all applicable Federal (40 CFR 745) and State of Wisconsin (Wisconsin Administrative Code, HFS 163) regulations.

E. Hazardous Waste Generated by the Contractor: The Contractor shall identify, characterize, containerize, store, and dispose of hazardous wastes in strict accordance with Federal guidelines found in the Code of Federal Regulations, Title 40 (40 CFR) parts 260-270; State requirements found in the Wisconsin Administrative Code NR 660-679; Fort McCoy Regulation 420-25; Wisconsin Solid Waste Regulations NR 502; Fort McCoy Regulation 200-1; and local

guidelines. The Contractor shall notify the Contracting Officer and DPWE Division upon encountering any material *not otherwise identified in the contract* documents thought to be hazardous that could jeopardize the safety of workers or personnel in the area. In those instances, the Government shall be responsible for characterization, transportation, storage, and disposal of such waste, if necessary.

F. Universal Waste: The Contractor shall handle and dispose of all universal waste in accordance with the Federal USEPA Universal Waste Management Standards (40 CFR 273), Wisconsin Administrative Code NR 690, and Fort McCoy Regulation 420-25. Universal waste includes florescent lamps (all types), mercury containing equipment, pesticides, and all batteries. Contractor shall furnish the Contracting Office with a certificate of recycling to indicate compliance with all applicable requirements.

G. Fluorescent lamp ballasts:

1. Fluorescent light ballasts that have "No PCBs" marked on them by the manufacture are considered scrap metal and is to be disposed within a scrap metal container identified by the KO or designated point of contact.

2. Fluorescent light ballasts NOT marked "No PCBs", must be disposed in accordance with 40 CFR 761 and the Wisconsin Department of Natural Resources, Hazardous Waste Program, Publication PUBL –SW-194 93.

3. Fluorescent light ballasts may not be recycled on Fort McCoy.

H. Used Oil: The contractor shall handle and dispose of used oil in accordance with USEPAs Standards for the Management of Used Oil (40 CFR 279), Used Oil Management Standards, Wisconsin Administrative Code NR 679, and Fort McCoy Regulation 420-25.

I. RESERVED

J. Regulated Refrigerants and Halons: Under NR 488, regulated refrigerants may not be released during salvaging and dismantling activities. The Contractor shall properly recover all refrigerants and halons using approved equipment operated by qualified technicians. The company that the technician works for must also be registered with the WDNR. Items containing refrigerants include but are not limited to: air conditioners, refrigerators, freezers, chillers, dehumidifiers, heat pumps, water fountains, walk-in coolers, vending machines, food display cases, and fire extinguishers.

K. Fuel and Petroleum Storage: All fuel or petroleum products shall be stored within secondary containment and shall be marked with appropriate signage (e.g. Flammable Storage - No Smoking within 50 ft.). All mobile fuel tanks and petroleum storage containers greater than 110 gallons (not mounted to a vehicle) shall be grounded and bonded in accordance with National Fire Protection Act (NFPA) standards. All mobile tanks shall be double walled or set within secondary containment/bermed area that contain 110% of the largest tank. Bermed areas shall be removed at the completion of the job and the area restored to its original condition. All other storage areas shall be kept free of debris, leaks, stains, or splashes and kept in a neat, clean, and safe condition.

L. Fuel, Petroleum, and Hazardous Material Spills: The Contractor shall attempt to safely stop the spill if possible. For a release within the cantonment area, notify the Fort McCoy Fire Department by calling 911 from a land line or (608) 388-2266 if

using a cell phone. For a release within ranges controlled by DPTMS Range Control Office, call (608) 388-4848. For questions pertaining to petroleum or hazardous materials releases, call the Environmental Division at (608)388-2160.

M. Nuisance and Polluting Activity Prohibited: Polluting, dumping, or discharging of any harmful, nuisance, or regulated materials (such as concrete truck washout, vehicle maintenance fluids, residue from saw cutting operations, solid waste or other hazardous substances) into building drains, site drains, streams, waterways, holding ponds or to the ground surface is not allowed. The Contractor shall be held responsible for any and all damages which may result. The Contractor shall conduct its activities in such a fashion which avoids creating any legal nuisance, including but not limited to, suppression of noise and dust, control of erosion, and implementation of other measures as necessary to minimize off-site impacts of work activities. The Contractor shall protect adjacent property, buildings, and their contents from dust, dirt, or other materials. Contractor is to wet down dry materials, settle debris, and prevent blowing dust. Work areas shall be maintained in a neat, clean, and safe condition and shall, as a minimum, be cleaned at the end of each shift.

N. Solid Waste Disposal: The Contractor shall collect all trash, debris, refuse and garbage in appropriately labeled and sealed or covered containers. These materials shall be hauled from the site and disposed at an approved receiving facility weekly. All receiving facilities shall conform to all local, State (Wisconsin Administrative Code, NR 502) and Federal guidelines (40 CFR Subchapter I, 260-370) and Fort McCoy Regulation 200-1.

O. Permits: The Contractor shall prepare and submit all applicable permit applications to complete the work. Furnish copies to the Contracting Officer and DPWE Division for demolition, renovation, construction and abatement permits in accordance with all applicable State of Wisconsin codes (i.e. Wisconsin Department of Natural Resources (WDNR), Wisconsin Department of Health and Family Services (WDHFS), and Wisconsin Department of Commerce) prior to commencing work.

P. Affirmative Procurement: Executive Order 13423 requires Federal agencies to procure items made from recovered (recycled) materials and environmentally preferable and energy efficient products and services. It is the policy of Fort McCoy to acquire, in a cost-effective manner, items composed of the highest percentage of recovered materials practical, consistent with maintaining a satisfactory level of competition. One of the key elements of the Affirmative Procurement Program is procurement of recovered materials. Procurement of recovered materials is covered in FAR Part 23.4. Recovered material means waste materials and by-products which have been recovered or diverted from solid waste.

Q. Energy: The Contractor shall use good judgment in the conservation of Government utilities. Prevailing energy conservation practices shall be adhered to and enforced by the Contractor.

PART 2 EXECUTION

2.01 TESTING OF ASBESTOS CONTAINING MATERIAL AND LEAD BASE PAINT

A. The Contractor must test all buildings assigned to the contract for Asbestos Containing Material and Lead Base Paint.

B. The Contractor must complete all required paperwork as identified in Section 1.02 above. All reports must be filed with the appropriate agencies. Copies of all reports shall be submitted at the same time to the Contracting Officer, Construction Inspector/Asbestos Supervisor, Environmental Division.

C. The Contractor must test and submit clearance sample test results to the Contracting Officer, Construction Inspector/Asbestos Supervisor, and Environmental Division.

D. The Contractor may not start construction on buildings assigned to the contract until all ACM is removed and all clearance sample results are back from the certified laboratory. Air Clearance Samples, if done, must test .01 f/cc or less before construction begins.

2.02 ABATEMENT AND REMOVAL OF LEAD AND ASBESTOS CONTAINING MATERIAL

A. The Contractor shall remove all ACM and Lead Based Paint Material in accordance with all State and Federal codes (i.e. Wisconsin Department of Natural Resources (DNR), Department of Health and Family Services (DHFS), Occupational Safety and Health Administration (OSHA), Federal Environmental Protection Agency (EPA)), and all other applicable laws and regulations.

B. The Contractor shall provide a list of all personnel involved with ACM investigation, removal, abatement, and disposal activities prior to work commencing. Further, the Contractor shall provide notification within 24 hours to the Contracting Office of any changes in personnel engaged in ACM activities during the performance of this contract. Only Wisconsin State Certified and Licensed individuals shall perform any ACM investigation, removal, abatement and disposal work in accordance with Wisconsin Revised Statutes Chapter 254 and Chapter HFS 159 "Asbestos Certification and Training Certification" in the following categories: Asbestos Hazard Reduction Certification (Asbestos Roofing Supervisor, Asbestos Roofing Worker, Asbestos Supervisor, Asbestos Worker), Asbestos Investigation Certification (Asbestos Inspector, Asbestos Management Planner, Asbestos Project Designer). The Contractor shall provide proof of accredited training.

C. A copy of each worker's State of Wisconsin asbestos certification and licensure MUST be submitted prior to commencing work.

D. The Contractor shall provide only Wisconsin State Certified/Licensed personnel to perform all lead-based paint activities, including lead hazard reduction, lead investigation, and work that disturbs lead-based paint, in accordance with Wisconsin Revised Statutes, Chapter 254.

E. A copy of each worker's State of Wisconsin lead-base paint certification and licensure and the company certification/license MUST be submitted prior to commencing work.

2.03 DISPOSAL

A. Contractor shall dispose and/or recycle all solid wastes generated under this contract as described in the above sections.

END OF SECTION

SECTION 03 00 01

QUALITY CONTROL - CONCRETE

PART 1 GENERAL

1.01 SCOPE

A. Provide quality control for concrete work.

1.02 REFERENCES

A. ACI SP-2 - Manual of Concrete Inspection.

B. ACI 318-08 - Building Code Requirements for Structural Concrete.

C. ASTM C31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field.

D. ASTM C39-10 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens

E. ASTM C143-10a - Standard Test Method for Slump of Hydraulic Cement Concrete.

F. ASTM C172 - Standard Practice for Sampling Freshly Mixed Concrete.

G. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.

1.03 SUBMITTALS

A. Test Reports:

1. Field Reports: Slump and Air Content Test Reports

2. Laboratory Reports: Compressive Strength Test Reports

1.04 MIX DESIGNS

A. Provide concrete mix designs in accordance with Section 03 30 00.

1.05 TESTING

A. The Contractor shall arrange and pay for services of a qualified testing agency.

B. The testing agency shall test concrete to measure slump, entrained-air content, and compressive strength to determine compliance with Section 03 30 00. Furnish test apparatus and cylinders, perform on-site sampling and testing, submit samples, and perform laboratory tests. Comply with applicable provisions of ACI SP-2, Manual of Concrete Inspection.

C. On-site tests shall be performed under observation of the COR or Construction Inspector unless waived.

PART 2 PRODUCTS

2.01 TEST CYLINDERS

A. 6 inch diameter by 12 inch high cylinder, ASTM C31.

2.02 SLUMP CONE

A. 12 inch high standard mold, ASTM C143.

PART 3 EXECUTION

3.01 SAMPLING

A. Contractor shall extend full cooperation to testing agency in obtaining concrete samples.

3.02 COMPRESSIVE STRENGTH TESTS

A. During progress of work, prepare three test cylinders per 150 CY or fraction thereof for each class of concrete placed each day. Comply with ACI 318, Section 4.3 (samples secured – ASTM C172, cylinders prepared and cured – ASTM C31, and tested – ASTM C39) except as otherwise directed. Identify samples, moist cure at 70 degrees F for five days, and ship samples to testing laboratory for one 7-day compressive strength test and two 28-day tests.

B. When less than 50 CY of a class of concrete is used per day, the Contractor shall prepare at least one cylinder for testing.

3.03 SLUMP AND AIR CONTENT TESTS

A. Perform slump and air content tests on concrete from same batch as sampled for strength tests and whenever there is a change in consistency of concrete. Test for slump in accordance with ASTM C143. Test for air content in accordance with ASTM C231.

3.04 COMPLIANCE

A. If measured slump or air content falls outside specified limits, immediately check another portion of same batch. In event of a second failure, concrete shall be rejected.

B. Average any three consecutive strength tests for each class of concrete shall be equal to or greater than the specified strength and no individual test shall fall more than 500 psi below the specified strength. When test results indicate deficiencies, the COR may require additional tests in accordance with ACI 318, Section 4.3, and may order remedial work. Specimens of cured concrete shall be tested in accordance with ASTM C42.

END OF SECTION

SECTION 03 11 00

CONCRETE FORMS

PART 1 GENERAL

1.01 SCOPE

A. Provide concrete forms as required.

1.02 CODES AND STANDARDS

A. Unless otherwise indicated, comply with ACI 347 Guide to Formwork for Concrete.

PART 2 PRODUCTS

2.01 FORMS FOR EXPOSED FINISH CONCRETE

A. Unless otherwise indicated, construct forms for exposed concrete surfaces with water-resistant plywood, metal, metal-framed plywood-faced, or other acceptable panel type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system if shown. Provide form material with sufficient thickness to withstand pressure of newly placed concrete without bow or deflection. Rust-stained steel forms are not acceptable.

2.02 FORMS FOR UNEXPOSED FINISH CONCRETE

A. Construct forms for concrete surfaces which will be unexposed in finished structure with plywood, lumber, metal, or other acceptable material. Provide lumber that is dressed on at least one side and two edges for tight fit.

2.03 FORM TIES

A. Factory-fabricated, adjustable-length, removable or snap-off metal form ties with a minimum working strength of 3000 lb, designed to prevent form deflection and to prevent spalling concrete upon removal. Unless otherwise indicated, provide ties which will leave no metal closer than 1-1/2 in. to concrete surface and which, when removed, will leave holes not larger than 1 in. diameter in concrete surface. Form ties fabricated on project site and wire ties are not acceptable.

2.04 CHAMFER STRIPS

A. 3/4 in. x 3/4 in. x 45 degrees wood, plastic, or rubber.

2.05 FORM COATING COMPOUND

A. Commercial form-coating compound that will not bond with, stain, or adversely affect concrete surfaces, and will not impair subsequent treatment of concrete surfaces requiring bond or adhesion, nor impede wetting of surfaces to be cured with water or curing compounds. Form oil for steel forms shall be non-staining, rust-preventative type.

PART 3 EXECUTION

3.01 FORM DESIGN

A. Design, erect, support, and maintain forms to safely support vertical and lateral loads, until such loads are supported by concrete structure. Carry vertical and

lateral loads to ground by form system and in-place construction that has attained adequate strength.

3.02 FORM CONSTRUCTION

A. Construct forms to sizes, shapes, lines, and dimensions shown, and to obtain accurate alignment, location, grades, levelness, and plumbness in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other accommodations for required features. Solidly butt joints and provide back-up at joints to prevent leakage of cement paste. Use selected materials to obtain required finishes.

3.03 JOINTS

A. Locate joints in accordance with Section 03 30 00. Arrange construction joint bulkheads to allow concrete to be placed between construction joints in one continuous operation. Place bulkheads where shown or where approved by COR. Obtain approval from COR if it becomes necessary to eliminate or relocate construction joints to facilitate use of ganged forms.

B. Tops of edge forms, bulkheads and screeds shall be set to finished elevations and to provide uniform pitch to drain as shown. If wet screeds are to be used, establish grade stakes or other fixed markers.

C. Provide snap ties or 5/8 in. bolt inserts greased for easy removal 3 in. to 4 in. below horizontal construction joints at same spacing as regular ties to tighten forms against hardened concrete. Other methods of achieving a leak proof joint may be used with approval of COR. No horizontal construction joints will be permitted in slabs.

D. Joints in reinforced slabs shall be perpendicular to axis or surface of member, near center of span. If an intersecting member occurs at mid-span, offset joint a distance equal to twice the width of member.

E. Locate contraction (control) joints and expansion joints as specified.

3.04 FORM COATINGS

A. Coat form surfaces with form-coating compound before reinforcement is placed. Do not allow excess form coating material to accumulate in forms or contact existing concrete against which new concrete will be placed. Apply in accordance with manufacturer's instructions.

3.05 CORNER TREATMENT

A. Form 3/4 in. chamfers at corners to produce uniformly straight lines and tight edge joints. Extend terminal edges to required limit and miter chamfer strips at changes in direction. Unexposed corners may be formed either square or chamfered.

3.06 CLEANOUTS, CLEANING, AND TIGHTENING

A. Provide temporary openings in forms to facilitate cleaning and inspection. Thoroughly clean forms and adjacent surfaces to receive concrete; remove sawdust, dirt, and debris just before concrete is placed. Retighten forms immediately after concrete placement to eliminate mortar leaks and maintain proper alignment.

3.07 REMOVAL OF FORMS

A. Remove forms from cast-in-place concrete only after concrete has achieved sufficient strength to support itself and superimposed loads; but in no case in less time than stated below.

B. Forms not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operations, and provided that curing and protection operations are maintained.

C. Forms supporting weight of concrete, such as beam soffits, joists, slabs, and other structural elements, may not be removed in less than 14 days, and not until concrete has attained design minimum 28-day compressive strength.

D. Form facing material may be removed 4 days after placement if shores and other vertical supports have been arranged to permit removal of form facing material without loosening or disturbing shores and supports.

3.08 RE-USE OF FORMS

A. Clean and repair surfaces of forms to be re-used in work. Split, frayed, delaminated, or otherwise damaged form facing material will not be acceptable. Apply new form coating compound to concrete contact surfaces as specified for new forms.

B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joints to avoid offsets. Do not use “patched” forms for exposed concrete surfaces.

END OF SECTION

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SECTION 03 15 00

CONCRETE ACCESSORIES

PART 1 GENERAL

1.01 SCOPE

A. Provide accessories for concrete work as required.

1.02 REFERENCES

A. ASTM D994-08 - Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type).

B. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.

C. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete.

D. ASTM C309 - Standard Specification for Liquid Membrane Forming Compounds for Curing Concrete.

E. ASTM D6690 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.

F. ASTM D1752-04a - Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.

1.03 SUBMITTALS

A. Product Data: Submit product data for bond breaker, backer rod, joint sealant, asphalt expansion joint filler, anchors, bonding agent, moisture retaining cover, curing and sealing compound, and any other products used by the Contractor.

PART 2 PRODUCTS

1.04 ASPHALT EXPANSION JOINT FILLER (ASPHALT PJF)

A. Preformed bituminous strips, ASTM D994, ½ in. thick, as required; Meadows Sealtite Asphalt or government approved equal.

1.05 ANCHORS

A. Anchor bolts shall be preformed steel rod with threaded ends as required, ASTM A307.

1.06 BONDING AGENT

A. Epoxy bonding agent as required; Sika Sikadur Hi-Mod or government approved equal.

1.07 JOINT SEALANT AND BACKER ROD

A. Joint sealant to be a polymer based sealant conforming to ASTM D6690

B. Backer rod to be Type 1, Sponge Rubber ASTM D1752.

1.08 MOISTURE-RETAINING COVER

A. Waterproof paper, polyethylene film, or polyethylene-coated burlap complying with ASTM C171 as required.

1.09 CURING AND SEALING COMPOUND (TYPE 2 CONCRETE SEAL)

A. Liquid membrane-forming compound for curing concrete, ASTM C309/AASHTO M148, Type 1, Class B as required.

PART 3 EXECUTION

1.10 INSTALLATION

A. Comply with manufacturer's instructions. Notify COR of contract provisions in conflict with manufacturer's recommendations.

B. Install anchors, and embedded accessories furnished by other trades, and as shown or required.

1.11 JOINTS

A. Place asphalt expansion joint fillers (asphalt PJF) between the concrete slab and the structure.

B. All construction and contraction (control) joints to be sealed with backer rod and joint sealant.

C. Separating tape or backer material is required to prevent joint sealant from flowing into saw-cut, to separate non-compatible materials, and to prevent sealant from bonding to bottom of reservoir.

D. Top of sealant will be 1/8" to 1/4" below top of slab.

E. Compression seal must be in compression at all times.

1.12 BONDING AGENT

A. Apply bonding agent to existing concrete before placing fresh concrete.

1.13 CURING AND SEALING

A. Curing and Sealing Compound: Apply membrane curing and sealing compound to concrete slabs in accordance with manufacturer's recommendations.

END OF SECTION

SECTION 03 21 00

CONCRETE REINFORCEMENT

PART 1 GENERAL

1.01 SCOPE

A. Section Includes:

1. Reinforcing bars.
2. Welded wire fabric.
3. Reinforcement accessories.

1.02 REFERENCES

A. American Concrete Institute:

1. ACI 301 - Specifications for Structural Concrete.
2. ACI 318 - Building Code Requirements for Structural Concrete.
3. ACI SP-66 - ACI Detailing Manual.
4. ACI 315 - Details and Detailing of Concrete Reinforcement.

B. American Society for Testing and Materials:

1. ASTM A82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
2. ASTM A184/A184M - Standard Specification for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement.
3. ASTM A497 - Standard Specification for Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement.
4. ASTM A615/A615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
5. ASTM A616/A616M - Standard Specification for Rail-Steel Deformed and Plain Bars for Concrete Reinforcement.
6. ASTM A617/A617M - Standard Specification for Axle-Steel Deformed and Plain Bars for Concrete Reinforcement.
7. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
8. ASTM A704/A704M - Standard Specification for Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement.
9. ASTM A706/A706M - Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
10. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement.
11. ASTM A775/A775M - Standard Specification for Epoxy-Coated Reinforcing Steel Bars.

12. ASTM A884/A884M - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Fabric for Reinforcement.

13. ASTM A934/A934M - Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars.

14. ASTM D3963/D3963M - Standard Specification for Fabrication and Jobsite Handling of Epoxy-Coated Reinforcing Steel Bars.

C. American Welding Society:

1. AWS D1.4 - Structural Welding Code - Reinforcing Steel.

D. Concrete Reinforcing Steel Institute:

1. CRSI - Manual of Standard Practice.

2. CRSI - Placing Reinforcing Bars.

1.03 SUBMITTALS

A. Certificates: Submit AWS qualification certificate for welders employed on the work.

B. Shop Drawings: Indicate bar sizes, spacing, locations, and quantities of reinforcing steel and or welded wire, bending and cutting schedules, supporting and spacing devices.

1.04 QUALITY ASSURANCE

A. Perform Work in accordance with CRSI - Manual of Standard Practice.

B. Prepare Shop Drawings in accordance with ACI SP-66.

C. Construction Inspector shall inspect the reinforcing steel prior to concrete placement. Notify inspector 24 hours in advance of scheduled concrete placement for reinforcing steel verification.

1.05 DELIVERY AND STORAGE

A. Deliver reinforcement bundled and marked using metal tags corresponding to placement diagrams.

B. Store reinforcement to prevent damage and accumulation of dirt and excessive rust.

PART 2 PRODUCTS

2.01 REINFORCEMENT

A. Reinforcing Steel: ASTM A615, 60 ksi yield grade; deformed, plain billet steel bars, unfinished or galvanized in accordance with ASTM A767, Class I or II, unfinished.

B. Reinforcing Steel Plain Bar and Rod Mats: ASTM A704, ASTM A615, Grade 40 or 60; steel bars or rods, unfinished.

C. Stirrups Steel: ASTM A82, unfinished or galvanized in accordance with ASTM A641, epoxy coated in accordance with ASTM A884 finish.

D. Welded Steel Wire Fabric: ASTM A497 Deformed Type or ASTM A185 Plain; in flat sheets or coiled rolls; unfinished, galvanized or epoxy coated in accordance with ASTM A884 Class A finish.

2.02 ACCESSORY MATERIALS

A. Tie Wire: Minimum 16 gauge annealed type.

B. Chairs, bolsters, bar supports, and spacers: sized and shaped for strength and support of reinforcement during concrete placement conditions including load bearing pad on bottom to prevent vapor barrier puncture.

C. Special chairs, bolsters, bar supports, and spacers adjacent to weather exposed concrete surfaces: plastic-coated steel, plastic tipped steel, stainless steel type; size and shape to meet project conditions.

D. Reinforcing splicing devices: exothermic welding type; full tension and compression; sized to fit joined reinforcing.

E. Reinforcing splicing devices: mechanical set screw, swaged or threaded type; full tension and compression; sized to fit joined reinforcing.

F. Over waterstop membranes, use precast concrete chairs to prevent penetration of membrane.

2.03 FABRICATION

A. Fabricate concrete reinforcement in accordance with CRSI Manual of Practice, ACI SP-66, ACI 318 or ASTM A184. Comply with fabrication tolerances of ACI 315.

B. Locate reinforcement splices not indicated on shop drawings, at point of minimum stress. Review location of splices with the COR.

C. Form reinforcement bends with minimum diameters in accordance with ACI 318.

PART 3 EXECUTION

3.01 PLACEMENT

A. Place, support and secure reinforcement against displacement. Do not deviate from required position beyond specified tolerance.

B. Accommodate placement of formed openings.

C. Space reinforcement bars with minimum clear spacing in accordance with ACI 318.

1. Where bars are indicated in multiple layers, place upper bars directly above lower bars.

D. Maintain concrete cover around reinforcement in accordance with ACI 318.

E. Splice reinforcing where indicated on shop drawings in accordance with splicing device manufacturer's instructions.

F. Provide splice lap lengths in accordance with ACI 318.

G. Place rebar to the tolerances specified in ACI 117.

END OF SECTION

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SECTION 03 33 00

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SCOPE

A. Cast-in-place concrete foundations, floors, and sidewalks.

B. Initial and final curing of horizontal and vertical concrete surfaces.

1.02 RELATED SECTIONS

A. Section 03 11 00 - Concrete Forms

B. Section 03 15 00 - Concrete Accessories

C. Section 03 21 00 - Concrete Reinforcement

1.03 REFERENCES

A. ACI 301 - Specification for Structural Concrete.

B. ACI 304 - Guide for Measuring, Mixing, Transporting, and Placing Concrete.

C. ACI 305.1 - Standard Specification for Hot Weather Concreting.

D. ACI 306.1 - Standard Specification for Cold Weather Concreting.

E. ACI 308.1 - Standard Specification for Curing Concrete.

F. ACI 318 - Building Code Requirements for Structural Concrete.

G. ANSI/ASTM A185 - Welded Steel Wire Fabric for Concrete Reinforcement.

H. ASTM A615 - Deformed and Plain Billet Steel Bars for Concrete Reinforcing.

I. ASTM C33 - Concrete Aggregates.

J. ASTM C94 - Ready Mixed Concrete.

K. ASTM C1116 - Standard Specification for Fiber-Reinforced Concrete.

L. ASTM C150 - Portland cement.

M. ASTM C1602 - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete.

N. ASTM C260 - Air Entraining Admixtures for Concrete.

O. ASTM C309 - Liquid Membrane - Forming Compound for Curing Concrete.

1.04 SUBMITTALS

A. Submit proposed mix designs.

B. Delivery Tickets - Ready-mixed concrete producer shall furnish duplicate delivery tickets. Contractor shall retain one ticket and attach other to laboratory test report (Section 03 00 01). Delivery tickets shall indicate delivery date, type or concrete, class, cement content, and amount of water.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 301.

B. Obtain cementitious materials from the same source throughout.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver curing materials in manufacturer's packaging including application instructions.

1.07 COORDINATION

A. Coordinate the placement of joint devices with erection of concrete formwork and placement of form accessories.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Do not place concrete when base surface temperature is less than 40 degrees Fahrenheit or if surface is frozen.

PART 2 PRODUCTS

2.01 CONCRETE MATERIALS

A. CEMENTITIOUS MATERIALS: Use materials meeting the following requirements:

1. Hydraulic Cement: ASTM C150 or ASTM C1157 or ASTM C595.

2. Fly Ash: ASTM C618.

3. Slag: ASTM C989.

4. Silica Fume: ASTM C1240.

B. Fine and Coarse Aggregates: ASTM C33.

C. Water: ASTM C 1602, potable water which is not detrimental to concrete.

2.02 ACCESSORIES

A. Miscellaneous Accessories: Conform to Section 03 15 00.

B. Bonding Agent: Polymer resin emulsion.

2.03 FORM MATERIALS

A. Conform to Section 03 11 00 and ACI 301.

2.04 CONCRETE MIX

A. Mix and deliver concrete in accordance with ASTM C94 and ASTM C 1116, and submit batch ticket information.

B. Prepare design mixtures for each class of concrete on the basis of laboratory trial mixtures or field test data, or both. ACI 318 Chapter 5 design mixtures shall meet the requirements listed in PART 4 SCHEDULES

2.05 REINFORCING STEEL

A. Furnish reinforcing steel in accordance with Section 03 21 00

1. Welded Steel Wire Fabric: Plain type, ANSI/ASTM A185; in flat sheets or coiled rolls; uncoated finish.

2. Reinforcing Steel: ASTM A615, 50 ksi, yield grade billet steel bars; uncoated finish.

2.06 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz.lsq. yd. (305 g/sq. m) dry.

C. Moisture-Retaining Cover: ASTM C171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Solvent-Borne, Membrane-Forming Curing Compound: ASTM C309, Type 1, Class B.

F. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C309, Type 1, Class B.

G. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

1. Evaporation Retarder:

a. Aquafilm; Conspec Marketing & Manufacturing Co., Inc.

b. Sure Film; Daylon Superior Corporation

c. Eucobar; Euclid Chemical Co.

d. E·Con; L&M Construction Chemicals, Inc.

e. Confilm; Master Builders, Inc. Rich Film; Richmond Screw Anchor Co.

f. SikaFilm; Sika Corporation.

2. Clear, Solvent-Borne, Membrane·Forming Curing Compound:

a. AH Clear Cure; Anti-Hydro International, Inc.

b. Spartan-Cote; Burke Group, LLC (The).

c. Spray-Cure & Seal 15: ChemMasters.

d. Conspec #1-15 percent solids; Canspec Marketing & Manufacturing Co., Inc.

e. Day-Chern Cure and Seal; Dayton Superior Corporation.

f. Diamond Clear; Euclid Chemical Co.

3. Clear, Waterborne, Membrane-Forming Curing Compound:

a. Safe-Cure & Seal 20; ChemMasters.

b. High Seal; Conspec Marketing & Manufacturing Co., Inc.

c. Safe Cure and Seal; Daylon Superior Corporation.

d. Diamond Clear VOX; Euclid Chemical Co.

e. SureCure; Kaufman Products Inc.

f. Vocomp-20; W. R. Meadows, Inc.

g. Kure-N-Seal W; Sonneborn, Div. of ChemRex, Inc.

2.07 ADMIXTURES

A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material to be compatible with other admixtures and cementitious materials. DO NOT use admixtures containing calcium chloride.

B. Air-Entraining Admixture: ASTM C260.

C. Water-Reducing Admixture: ASTM C494, Type A.

D. High-Range, Water-Reducing Admixture: ASTM C494, Type F.

E. Water-Reducing and Accelerating Admixture: ASTM C494, Type E.

F. Water-Reducing and Retarding Admixture: ASTM C494, Type D.

2.08 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C219.

2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.

3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.

4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C109.

B. Repair Topping: Traffic bearing, cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch.

1. Cement Binder: ASTM C150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C219.

2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.

3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.

4. Compressive Strength: Not less than 5700 psi at 28 days when tested according to ASTM C109.

PART 3 EXECUTION

3.01 MIXING AND DELIVERY

A. Concrete shall be ready-mixed and delivered in accordance with ASTM C94. Place concrete within one hour after water is added to batch.

B. No water shall be added on job unless authorized by the COR. If added, record amount of water on all copies of delivery tickets. If water is added to mixed concrete at job, provide twenty revolutions of additional mixing.

C. Concrete shall arrive at site of work having a temperature of not less than 60 degrees Fahrenheit nor greater than 90 degrees Fahrenheit.

3.02 EXAMINATION

A. Verify requirements for concrete cover over reinforcement.

B. Verify that anchors, seats, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not cause hardship in placing concrete.

3.03 PREPARATION

A. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent in accordance with manufacturer's instructions.

B. Prior to placing floor topping, roughen substrate concrete surface and remove deleterious material. Broom and vacuum clean.

C. Apply bonding agent to substrate in accordance with manufacturer's instructions.

3.04 PLACING CONCRETE

A. Place concrete in accordance with ACI 304.

B. Ensure reinforcement is not disturbed during concrete placement.

C. Place concrete continuously between predetermined expansion and construction joints.

D. Do not interrupt successive placement or permit cold joints to occur.

E. Place concrete floor toppings to required lines and levels.

F. Screed toppings level, maintaining surface flatness of maximum 1/8 inch in 10 ft.

3.05 PLACING CONCRETE INTO FORMS

A. Deposit concrete in forms in horizontal layers not deeper than 18 inches and in a manner to avoid inclined construction joints.

B. Remove temporary spreaders in forms when concrete placing reaches elevation of spreaders.

C. Consolidate concrete in forms by mechanical vibrating equipment and supplement by hand spading, rodding or tamping. Use vibrators designed to operate at a speed of not less than 6000 impulses per minute when submerged in concrete. Vibration of forms and reinforcing will not be permitted.

D. Do not use vibrators to move concrete into forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visibly effective. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other items without segregation of mix.

3.06 PLACING CONCRETE SLABS

A. Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until panel or section is complete.

B. Consolidate concrete during placing operations by mechanical vibrating equipment. Thoroughly work concrete around reinforcement and other embedded

items and into corners. Consolidate concrete placed in beams and girders of supported slabs, and against bulkheads of slabs-on-grade, as specified for formed concrete structures. Consolidate concrete in remainder of slabs by vibrating bridge screeds, roller pipe screeds, or other acceptable methods. Limit time of vibrating consolidation to prevent bringing an excess of fine aggregate to surface.

C. Bring slab surfaces to correct level with straight edge and strike off. Use bull floats or darbies to smooth surface, leaving it free of humps or hollows. Do not sprinkle water on concrete surface while in plastic state. Do not disturb slab surfaces prior to beginning finishing operations.

3.07 COLD WEATHER PLACING

A. Protect concrete work from physical damage or reduced strength caused by frost, freezing actions, or low temperatures in compliance with ACI 306.1.

B. When air temperature falls to or is expected to fall below 40 degrees Fahrenheit, uniformly heat water and aggregates before mixing to obtain a concrete mix temperature of not less than 50 degrees Fahrenheit and not more than 80 degrees Fahrenheit at point of delivery.

C. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials. Ascertain that forms, reinforcing steel, and adjacent concrete surfaces are entirely free of frost, snow, and ice before placing concrete.

D. Do not use calcium chloride, salt or other materials containing antifreeze agents or chemical accelerators.

3.08 HOT WEATHER PLACING

A. When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305R and as specified below.

B. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 degrees Fahrenheit. Mixing water may be chilled, or chopped ice may be used to control temperature provided water equivalent of ice is calculated in total amount of mixing water.

C. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.

D. Spray forms, reinforcing steel, and subgrade just before concrete is placed.

3.09 CONCRETE FINISHING- VERTICAL SURFACES

A. Concealed surfaces and foundations below grade: Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defective areas repaired and patched. Remove fins and other projections exceeding ACI 347R limits for class of surface specified.

B. Exposed decorative finished wall surfaces: Rubbed Finish; Apply the following to smooth·formed finished concrete:

1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another

abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.

C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces. Strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.10 CONCRETE FINISHING- HORIZONTAL SURFACES

A. General: Comply with recommendations in ACI 302.1 R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces. The maximum variation of surface flatness shall not exceed 1/8 inch in 10 feet.

B. Trowel Finish: After applying float finish, apply first trowel finish and consolidate concrete by hand or power-driven trowel. Continue trowel passes and re-straighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to interior floor slabs.

2. Finish surfaces to the following tolerances, measured within 24 hours according to ASTM E1155/E1155M for a randomly trafficked floor surface.

a. Specified overall values of flatness, F(F) 25; and levelness, F(L) 20; with minimum local values of flatness, F(F) 17; and levelness, F(L) 15.

C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Re-straighten, cut down high spots, and fill low spots. Repeat float passes and re-straightening until surface is left with a uniform, smooth, granular texture.

D. Broom Finish: Apply a light broom finish (ridges to run short dimension of surface) to exterior concrete slabs and walkways, steps, and ramps, and elsewhere as indicated.

3.11 CONCRETE PROTECTION AND CURING:

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with recommendations in ACI 30SR for hot-weather protection during curing.

B. Start initial curing as soon as free water has disappeared from concrete surface. Cure and protect concrete at temperatures above 50 degrees Fahrenheit for 7 days or until 75 percent of the required 28 day compressive strength is obtained, whichever is less. Avoid rapid drying at end of final curing period.

C. When atmospheric temperature is 40 degrees Fahrenheit and below, maintain concrete temperature at not less than 50 degrees Fahrenheit continuously throughout curing period. When necessary, make arrangements before concrete placement for heating, covering, insulation or housing as required to maintain specified temperature and moisture conditions continuously for the concrete curing

period. Keep protection in place and intact at least 24 hours after artificial heat is discontinued to allow gradual temperature adjustments. Avoid rapid dry out of concrete due to overheating. Provide cold weather protection complying with ACI 306.1.

D. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

E. Formed Surfaces: Cure formed concrete surfaces, including underside of beams. Supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

   a. Water.

   b. Continuous water-fog spray.

   c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

   a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.

   b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.

   c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer recommends for use with floor coverings.

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat perpendicular to the direction of the first application. Maintain continuity of coating and repair damage during curing period.

F. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

   a. Water.

   b. Continuous water-fog spray.

   c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

   a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.

   b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.

   c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer recommends for use with floor coverings.

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat perpendicular to the direction of the first application. Maintain continuity of coating and repair damage during curing period.

3.12 LIQUID FLOOR TREATMENTS:

A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions to elevated walkway and platform slabs.

1. Remove curing compounds. sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.

2. Do not apply to concrete that is less than seven days old.

3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeal brooming or scrubbing. Rinse with water; remove

excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.

B. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller according to manufacturer's written instructions.

3.13 CONCRETE SURFACE REPAIRS:

A. Defective Concrete: Repair and patch defective areas as designated by the COR. Remove and replace concrete that cannot be repaired and patched to COR's approval.

1. All repairs shall be in accordance with ACI 301.

2. Notify COR upon discovery of defects, imperfections, deviations from required lines, or deviations from stated tolerances. Do not patch, fill, touch-up, repair, or replace any items prior to inspection by the COR.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension in solid concrete but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill voids with patching mortar or cone plugs secured in place with bonding agent.

2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.

3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by the COR.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, pop outs honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.

2. After concrete has cured at least 14 days, correct high areas by grinding.

3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.

4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.

5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair lopping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level.

6. Repair defective areas, except random cracks and single holes 1 inch (25 mm) or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least 3/4 inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mix as the original concrete.

3.14 FIELD QULAITY CONTROL

A. Field inspection and testing will be performed in accordance with ACI 301.

B. Tests of cement and aggregates may be performed to ensure conformance with specified requirements.

PART 4 SCHEDULES

4.01 CLASSES OF CONCRETE

Material and Property	Class A	Class B
Minimum Compressive Strength @ 28 days, (psi)	4000	4000
Maximum Slump (inches)	3 1/2	3 1/2
Maximum Aggregate Size (inches)	3/4	3/4
Minimum Cement (bags/cy)	6	6
Maximum Water (gal/cy)	30	32
Maximum Water-Cement Ratio	0.45	.48
Air Content % by volume	5 - 7%	1 - 3%

PART 5 USAGE SCHEDULE

Usage/Application	Min. Class
Sidewalks, exterior slabs	A
Footings, 48 in. +/- foundation walls	B
Interior slabs-on grade and pads	B

END OF SECTION

SECTION 04 05 01

MASONRY MORTAR AND GROUT

PART 1 GENERAL

1.01 SCOPE

A. Provide masonry mortar and grout as shown and specified. This includes all labor, material, equipment, and related services necessary to install mortar and grout for masonry.

1.02 RELATED SECTIONS

A. 04 05 23 Masonry Accessories

B. 04 22 00 Concrete Unit Masonry

1.03 REFERENCES

A. ASTM C5 – Standard Specification for Quicklime for Structural Purposes.

B. ASTM C67 - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile

C. ASTM C91 – Standard Specification for Masonry Cement.

D. ASTM C94 – Standard Specification for Ready-Mixed Concrete.

E. ASTM C143 – Standard Specification for Slump of Hydraulic Cement Concrete.

F. ASTM C144 – Standard Specification for Aggregate for Masonry Mortar.

G. ASTM C150 – Standard Specification for Portland Cement.

H. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale)

I. ASTM C207 – Standard Specification for Hydrated Lime for Masonry Purposes.

J. ASTM C270 – Standard Specification for Mortar for Unit Masonry.

K. ASTM C387 – Standard Specification for Packaged, Dry, Combined Materials for Mortar and Concrete.

L. ASTM C404 – Standard Specification for Aggregates for Masonry Grout.

M. ASTM C476 – Standard Specification for Grout for Masonry.

N. ASTM C780 – Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.

O. ASTM C1019 – Standard Test Method for Sampling and Testing Grout.

P. ASTM C1329 – Standard Specification for Mortar Cement.

Q. ASTM C1357 – Standard Test Method for Evaluating Masonry Bond Strength.

R. MSJC – Building Code Requirements for Masonry Structures (ACI 503/ASCE 5/TMS 402), Specification for Masonry Structures (ACI 530.1/ASCE 6/TMS 602) and Commentaries, latest edition.

1.04 SUBMITTALS

A. Samples: Submit actual samples of colored mortar.

B. Test Reports: Submit gradation of proposed aggregate for mortar and grout.

1.05 UL CLASSIFICATION

A. Where fire-resistance classification is designated, provided mortar tested and listed by UL.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store cementitious materials and aggregates to prevent deterioration or contamination with foreign material.

PART 2 PRODUCTS

2.01 MORTAR AND GROUT MATERIALS (ASTM C270)

A. Portland Cement: ASTM C150, Type I or Type II except Type III may be used for cold weather construction. Provide natural color or white cement to produce mortar color indicated.

B. Hydrated Lime: Lime shall be pressure-hydrated, non air-entrained and conform to ASTM C207, Type S or N.

C. Aggregate for Mortar: Natural sand or manufactured sand obtained by crushing stone or gravel, ASTM C144.

D. Aggregate for Grout: Fine and course aggregate, ASTM C404.

E. Water: Clean and free from deleterious amounts of acid, alkali, oils, salts, or organic material and shall be handled in clean containers.

F. Cold Weather Mixtures: Non-chloride, noncorrosive, accelerating admixture complying with ASTM C494/C494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated. Water repellent admixture; liquid water-repellent mortar admixture intended for use with concrete masonry units, containing integral water repellent by same manufacturer.

G. Mortar Cement: Mortar cement may be used in lieu of Portland cement and lime at Contractor's option. (ASTM C1329)

H. Portland Cement-Lime Mix: Packaged blend of Portland cement complying with ASTM C150, Type I or Type II, and hydrated lime complying with ASTM C207, Type S.

I. Masonry Cement: ASTM C91.

2.02 MORTAR MIXTURES (ASTM C270)

A. Minimum Comp Strength = 1800 psi

B. Use water-repellent admixture in mortar for concrete masonry unit containing integral water repellent.

C. Use colored mortar for all integral color CMU units.

D. For masonry below grade, or in contact with earth, use Type S. For Reinforced masonry, use Type N.

E. For exterior above grade walls or other walls where type is not indicated use Type N. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C143/C143M.

2.03 MASONRY GROUT MIXTURE

A. Mix grout in accordance with ASTM C476. Grout shall have a minimum compressive strength of 2000 psi at 28 days. Provide grout with a slump of 8 toll inches as measured according to ASTM C143/C143M.

2.04 MASONRY LINTEL

A. General: Provide either concrete or masonry lintels, at Contractor's option, complying with requirements below.

B. Masonry Lintels; Prefabricated or built-in-place masonry lintels made from bond beam concrete masonry units with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

PART 3 EXECUTION

3.01 PREPARATION

A. Plug cleanout holes with masonry units to prevent leakage of grout materials. Brace masonry for wet grout pressure.

3.02 MIXING MORTAR AND GROUT

A. Mixing equipment shall be clean and free of hardened materials, dirt, and foreign matter.

B. Accurately measure materials to specified proportions.

C. Mix mortar and grout in mechanical batch mixer for at least 3 minutes to produce a workable consistency. Hand mixing of materials is not permitted.

D. At temperatures below 40 degrees Fahrenheit, heat materials (not greater than 140 degrees Fahrenheit) to achieve mixture temperature between 50 and 90 degrees Fahrenheit.

3.03 RETEMPERING MORTAR

A. Mortars that have stiffened because of the evaporation of water from the mortar may be retempered by adding water to restore the required consistency. Mortar shall be used and place in final position with 1-1/2 hours after initial mixing; discard mortar that had begun to set.

3.04 INSTALLATION

A. Install mortar and grout in accordance with the MSJC specification.

B. Work grout into masonry cores and cavities to eliminate voids.

C. Do not displace reinforcement while placing grout.

D. Remove grout spaces of excess mortar.

END OF SECTION

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SECTION 04 05 23

MASONRY ACCESSORIES

PART 1 GENERAL

1.01 SCOPE

A. Provide masonry accessories as shown and as specified.

1.02 REFERENCES

A. ASTM A153 - Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

B. ASTM A615 - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

C. ASTM A641 - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.

D. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

E. ASTM A709 - Low Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.

F. ASTM A951 - Standard Specification for Masonry Joint Reinforcement.

G. ASTM C5 - Standard Specification for Concrete Brick.

H. ASTM C90 - Standard Specification for Load bearing Concrete Masonry Units.

I. ASTM C140 - Standard Test Methods of Sampling and Testing Concrete Masonry Units.

J. MSJC - Building Code for Masonry Structures (ACI 530/ASCE 5/TMS 402), Specification for Masonry Structures (ACI 530.0/ASCE 6/TMS 602) and Commentaries.

1.03 SUBMITTALS

A. Product Data: Submit product data for each type of masonry accessory.

PART 2 PRODUCTS

2.01 CMU JOINT REINFORCEMENT: ASTM A951

A. Welded wire units prefabricated in straight lengths of not less than 10 feet with matching corner and tee units. Fabricate from cold-drawn steel with deformed continuous side rods and plain cross-rods, crimped for cavity wall construction (if any), and unit width 1-1/2 to 2 inches less than thickness of wall or partition. Reinforcement shall comply with ASTM A951.

B. Fabricate using 9 gauge mill galvanized steel wire for side cross-rods, unless otherwise designated. Spacing of cross-rods, tabs and cross ties: Not more than 16inches on center. Reinforcement for exterior walls and interior walls shall be fabricated from hot-dip galvanized wire.

C. For masonry joint reinforcement for Single-Wythe Masonry: Either ladder or truss type with single pair of side rods.

2.02 WIRE TIES: ASTM A951

A. Individual prefabricated wire units. Fabricate from 3/16 inch galvanized cold-drawn steel wire (ASTM A82), unless otherwise designated, of length required for proper embedment in withes of masonry shown, and crimped if used in cavity wall construction.

B. For use with hollow masonry units laid with cells vertical, provide rectangular shaped ties. For use with solid masonry units or hollow units laid with cells horizontal, provide tees with ends bend 90 degrees to form hooks not less than 2 inches long.

C. Corrosion protection: Hot-dip galvanized to comply with ASTM A153/A153M.

2.03 ANCHORING DEVICES

A. Straps, bars, bolts, and rods of type and size shown, fabricated from not less than 16 gauge galvanized sheet metal and 3/8 inch diameter galvanized rod stock, unless otherwise shown. Where designated, flexible anchors shall provide lateral restrain while permitting horizontal and vertical movement of masonry.

END OF SECTION

SECTION 04 22 00

CONCRETE UNIT MASONRY

PART 1 GENERAL

1.01 SCOPE

A. Provide concrete masonry units as shown and as specified.

1.02 SUBMITTALS

A. Product Data: Submit product data for split-faced masonry units, including certified copies of laboratory test reports, to show compliance with the specified requirements.

B. Samples: Submit samples of split-faced masonry units for color verification. Select units to show range of color and texture expected in finished work.

1.03 CODES AND STANDARDS

A. Concrete masonry work shall comply with ACE 530.1/ASCEG/TMG 602.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver mortar materials in original unbroken and undamaged packages with the manufacturer's name and brand distinctively marked, and upon delivery, cover stored units with protective enclosure in a dry location. Do not use cementitious materials that have become damp.

B. Deliver concrete masonry units to the site in approved protective film. Prevent damage to units. Protect corners and edges.

C. Store masonry units in a manner designed to prevent damage and staining of units.

D. Store units 3 feet above grade.

E. Place polyethylene or other plastic film between wood and other surfaces of units when stored for extended periods of time.

F. Do not use salt or calcium chloride to remove ice from masonry surfaces.

1.05 ENVIRONMENTAL REQUIREMENTS

A. Cold-weather requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold weather construction requirements contained in ACE 530.1/ASCE 6/TMS 602 and Section 2104.3 in the Uniform Building Code.

B. Hot-weather requirements: comply with hot-weather construction requirements contained in ACE 530.1/ASCE 6/TMS 6.

PART 2 PRODUCTS

2.01 HOLLOW CONCRETE MASONRY UNITS: ASTM C90

A. Exposed faces shall be free of void spaces, cracks, or other imperfections larger than ¼ inch in any face dimension by 1/8 inch deep, standard grey unless noted otherwise on drawings. The Contractor and Construction Inspector shall review block pallets upon arrival at site to determine acceptability. Discard block not meeting standards.

B. Provide lintel block where masonry bond beams are designated. Temporarily support built-in lintels with cured.

2.02 SOLID CONCRETE MASONRY UNITS: ASTM C90

A. Normal-weight, solid load-bearing concrete masonry units, Type II, except that appearance of exposed faces shall be as specified below.

B. Exposed faces shall be free of void spaces, cracks, or other imperfections larger than ¼ inch in any face dimension by 1/8 inch deep. The Contractor and Construction Inspector shall review block pallets upon arrival at site to determine acceptability. Discard block not meeting standards.

2.03 MASONRY UNITS, GENERAL

A. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding and other special conditions. Provide square-edged units for outside corners unless noted otherwise.

B. Unit compressive strength: Provide units with minimum average net-area compressive strength of 2150 psi.

C. Weight classification: Light weight, except normal weight below grade.

D. Size width: Manufactured to dimensions 3/8 inch less than nominal dimensions.

2.04 MASONRY ACCESSORIES

A. See Section 04 05 23.

PART 3 EXECUTION

3.01 INSTALLATION, GENERAL

A. Build walls and other masonry construction to full thickness shown.

B. Coordinate with other trades for location and tolerances for building openings, chases, and recesses as shown and as required. Provide not less than 8 inches of masonry between chase or recess and jamb of openings, and between adjacent chases and recesses.

C. Leave openings for equipment to be installed before completion of masonry. After installation of equipment, complete masonry to match adjacent work.

D. Presoak units using clean water prior to cutting. Cut masonry units with motor-driven wet saw designed to cut masonry with clean, sharp, un-chipped edges. Provide wet-type saw or exhaust duct properly from enclosed areas. Cut units as required to provide pattern shown and to fit adjoining work neatly. Use full-size units without cutting wherever possible. Clean cut units with stiff fiber brush and clean water. Allow units to surface dry prior to placement.

E. Do not use chipped, damaged, or discolored masonry units in exposed work. Do not use metal reinforcing or ties having loose rust, frost, or other coatings which will reduce or destroy bond.

F. Cover tops of unfinished walls and new work during inclement weather and at the end of each day's work to prevent moisture entry. Extend covering a minimum of 24 inches down both sides of wall and hold covering securely in place.

3.02 LAYING CONCRETE MASONRY UNITS

A. Layout walls in advance for accurate spacing of surface bond patterns with uniform joint widths and to properly locate openings, movement-type joints, returns, and offsets. Avoid use of less-than-half-size units at corners and jambs, and whenever possible at other locations.

B. Lay-up walls plumb and true, with courses level, accurately spaced, and make horizontal and vertical joints equal and of uniform thickness. Course one masonry unit and one mortar unit to equal 8 inches. Tool joints to a concave raked finish.

C. Lay hollow concrete masonry units with full mortar coverage on horizontal and vertical face shells. Bed webs in mortar in starting course on footings and foundation walls and in all courses of piers, columns and pilasters, and where adjacent to cells or cavities to be reinforced or to be filled with concrete or grout. Isolate masonry partitions from vertical structural framing members with a control joint as indicated.

D. Remove masonry units disturbed after laying; clean and relay in fresh mortar. Do not pound corners at jambs to fit stretcher units which have been set in position. If adjustments are required, remove units, clean off mortar, and reset in fresh mortar. Fully bond intersections and external corners.

E. As work progresses, build-in items specified under this and other sections. Fill in solidly with masonry around built-in items. Buttering corners of joints and deep or excessive furrowing of mortar joints are not permitted.

F. Fill space between hollow metal frames and masonry with mortar.

G. Tolerances:

1. Variation in alignment from unit to adjacent unit: 1/16 inch maximum.

2. Variation of mortar joint thickness: 1/8 inch every 36 inches.

3.03 BOND PATTERN

A. Lay exposed masonry in running bond with vertical joint centered on units in courses above and below. Lay concealed masonry with all units in a wythe bonded by lapping not less than 2 inches. Bond and interlock each course of each wythe at corners. Do not use units with less than 4 inches horizontal face dimensions at corners or jambs.

3.04 JOINT TREATMENT

A. Strike joints flush for masonry to be concealed or covered by other materials. Tool exposed joints slightly concave, except tool joints flush within 1 inch of outlet boxes. Rake out mortar in preparation of sealants. Maintain 3/8 inch joint width, except for minor variations required to maintain bond alignment.

3.05 JOINT REINFORCEMENT

A. Provide continuous horizontal joint reinforcement as shown and as specified under Section 04 05 23. Fully embed longitudinal side rods in mortar for their entire length with a minimum cover of 5/8 inch on exterior side of walls and ½ inch at other locations. Lap reinforcement a minimum of 6 inches at ends of units. Do not bridge control and expansion joints with reinforcement except at wall openings.

B. Provide continuity at corners and wall intersections by use of prefabricated "L" and "T" sections. Cut and bend units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

C. For single wythe walls, space reinforcement at 16 inches o.c. vertically.

D. For multi-wythe walls (solid or cavity) where continuous horizontal reinforcement also acts as structural bond or tie between wythes, space reinforcement as required by code, but not more than 16 inches o.c. vertically.

E. Reinforce masonry openings greater than 1 foot wide, with horizontal joint reinforcement placed in two horizontal joints approximately 8 inches apart, both immediately above lintel and immediately below sill. Extend reinforcement 2 feet beyond jambs of opening, bridging control joints where provided.

3.06 ANCHORING

A. Provide anchoring devices of type specified in Section 04 05 23 or provide manufacturer's recommended type for facing and back-up involved.

3.07 CONTROL AND EXPANSION JOINTS

A. Locate vertical control joints at 30 feet o.c. and at points of natural weakness in masonry including the following:

1. At structural column or joints between bays.

2. Above expansion or control joints in supporting structure.

3. At ends of lintels upward and below at ends of sills downward. Place at one side of jamb for openings less than 6 feet wide and at both sides for openings over 6 feet wide.

4. At vertical chases, recesses, and other points of reduction in wall thickness.

5. At locations where masonry wall height changes by more than 20%.

6. Where masonry abuts supporting structure.

7. At a distance equal to ½ wall height from corners or intersections with other masonry.

8. Lintels - Install loose lintels as shown.

3.08 FLASHING

A. Provide concealed flashing in masonry work. Refer to Section 04 05 23 for type of flashing required. Prepare masonry surfaces smooth and free from projections which might puncture flashing. Place through-wall flashing on sloped bed of mortar and cover with mortar. Seal flashing penetrations with mastic before covering with mortar. Terminate flashing ¼ inch beyond face of wall.

B. Extend flashings beyond edge of lintels and sills at least 4 inches and turn up edge on sides to form pan to direct moisture to exterior.

C. Provide vents/weep holes in head joints of first course of masonry immediately above concealed flashings. Vents/weep holes shall be spaced 32 inches o.c.

3.09 CAVITY WALLS

A. Keep cavity clean of mortar droppings during construction. Strike joints facing cavity flush.

B. Tie exterior wythe to back-up with individual ties or continuous horizontal joint reinforcement embedded in mortar joints at not more than 16 inches o.c. vertically. Refer to Section 04 05 23 for type of reinforcement required.

C. Install cavity insulation in accordance with Section 07 21 23 and as shown.

D. Provide flashing and vents/weep holes in exterior wythe of cavity walls as shown and as specified in 3.08 FLASHING.

3.10 FINAL CLEANING

A. After mortar is thoroughly set and cured, clean sample wall area of approximately 20 square feet in an inconspicuous location using methods described below. After acceptance of sample cleaning, clean remainder of masonry until clean and free of mortar stains.

B. Dry clean to remove large particles of mortar using wood paddles and scrapers. Acid cleaning of exterior masonry will not be permitted.

C. Rinse walls by washing off all cleaning solution, dirt, and mortar crumbs using clean water.

D. For integrally-color units, comply with block manufacturer's cleaning instructions.

3.11 FINAL REPAIR - WILL NOT APPLY TO LAUNDRY FACILITY

A. After block walls have received one coat of paint block filler under Section 09 91 00, the Contractor and COR shall review walls. All cracks, chips, and other imperfections shall be patched with patching mortar and allowed to cure before finish painting.

END OF SECTION

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SECTION 05 51 00

METAL STAIRS

PART 1 GENERAL

1.01 SCOPE

A. Galvanized steel steps.

1.02 REFERENCES

A. ASTM A36 - Carbon Structural Steel.

B. ASTM A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

C. ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

D. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings.

E. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings.

F. ASTM A500-03a - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Round and Shapes.

G. NAAMM MBG531-00 - Metal Bar Grating Manual for Steel and Aluminum Gratings and Stair Treads.

H. AWS D1.1 - Structural Welding Code.

I. IBC - 2006 International Building Code.

J. ADA - Americans with Disabilities Act.

1.03 SUBMITTALS:

A. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.

PART 2 PRODUCT

2.01 GENERAL

A. There shall be no rubber or plastic plugs utilized on handrails, guardrails or any other surface. Any open tube items shall be finished with welded caps of the same material. All welds in these situations shall be of smooth finish.

B. The manufacturer shall have a minimum of 3 years experience in the manufacture of like stairs systems and shall provide references upon request where such systems are installed, to include name of organization, contact person, address and contact telephone number.

2.02 QUALITY CONTROL

A. The design shall conform to current industry standards as well as the Americans with Disabilities Act and Federal Traction Specification RR-G-1602.

B. All welding shall be in accordance with the American National Standards Institute (ANSI).

C. All exposed surfaces shall be free of sharp or jagged edges.

D. Ramps shall comply with all provisions of applicable codes.

2.03 PLATFORMS

A. Engineering:

1. Platforms shall be designed for a minimum live load of 100 pounds per square foot and a concentrated vertical load of 300 pounds distributed uniformly over an area of one square foot.

B. Materials:

1. Tread surfaces shall be of HRP & O Galvanized Steel construction, 14 gauge, in an open weave (Grip-Trac) design.

2. Tread surfaces shall meet Federal Specification RR-G-1602 governing slip resistance.

C. Design:

1. Platforms shall be fabricated in 5'x5' sections. Larger sections shall be fabricated as required by local codes and/or for specific applications as indicated on architectural drawings.

2. Platforms shall be designed for variable heights.

3. All platform sections shall have a side safety curb of a minimum of 4 inches.

2.04 LEGS

A. Engineering

1. Legs shall have an outside dimension of 1 5/8 inch with wall thickness of 0.125 inch.

2. Mounting feet shall be screw type and terminate in a flat steel pad with a minimum dimension of 6"x 6" and a minimum of 0.125" thickness.

3. All fasteners shall be of 18-8 stainless steel.

B. Design:

1. Legs shall be attached to the ramp and platform sections. Legs shall be designed so that they are plumb. Open ends of the legs shall be fitted with non-removable caps.

2. Rough adjustment of the legs will be in ½ inch increments with fine adjustment accomplished by the screw type mounting foot

2.05 METAL STEPS

A. Engineering:

1. Fabricate step and stair landing assembly to support live load of 100 lb/sq ft. Deflection of stringer or landing framing shall not to exceed 1/240 of span. Contractor to field verify stair height.

B. Materials

1. Tread surfaces shall be of HRP & O Galvanized Steel construction, 14 gauge, in an open weave (Grip-Trac) design.

2. Stringers shall be rolled steel channels.

C. Design to meet International Building code; latest edition.

1. Rise:

a. Maximum - 7 inches.

b. Minimum - 4 inches.

2. Tread Depth: Minimum - 11 inches.

3. Landing clear width: 5 feet x 5 feet

2.06 FINISHING

A. All materials shall be hot dipped galvanized after fabrication.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

B. Beginning of installation means erector accepts existing conditions.

C. Field measurements: Verify that field measurements are as indicated on shop drawings.

3.02 FABRICATION

A. Fit and shop assemble in largest practical sections, for delivery to site.

B. Fabricate galvanized components with joints tightly fitted and secured.

C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

3.03 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Provide blocking anchors, plates, angles, hangers and struts required for installation.

C. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

D. Field weld components indicated on shop drawings. Perform field welding in accordance with AWS D1.1.

E. Field bolt and weld to match shop bolting and welding. Conceal bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

F. Field welds shall be recoated to match surrounding material.

G. Erection tolerances.

1. Maximum Variation from Plumb: 1/8 inch.

2. Maximum Offset from True Alignment: 1/8 inch.

H. Steps shall be attached in accordance with the manufacturer's installation instructions.

END OF SECTION

SECTION 05 52 00

METAL RAILINGS

PART 1 GENERAL

1.01 SCOPE

A. Galvanized handrails.

1.02 REFERENCES

A. ASTM A36 - Carbon Structural Steel.

B. ASTM A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

C. ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

D. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings.

E. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings.

F. ASTM A500-03a - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Round and Shapes.

G. NAAMM MBG531-00 - Metal Bar Grating Manual for Steel and Aluminum Gratings and Stair Treads.

H. AWS D1.1 - Structural Welding Code.

I. IBC - 2006 International Building Code.

J. ADA - Americans with Disabilities Act.

1.03 SUBMITTALS:

A. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.

PART 2 PRODUCT

2.01 GENERAL

A. There shall be no rubber or plastic plugs utilized on handrails, guardrails or any other surface. Any open tube items shall be finished with welded caps of the same material. All welds in these situations shall be of smooth finish.

B. The manufacturer shall have a minimum of 3 years experience in the manufacture of like stairs systems and shall provide references upon request where such systems are installed, to include name of organization, contact person, address and contact telephone number.

2.02 QUALITY CONTROL

A. The design shall conform to current industry standards as well as the Americans with Disabilities Act and Federal Traction Specification RR-G-1602.

B. All welding shall be in accordance with the American National Standards Institute (ANSI).

C. All exposed surfaces shall be free of sharp or jagged edges.

D. Ramps shall comply with all provisions of applicable codes.

2.03 HANDRAILS - SINGLE BAR

A. Engineering:

1. Single Bar Handrails shall be designed and constructed for a concentrated load of 200 pounds applied at any point and in any direction. Note: The above loads shall not be applied simultaneously.

B. Materials:

1. Handrails shall be constructed from 1-1/2" diameter Galvanized Steel EMT Pipe.

2. Handrail receptor cups shall be constructed from steel, Schedule 40 pipe.

C. Design:

1. Handrails surface shall be smooth and continuous for each section.

2. The top of the handrail shall be placed 34 to 38 inches above the walking surface of the ramp or platform structure.

3. Handrail cups shall be welded to the steel plates. Handrails shall be mounted in the receptor cups and secured by nut, bolt and washer stainless steel fasteners.

4. Handrails ends shall have a 1 foot return at top or bottom locations where they are not connected to other sections or where the handrails terminate at a wall. Where the termination point does not have a return the end shall be finished in a rounded termination at the upright support.

2.04 HANDRAILS - DOUBLE-BAR

A. Engineering:

1. Two Line (Double Bar) Handrails shall be designed and constructed for a concentrated load of 200 pounds applied at any point and in any direction. Note: The above loads shall not be applied simultaneously.

B. Materials:

1. Handrails shall be constructed from 1-1/2" diameter Galvanized Steel EMT Pipe.

2. Handrail receptor cups shall be constructed from steel, Schedule 40 pipe.

C. Design:

1. Handrail surface shall be smooth and continuous for each ramp section and shall have smooth, interconnecting sections between ramp and platform sections.

2. The top of the handrail shall be placed 34 - 38 inches above the walking surface of the ramp or platform structure.

3. The lower rail shall be located at midpoint between the top of the toe kick and the top rail.

4. Handrail cups shall be welded to the ramp curb. Handrails shall be mounted in the receptor cups and secured by stainless steel nut, bolt, and washer fasteners.

5. Handrail ends shall have a 1 foot return at top or bottom locations where they are not connected to other sections or where the handrail terminate at a wall. Where the termination point does not have a return the end shall be finished in a rounded termination at the upright support.

2.05 FINISHING

A. All materials shall be hot dipped galvanized after fabrication.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

B. Beginning of installation means erector accepts existing conditions.

C. Field measurements: Verify that field measurements are as indicated on shop drawings.

3.02 FABRICATION

A. Fit and shop assemble in largest practical sections, for delivery to site.

B. Fabricate galvanized components with joints tightly fitted and secured.

C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

3.03 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Provide blocking anchors, plates, angles, hangers and struts required for installation.

C. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

D. Field weld components indicated on shop drawings. Perform field welding in accordance with AWS D1.1.

E. Field bolt and weld to match shop bolting and welding. Conceal bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

F. Field welds shall be recoated to match surrounding material.

G. Erection tolerances.

1. Maximum Variation from Plumb: 1/8 inch.

2. Maximum Offset from True Alignment: 1/8 inch.

H. Steps shall be attached in accordance with the manufacturer's installation instructions.

END OF SECTION

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SECTION 06 10 00

ROUGH CARPENTRY

PART 1 GENERAL

1.01 SCOPE

A. Structural floor and wall framing.

B. Structural composite lumber products – Laminated Veneer Lumber beams.

C. Plywood floor sheathing.

D. Preservative treatment of wood.

E. Telephone and electrical panel boards

F. Rough carpentry accessories including, but not limited to:

1. Framing anchors and fasteners

1.02 REFERENCES

A. American Wood Council (AWC)

1. National Design Specification (NDS) for Wood Construction

2. Special Design Provisions for Wind & Seismic (SDPWS)

B. EWA - Engineered Wood Association (APA).

1. E30 - Design/Construction Guide - Residential and Commercial

2. E445 - Performance Standard and Policies for Structural-use Panels

C. AWPA (American Wood Preservers Association) U1 - Preservation Treatment by Pressure Process.

D. ASTM D5456 – Standard Specification for Evaluation of Structural Composite Lumber Products

E. Inspection Agencies

1. NLGA: National Lumber Grades Authority

2. SPIB: Southern Pine Inspection Bureau

3. WCLIB: West Coast Lumber Inspection Bureau

4. WWPA: Western Wood Products Association

1.03 SUBMITTALS - NOT USED

PART 2 PRODUCTS

2.01 LUMBER MATERIALS

A. Lumber Grading Rules: NLGA, SPIB, WCLIB and WWPA.

B. Lumber, General:

1. Lumber Standards: Manufacture lumber to comply with DOC PS 20, applicable grading rules of referenced inspection agencies certified by ALSC Board of Review.

2. Grade Stamps: Factory-mark each piece with grade stamp of inspection agency evidencing compliance with grading rule requirements, grading agency, grade, species, moisture content at time of surfacing, and mill.
3. Nominal Sizes:
   a. As indicated, except as shown by detail dimensions.
   b. Actual sizes required by PS 20, moisture content specified for each use.
   c. Dressed lumber, S4S, unless otherwise indicated.
   d. Seasoned lumber with 19 percent maximum moisture content at time of dressing and shipment for sizes 2 inches or less nominal thickness, unless otherwise indicated.

C. Plywood and Oriented Strand Board (OSB) Panels:
1. Comply with PS 1 (plywood) or PS 2 (plywood or OSB).
2. Trademark: Factory-mark each panel with APA trademark evidencing compliance with grade requirements and span rating information.
3. Provide Exposure 1 grade plywood at all locations unless specified otherwise.
4. Concealed APA Performance-Rated Panels: Comply with requirements indicated for grade designation, span rating, exposure durability classification, edge detail where applicable, thickness.
5. Type of Use:
   a. Wall Sheathing:
      1) Grade: APA Rated Sheathing – Structural I
      2) Thickness as indicated but at least 15/32 inch.
      3) Size: 4 feet by 8 feet.
   b. Floor Sheathing:
      1) Grade: APA Rated STURD-I-FLOOR Underlayment – 24 oc
      2) Thickness as indicated but minimum 3/4 inch.
      3) Size: 4 feet by 8 feet wherever possible.
      4) Configuration: Tongue and groove.
   c. Plywood backing panels:
      1) Mounting electrical or telephone equipment: Fire-retardant treated plywood panels with grade designation, APA C-D PLUGGED INT with exterior glue, thickness indicated, or, if not otherwise indicated, not less than 1/2 inch nominal.
      2) Grab bar mounting:
         a) APA C-D exterior glue.
         b) Thickness as indicated, 5/8-inch minimum.

D. Structural Floor Framing: Design Basis: Douglas Fir Larch, Grade No. 2 or better.

E. Wall Studs: Douglas Fir-Larch, Spruce-Pine-Fir, or Southern Pine species, No. 2 grade or better.

F. Blocking for Support or Attachments: Douglas Fir-Larch, Spruce-Pine-Fir, or Southern Pine species, No. 2 grade or better.

G. Lumber and Timber Posts: Southern Pine Grade No. 2 or Better.

2.02 ACCESSORIES

A. Fasteners, clips and hangers shall be in accordance with current IBC.

B. Bridging with solid wood blocking or metal braces at mid-span or max. spacing of 6’-0” o.c.

2.03 FACTORY WOOD TREATMENT

A. Wood Preservative (Pressure Treatment): AWPA treatment U1 using water borne preservative with a minimum of 0.60 percent retainage – ground contact grade.

PART 3 EXECUTION

3.01 FRAMING

A. Set framing members level and plumb, in correct position.

B. All framing and bridging shall be sized and installed accordance with the current IBC.

C. Provide double 2 inch nominal thickness top plates for bearing walls and partitions.

D. Plates shall be of same width as studs.

3.02 FLOOR JOISTS FRAMING

A. Provide framing of sizes and spacings shown.
   1. Install with crown edge up and support ends of each member with not less than 1-1/2 inch of bearing on wood or metal, or 3 inches on masonry.
   2. Attach to wood bearing members by toe nailing or metal connectors; frame to wood supporting members with wood ledgers as shown, or if not shown, with metal connectors.

B. Under jamb studs at openings, provide solid blocking between joists.

3.03 PLYWOOD INSTALLATION

A. Plywood Installation:
   1. Comply with applicable recommendations contained in Form No. E30, "APA Plywood Design/ Construction Guide," Residential and Commercial," for types of plywood products and applications indicated. Comply with "CodePlus" provisions of above referenced guide.
   2. Fastening Methods:
      a. Subfloor/underlayment combination:
         1) Glue and mechanically fasten to framing throughout
         2) Space panels 1/8 inch at edges and ends.
         3) Fill and sand edge joints of underlayment receiving resilient flooring just before installing flooring.

3.04 ORIENTED STRAND BOARD INSTALLATION

A. Allow 1/16 inch spacing at panel ends and 1/8 inch at panel edges, unless noted otherwise by manufacturer.

B. Nails: Cement coated box nails, unless otherwise noted.

C. Stapling of oriented Strand board not permitted.

D. Wall Sheathing:

   1. Place vertically with joints over studs, plates or 2-inch blocking.

   2. Stagger end joints and allow 1/8-inch space. End joints shall occur on supports. Space panel edges 1/8 inch.

3. Nail 6 inches on center along panel edges and 12 inches on center at intermediate supports, except as indicated in details or shearwall schedule.

4. Use 8d common wire nails

3.05 TOLERANCES

A. Framing Members: 1/8 inch from true position, maximum.

END OF SECTION

SECTION 06 20 00

FINISH CARPENTRY

PART 1 GENERAL

1.01 SCOPE

A. Finish carpentry items, chair rail, and casing.

B. AWI Quality Standards.

PART 2 PRODUCTS

2.01 LUMBER MATERIALS

A. Hardwood Lumber (Trim): Graded in accordance with AWI Premium; oak species, plain sawn.

2.02 FASTENERS

A. Fasteners: Of size and type to suit application; plain finish.

PART 3 EXECUTION

3.01 PREPARATION

A. Protect finish carpentry items from damage.

3.02 INSTALLATION

A. Install work in accordance with AWI Quality Standard.

B. Set and secure materials and components in place, plumb and level.

C. Install trim in single non-jointed lengths for openings and runs less than 10 feet. For longer runs use only one piece less than 10 feet in any straight run. Stagger joints in adjacent members. Cope returns and miter corners.

3.03 PREPARATION FOR SITE FINISHING

A. Set exposed fasteners. Apply color matching wood putter / filler in exposed fastener indentations. Wipe work smooth and clean.

3.04 ERECTION TOLERANCES

A. Maximum Variation from True Position: 1/16 inch.

B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

END OF SECTION

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SECTION 06 40 00

ARCHITECTURAL WOOD CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manufactured Casework.

B. Post Formed Counter Tops.

1.02 REFERENCES

A. AWI - Quality Standards.

B. FS MMM-A-130 - Adhesive, Contact.

C. National Electric Manufacturers Association (NEMA) LD3 - High Pressure Decorative Laminates.

D. PS 1 - Construction and Industrial Plywood.

1.03 SUBMITTALS

A. Product Data: cabinet data indicating sizes, finishes, and profile.

B. Samples: Submit color samples of plastic laminate.

1.04 QUALITY ASSURANCE

A. Perform work in accordance with AWI Custom quality.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect units from moisture damage.

1.06 FIELD MEASUREMENTS

A. Verify field measurements are as indicated on drawings.

1.07 ENVIRONMENTAL REQUIREMENTS

A. During and after installation of work, maintain the same temperature and humidity conditions in building spaces as will occur after occupancy.

PART 2 PRODUCTS

2.01 WOOD CABINET

A. Solid oak face frame.

B. Oak Raised Panel Door with edge molded finger pull.

C. 5/8” thick laminated full depth adjustable shelf.

D. 3/8” thick laminated cabinet end panels.

E. Color: Honey Oak.

F. Standard adjustable hinges.

G. Standard roller style drawer guides.

2.02 LAMINATE MATERIALS

A. Plastic Laminate: NEMA LD3, PF 42 Post Forming GP - 50 General Purpose type; color, pattern, and surface texture as selected by COR.

2.03 ACCESSORIES

A. Adhesive: FS MMM-A-130 contact adhesive.

B. Plastic Edge Trim: Extruded convex shaped; finish; self-locking serrated tongue; of width to match component thickness.

C. Concealed Joint Fasteners: Threaded steel.

D. Counter top supports shall be plastic laminate angled supports or white painted "L" brackets.

2.04 FABRICATION

A. Cap exposed plastic laminate finish edges with material of same finish and pattern.

B. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

C. Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.

D. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.

2.05 FINISHING

A. Seal surfaces in contact with cementitious materials.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

3.02 INSTALLATION

A. Cabinets are to be installed plumb and level, securely fastened in place per manufacturer's printed instructions.

B. Set and secure countertop in place; rigid, plumb, and level.

C. Use fixture attachments in concealed locations for wall mounted components.

3.03 ADJUSTING

A. Adjust moving or operating parts to function smoothly and correctly.

3.04 CLEANING

A. Clean counters, hardware, fittings and fixtures.

END OF SECTION

SECTION 06 60 00

PLASTIC FABRICATIONS

PART 1 GENERAL

1.01 SCOPE

A. Free-Foam Cellular PVC Trim Boards for corner boards, soffits, fascias, battens, door pilasters, frieze boards, rake boards, pilasters, water tables, architectural mill work and door/window trim.

1.02 RELATED SECTIONS

A. Section 06 64 00 – Plastic Paneling

B. Section 06 65 00 – Plastic Simulated Wood Trim

C. Section 06 66 00 – Custom Ornamental Simulated Woodwork

1.03 REFERENCES

A. ASTM D792 – density and specific gravity of plastics by displacement.

B. ASTM D570 – Water absorption of plastics.

C. ASTM D638 – Tensile properties of plastics.

D. ASTM D790 – Flexural properties of unreinforced and reinforced plastics and electrical insulating materials.

E. ASTM D1761 – Mechanical fasteners in wood.

F. ASTM D5420 – Standard test method for impact resistance of flat, rigid plastic specimen by means of a striker impacted by a falling weight.

G. ASTM D256 – Determining the pendulum impact resistance of plastics.

H. ASTM D696 – Coefficient of linear thermal expansion of plastics between -30°c and 30° c with a vitreous silica dilatometer.

I. ASTM D635 – Rate of burning and/or extent and time of burning of plastics in a horizontal position.

J. ASTM E84 – Surface burning characteristics of building materials.

K. ASTM D648 – Deflection temperature of plastics under flexural load in the edgewise position.

L. ASTM D3679 – Standard specification for rigid poly vinyl chloride (pvc) siding.

1.04 SUBMITTALS

A. General: Present listed submittals in accordance with Conditions of the Contract and Division 1 Submittal Procedures Section.

B. Product Data: Submit product data, manufacturer's catalog, Technical Bulletins, for specified products.

C. Samples: Submit three materials samples representative of the texture, thickness and widths shown and specified herein.

1.05 QUALITY ASSURANCE

A. Regulatory Requirements: Check with Local Building Code for installation requirements.

B. Allowable Tolerances.

1. Variation in component length: -0.00 / +1.00.

2. Variation in component width: +/- 1/16".

3. Variation in component thickness: +/- 1/16".

4. Variation in component edge cut: +/- 2°.

5. Variation in Density +/- 0.025 grams per cubic centimeter

C. Workmanship, Finish, and Appearance:

1. Free Foam Cellular PVC that is homogeneous and free of voids, holes, cracks, foreign inclusions and other defects. Edges must be square and top and bottom surfaces shall be flat with no convex or concave deviation.

2. Uniform surface free from cupping, warping, and twisting.

1.06 DELIVERY, STORAGE AND HANDLING

A. Trim materials should be stored on a flat and level surface on a full shipping pallet. Handle materials to prevent damage to product edges and corners. Store materials under a protective covering to prevent job site dirt and residue from collecting on the boards.

1.07 WARRANTY

A. Provide manufacturer's 30-year transferable warranty against defects in manufacturing that causes the products to rot, corrode, delaminate, or excessively swell from moisture.

PART 2 PRODUCTS

2.01 MATERIALS

A. Acceptable products: PALIGHT TRIMBOARD manufactured by Palram Americas, Inc., 9735 Commerce Circle, Kutztown, PA 19530. Phone: 610-285-9918

B. Material: Free Foam Cellular PVC material with a small-cell microstructure and density of .55 -.60grams/cm³.

1. Material shall have a minimum physical and performance properties specified in the following Section C.

C. Performance and physical characteristic requirements:

Property	Conditions (U.S.	ASTM Method	Units - SI (U.S.	Value (U.S.Custo

	Customary)		Customary)	mary)
Physical				
Density		D-1505	g/cm^3 (lb/ft^3)	0.55-0.60 (35)
Water Absorption	24 hr. @ 23°C	D-570	%	0.5
Mechanical				
Tensile strength at yield	10 mm/min (0.4 in./min)	D-638	MPa (psi)	MPa (psi)
Tensile strength at break	10 mm/min (0.4 in./min)	D-638	MPa (psi)	14.5 (2,100)
Elongation at yield	10 mm/min (0.4 in./min)	D-638	%	5
Elongation at break	10 mm/min (0.4 in./min)	D-638	%	40
Flexural Modulus	1.3 mm/min (0.05 in./min)	D-790	MPa (psi)	896 (130,000)
Flexural Strength at Yield	1.3 mm/min (0.05 in./min)	D-790	MPa (psi)	28 (4,000)
Hardness (Shore D)		Durometer	Shore D	52-58
Screw Hold	lbf/in of penetration	D-1761	lbf	600
Nail Hold	lbf/in of penetration	D-1761	lbf	90
Staple Hold	lbf/in of penetration	D-1761	lbf	69
Thermal				
Long Term Service Temperature			°C (°F)	-15 to 55 (14 to 131)
Heat Deflection Temperature	Load: 1.82 Mpa (264 psi)	D-648	°C (°F)	60 (140)
Coefficient of Linear Thermal Expansion		D-696	10^{-5}/°C (10^{-5}/°F)	6.7 (3.7)
Thermal Conductivity		C-177	W/m°K (Btu-in./hr-ft^2-°F)	.87 (0.5)
Electrical				
Surface Resistance	Ketley	D-257	Ohm	5×10^{15}
Volume Resistance	Ketley	D-257	Ohm-cm	2×10^{16}

2.02 ACCESSORY PRODUCTS

A. Fasteners:

1. Use stainless steel fasteners designed for wood trim and siding for best results. Fastener should have sufficient flexural and tensile strength to resist bending.

2. Fasteners with thin shanks, blunt points, and full round heads are preferred. The fastener must be long enough to penetrate the substrate a minimum of 1 1/2 inches.

3. Do not use staples, small brads and wire nails. Avoid using fine threaded wood screws and ringshank fasteners.

4. Use standard nail guns with a pressure setting between 70 psi and 100 psi. The recommended pressure de- pends on the type of gun, type of nail, ambient temperature, and the substrate. Care should be taken not to overdrive the nail into the material.

5. Pre-drilling typically is not required unless large fasteners are used or the product is installed during low temperatures.

6. Use two fasteners for every framing member for trimboard applications. Palight Trimboard Sheet and trimboards 8 inches and wider require additional fasteners.

7. Install fasteners no more than 2 inches from the end of each board.

8. Avoid fastening Palight Trimboard over hollow or uneven areas. Fasten Palight Trimboard onto flat, solid substrates.

9. 3/8" and 1/2" thick Palight Trimboard Sheet and Beadboard are not designed to be ripped and used for trim applications. These products must be glued and mechanically fastened to the substrate.

B. Adhesives:

1. All bonded surfaces must be smooth, clean, and in complete contact with each other for best results.

2. For adhering Palight Trimboard to itself, bond joints with PVC cement or cellular PVC adhesives to prevent joint separation. Products such as Bond-and-Fill (2 component epoxy), IPS Weld-On 705 (white), and Genova Vinyl Adhesive are excellent cements.

3. Remember that most PVC cements cure quickly (3-5 minutes), and have a limited working time.

4. Scarf cut joints are recommended.

5. Bonded joints should be secured with fasteners and fastened on each side of the joint.

6. When bonding Palight Trimboard to other substrates, consult the adhesive manufacturer to determine suitability.

7. If you have to butt joints, double nail the trimboards on both sides of the butt joint and reinforce with construction adhesive applied to the backside of the trimboards.

C. Sealants:

1. Use urethane, polyurethane, polymer blends or acrylic based sealants that do not contain silicone.

2.03 FINISHES

A. Preparation:

1. Be sure the Palight Trimboard surface to be painted is clean, dry, and free of dirt, loose or peeling paint, mildew, chalk, grease and any other surface contaminants before paint application.

2. Use 100% acrylic latex or 100% acrylic latex with urethane additive paint with a light reflective value equal to or greater than 55 units.

3. Follow the paint manufacturer's application recommendations.

4. Nail holes may be finished with a two component methacrylate, polyurethane, polymer, or acrylic based caulk, or painted over. Use a caulk that is UV resistant.

PART 3 EXECUTION

3.01 INSTALLATION

Manufacturer's instructions: Comply with manufacturer's installation instruction and product technical bulletins

A. Cutting:

1. Cut using standard woodworking saws. Conventional carbide-tipped blades designed for cutting wood are preferred. Avoid using fine-tooth metal-cutting blades.

B. Rough-cut edges are typically caused by excessive friction, poor board support, or worn or improper toolingDrilling

1. Drill using standard woodworking drill bits. Do not use drill bits made for rigid PVC.

2. Avoid frictional heat build-up.

3. Remove shavings periodically from a drill hole as necessary.

C. Routing

1. Product can be routed with virtually any piece of equipment used to rout wood.

2. Carbide tipped router bits are recommended.

3. Machinery that allows for multiple cutting speeds will allow you to optimize the process obtaining a smoother finished part.

D. Milling & Moulding:

1. Product can be milled or moulded using standard milling or moulding machines found in millwork shops.

2. Rake angle 20 to 30 degrees. 25 degrees appears to work the best.

3. Cutting speed to be optimized with the number of knives and feed rate.

E. Edge Finishing:

1. Traditional sanding, grinding or filing tools used for woodworking are preferred.

F. Nail Location:

1. For trimboard applications, use 2 fasteners per framing member.

2. Additional fasteners are required for trimboard 8" and wider.

3. Fasteners must be installed a maximum of 2" from the end of each board.

G. Expansion and Contraction:

1. Palight Trimboard expands and contracts with changes in temperature. Properly fastening Palight Trimboard along its entire length will minimize expansion and contraction.

2. Allow 3/16-inch space per 18-foot run of Palight Trimboard for expansion and contraction.

3. Bond joints between pieces of Palight Trimboard to eliminate separation.

H. Allow expansion and contraction space at the ends of long runs. Cleaning:

Clean with mild detergent and water. Products with pumice, such as Soft Scrub® with Bleach, may be applied with an abrasive nylon brush. For more stubborn stains use a mild household cleaner and degreaser like Clorox® Cleanup or Clorox® Outdoors.

END OF SECTION

SECTION 07 21 13

BOARD INSULATION

PART 1 GENERAL

1.01 SCOPE

A. Board insulation.

1. Wall Exterior

1.02 REFERENCES

A. ASTM C578 - Preformed Cellular Polystyrene Thermal Insulation.

B. ASTM C1289 - 07 Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board

1.03 ENVIRONMENTAL REQUIREMENTS

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

B. Do not store materials exposed to direct sunlight.

1.04 SUBMITTALS

A. Product Data: Provide data on product characteristics, performance criteria, limitations for board insulation and manufacturer's installation instructions.

PART 2 PRODUCTS

2.01 NON-VENTED NAIL BASE INSULATION PANELS

A. Description of system:
1. The insulated sheathing shall be a preassembled panel consisting of one layer of 7/16" oriented strand board top surface (standard) bonded to 1" thick polyiso foam.
2. The Long Term Thermal Resistance (LTTR) R-Value of the non-vented roof insulation shall be no less than 6.3.
3. Wood panel edges shall be rabbetted to allow the foam edges to fit together while providing clearance between the wood sheathing on adjoining panels.
4. Foam sides and ends shall have a machined tongue and groove profile to reduce heat loss at the joints.

B. Performance Requirements:
1. The foam insulation shall have a Flame Spread Rating of 40-60.

C. PRODUCT
1. ThermaCal® Non-Ventilated Roof Insulation Panels by GAF Cornell (Basis of Design)

D. Manufacturers: Subject to compliance with requirements, available manufacturers offering similar products that may be incorporated into the Work include, but are not limited to, the following, as approved by COR:
1. Johns Manville

2.02 ACCESSORIES

A. Tape: Self-adhering type, 2 inch wide.

B. Insulation Fasteners: Impale clip of galvanized steel to be mechanically fastened to surface to receive board insulation, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place. If clip is installed on a waterproof membrane, ensure that membrane integrity is maintained or restored.

C. Manufacturer’s approved insulation adhesives.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation boards are dry and ready application.

3.02 INSTALLATION

A. Polystyrene Insulation (Walls)

1. Extend insulation full thickness over entire surface.

2. Cut and fit tightly around obstructions, and fill voids with insulation and mastic.

3. Comply with manufacturer's instructions for the particular conditions of installation.

4. If printed instructions are not available or do not apply to the project conditions, consult manufacturer's technical representative for specific recommendations before proceeding with the work.

5. Apply a single layer of insulation of required thickness, unless otherwise shown or as required to make up the total thickness.

6. Provide protection for exposed surfaces of material above grade after application.

END OF SECTION

SECTION 07 21 16

BLANKET INSULATION

PART 1 GENERAL

1.01 SCOPE

A. Batt insulation for filling all partitions, perimeter walls, and ceiling and floor joists.

B. Low expanding insulation for window jambs and door frames.

1.02 REFERENCES

A. ASTM C665 - Mineral Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

B. ASTM E84 - Class 1 Foam.

PART 2 PRODUCTS

2.01 MATERIALS

A. Batt Insulation: ASTM C665 Type I - without membranes, preformed glass and mineral fiber batt, friction fit, unfaced, thicknesses as shown on drawings.

B. Low Expanding Foam:

1. ASTM E84 Class 1 Foam.

2. Close Cell Content ASTM D285 Minimum of 70%.

3. R-Factor Minimum of 4.5 per inch.

C. Vapor Barrier:

1. Interior shall be 4 mil polyethylene sheet.

2. Ground cover shall be 6 mil polyethylene sheet.

3. Material shall be provided in the widest practical sheet possible to minimize joints.

4. Material shall be placed in the most efficient direction possible to minimize joints.

D. Staples: Steel wire; electroplated; size and type to suit application.

E. Tape: Polyethylene self-adhering type, mesh reinforced, 2 inch wide.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that all adjacent materials are dry and ready to receive insulation.

B. Verify that the structure is adequately sealed from the exterior environment to prohibit moisture from contacting the insulation.

C. Verify that attic ventilation chutes are clear, unobstructed, and have provisions in place to ensure that installed insulation does not restrict the required airflow.

3.02 INSTALLATION

A. Install insulation and vapor barrier in accordance with insulation manufacturer's instructions. Provide a minimum of 12 inches of overlap at all vapor barrier joints.

B. Trim insulation neatly to fit spaces.

C. Fit insulation tightly in spaces and tightly to exterior side of mechanical and electrical services within the plane of insulation. Leave no gaps or voids. Do not compress the insulation.

D. Install with factory applied membrane facing the warm side of the building spaces. Lap ends and side flanges of membrane between framing members.

E. Tape seal butt ends, lapped flanges, and tears or cuts in membrane.

F. Wood Framing: Place vapor and air barrier on warm side of insulation by stapling at 6 inches on-center. Lap and seal sheet barrier joints over member face.

G. Extend vapor and air barrier tight to full perimeter of adjacent window and door frames and other items interrupting the plane of membrane. Tape seal in place.

H. Floor Insulation.

1. Retain in place with spindle fasteners at 16 inches on-center. Retain in place with wire mesh secured to framing members

PART 4 SCHEDULE

A. Exterior sidewalls: Install batt and blanket insulation to the thickness necessary to meet R-19 value.

B. Interior walls: Install batt and blanket insulation to the thickness necessary to meet R-11 value.

C. Floor insulation: Install batt and blanket insulation to the thickness necessary to meet R-25 value.

D. Windows & Doors: Insulate steel door frames and window jambs with Low Expanding Foam Insulation.

END OF SECTION

SECTION 07 21 19

FOAMED-IN-PLACE INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Closed-cell spray polyurethane foam.

B. Related Requirements:

1. Section 072100 "Thermal Insulation" for foam-plastic board insulation.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

PART 2 - PRODUCTS

2.1 CLOSED-CELL SPRAY POLYURETHANE FOAM

A. Closed-Cell Spray Polyurethane Foam: ASTM C1029, Type II, minimum density of 1.5 lb/cu. ft. (24 kg/cu. m) and minimum aged R-value at 1-inch (25.4-mm) thickness of 6.2 deg F x h x sq. ft./Btu at 75 deg F (43 K x sq. m/W at 24 deg C).

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. BASF Corporation.
b. CertainTeed Corporation.
c. Dow Chemical Company (The).
d. Henry Company.

e. Icynene-Lapolla.
f. Johns Manville; a Berkshire Hathaway company.
g. NCFI Polyurethanes; a division of Barnhardt Manufacturing Company.

2. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

a. Flame-Spread Index: 25 or less.
b. Smoke-Developed Index: 450 or less.

PART 3 - EXECUTION

3.1 PREPARATION

A. Verify that substrates are clean, dry, and free of substances that are harmful to insulation.

B. Priming: Prime substrates where recommended by insulation manufacturer. Apply primer to comply with insulation manufacturer's written instructions. Confine primers to areas to be insulated; do not allow spillage or migration onto adjoining surfaces.

3.2 INSTALLATION

A. Comply with insulation manufacturer's written instructions applicable to products and applications.

B. Spray insulation to envelop entire area to be insulated and fill voids.

C. Apply in multiple passes to not exceed maximum thicknesses recommended by manufacturer. Do not spray into rising foam.

D. Framed Construction: Install into cavities formed by framing members to achieve thickness indicated on Drawings.

E. Miscellaneous Voids: Apply according to manufacturer's written instructions.

3.3 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes.

END OF SECTION 072119

SECTION 07 21 23

LOOSE FILL INSULATION

PART 1 GENERAL

1.01 SCOPE

A. Loose fill insulation pneumatically placed in attic through access holes.

1.02 REFERENCES

A. ANSI/ASTM C764 - Mineral Fiber Loose Fill Insulation.

PART 2 PRODUCTS

2.01 MATERIALS

A. Fiber Fill Insulation: ANSI/ASTM C764 Type 1 fiber glass, bulk for pneumatic placement.

B. Ventilation Baffles: Extruded Polystyrene, Size 22 ½" x 48", Net Free area 25.5 sq. inches (full piece), 12.75 sq. inches (when split).

C. Vapor Barrier: 4 mil polyethylene sheet.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation are dry and ready to receive insulation.

B. Verify spaces are unobstructed to allow placement of insulation.

3.02 INSTALLATION

A. Install air vapor barrier in accordance with manufacturer's instructions.

B. Install insulation and ventilation baffle in accordance with manufacturer's instructions.

C. Pneumatically place insulation in truss spaces.

D. Place insulation against baffles. Do not impede natural attic ventilation to soffit.

E. Completely fill intended spaces. Leave no gaps or voids.

3.03 CLEANING

A. Remove loose insulation residue.

END OF SECTION

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SECTION 07 25 00

WEATHER BARRIERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Weather barrier membrane.

B. Seam Tape.

C. Flashing.

D. Fasteners.

1.02 REFERENCES

A. AATCC - American Association of Textile Chemists and Colorists.

1. Test Method 127 Water Resistance: Hydrostatic Pressure Test.

B. ASTM International

1. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.

2. ASTM C1193 - Standard Guide for Use of Joint Sealants.

3. ASTM D882 - Test Method for Tensile Properties of Thin Plastic Sheeting.

4. ASTM D1117 - Standard Guide for Evaluating Non-woven Fabrics.

5. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials.

6. ASTM E96 - Test Method for Water Vapor Transmission of Materials.

7. ASTM E1677 - Specification for Air Retarder Material or System for Framed Building Walls.

8. ASTM E2178 - Test Method for Air Permeance of Building Materials.

C. TAPPI

1. Test Method T-410 - Grams of Paper and Paperboard (Weight per Unit Area).

2. Test Method T-460 - Air Resistance (Gurley Hill Method).

1.03 SUBMITTALS

A. Product Data: Submit manufacturer current technical literature for each component.

B. Samples: Weather Barrier membrane, minimum 8-1/2 inches by 11 inch.

C. Quality Assurance Submittals

D. Manufacturer Instructions: Provide manufacturer's written installation instructions.

1.04 QUALITY ASSURANCE

A. Qualifications

1. Installer shall have experience with installation of similar weather barrier assemblies under similar conditions.

2. Installation shall be in accordance with manufacturer's installation guidelines and recommendations.

3. Source Limitations: Provide weather barrier and accessory materials produced by single manufacturer.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver weather barrier materials and components in manufacturer's original, unopened, undamaged containers with identification labels intact.

B. Store weather barrier materials as recommended by system manufacturer.

PART 2 PRODUCTS

2.01 MATERIALS

A. Basis of Design: spunbonded polyolefin, non-woven, non-perforated, weather barrier.

B. Performance Characteristics:

1. Air Penetration: Minimum of 0.007 cfm/ft^2 at 75 Pa, when tested in accordance with ASTM E2178. Type I per ASTM E1677.

2. Water Vapor Transmission: Minimum of 5 perms and maximum of 20 perms, when tested in accordance with ASTM E96, Method B.

3. Water Penetration Resistance: Minimum of 500 cm when tested in accordance with AATCC Test Method 127.

4. Air Resistance: 300 seconds, when tested in accordance with TAPPI Test Method T-460.

5. Tensile Strength: 30/30 lbs/in., when tested in accordance with ASTM D882, Method A.

6. Tear Resistance: 30/30 lbs, when tested in accordance with ASTM D1117.

2.02 ACCESSORIES

A. Seam Tape: 2 or 3 inch wide.

B. Fasteners:

1. Wrap Caps: #4 nails with large 1-inch plastic cap fasteners.

2. And/or

3. Wrap Cap staples.

C. Sealants

1. Provide sealants that comply with ASTM C 920, elastomeric polymer sealant to maintain watertight conditions.

D. Adhesive:

1. Provide adhesive recommended by weather barrier manufacturer.

E. Primer:

1. Provide flashing manufacturer recommended primer to assist in adhesion between substrate and flashing.

F. Self-adhering Flashing:

1. Face material composition: polypropylene barrier.
2. Adhesive composition: butyl adhesive.
3. Thickness: Minimum 15mil.
4. Release liner: siliconized paper.
5. Dimensions: 4 in., 6 in. or 9 in.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify substrate and surface conditions are in accordance with weather barrier manufacturer recommended tolerances prior to installation of weather barrier and accessories.

3.02 INSTALLATION - WEATHER BARRIER

A. Install weather barrier over exterior face of exterior wall substrate in accordance with manufacturer recommendations.

B. Start weather barrier installation at a building corner, leaving 6-12 inches of weather barrier extended beyond corner to overlap.

C. Install weather barrier in a horizontal manner starting at the lower portion of the wall surface. Maintain weather barrier plumb and level.

D. Extend bottom roll edge over sill plate interface 2” to 3” minimum. Seal weather barrier with sealant or tape.

E. Subsequent layers shall overlap lower layers a minimum of 6 inches horizontally in a shingling manner.

F. Window and Door Openings: Extend weather barrier completely over openings.

G. Weather Barrier Attachment:

1. Attach weather barrier to studs through exterior sheathing. Secure using weather barrier manufacturer recommended fasteners, spaced 12 -18 inches vertically on center along stud line, and 24 inch on center, maximum horizontally.

3.03 SEAMING

A. Seal seams of weather barrier with seam tape at all vertical and horizontal overlapping seams.

B. Seal any tears or cuts as recommended by weather barrier manufacturer.

3.04 OPENING PREPARATION (FOR USE WITH FLANGED WINDOWS).

A. Cut weather barrier membrane in a modified “I-cut” pattern.

1. Cut weather barrier horizontally along the bottom of the header.

2. Cut weather barrier vertically 2/3 of the way down from top center of window opening.

3. Cut weather barrier diagonally from bottom of center vertical cut to the left and right corners of the opening.

4. Fold side and bottom weather barrier flaps into window opening and fasten.

B. Cut a head flap at 45-degree angle in the weather barrier membrane at window head to expose 8 inches of sheathing. Temporarily secure weather barrier membrane flap away from sheathing with tape.

3.05 FLASHING

A. Cut a minimum 9-inch wide flexible wrap a minimum of 12 inches longer than width of sill rough opening. Apply primer as recommended by the manufacturer.

B. Cover horizontal sill by aligning flexible wrap edge with inside edge of sill. Adhere to rough opening across sill and up jambs a minimum of 6 inches. Secure flashing tightly into corners by working in along the sill before adhering up the jambs.

C. Fan flexible wrap at bottom corners onto face of wall. Firmly press in place. Mechanically fasten fanned edges.

D. On exterior, apply continuous bead of sealant to wall or backside of window mounting flange across jambs and head. Do not apply sealant across sill.

E. Install window according to manufacturer’s instructions.

F. Apply 4-inch wide strips of straight flashing at jambs overlapping entire mounting flange. Extend jamb flashing 1-inch above top of rough opening and below bottom edge of sill flashing.

G. Apply 4-inch wide strip of straight flashing as head flashing overlapping the mounting flange. Head flashing should extend beyond outside edges of both jamb flashings.

H. Position weather barrier head flap across head flashing. Adhere using 4-inch wide Straight Flash over the 45-degree seams.

I. Tape head flap in accordance with manufacturer recommendations.

J. On interior, install backer rod in joint between frame of window and flashed rough framing. Apply sealant around entire window to create air seal. Apply sealant in accordance with sealant manufacturer’s instructions and ASTM C1193.

3.06 PROTECTION

A. Protect installed weather barrier from damage.

END OF SECTION

SECTION 07 31 10

ASPHALT SHINGLES SYSTEM

PART 1 GENERAL

1.01 SCOPE

A. Granular surfaced Dimensional Asphalt Shingle roofing.

B. Moisture shedding underlayment, eave, valley and ridge protection.

C. Installation of flashings.

D. Pre-coated aluminum.

E. Permanent fall protection roof anchors.

1.02 REFERENCES

A. ANSI/ASTM D225 - Asphalt Shingles (Organic Felt) Surfaced with Mineral Granules.

B. ANSI/ASTM D226 - Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.

C. ASTM A525 - Metal Flashing Prefinished Sheet Metal (Zinc-Coated).

D. ASTM A653 - Galvanized Steel: structural steel sheet, G90 zinc coating

E. ASTM B209 - Aluminum and Aluminum Alloy Sheet and Plate.

F. ASTM D2822 - Plastic Cement Asphalt Type with Mineral Fiber Components.

G. SMACNA - Architectural Sheet Metal Manual.

H. NATIONAL COIL COATERING ASSOCIATION TECHNICAL MANUAL AND AN AMA 605.2-92 - Trim Coil, Acrylic Aluminum.

1.03 SUBMITTALS

A. Product Data: Product characteristics and performance criteria

1. Asphalt Shingles
2. Ridge Vent
3. Roof Vent
4. Roof Vent Cap/Exhaust Vent
5. Shingle Over Intake Vent
6. Permanent Fall Protection Roof Anchor
7. Underlayment
8. Ice Dam Membrane

B. Color Sample:

1. Shingles: One (1) full size color sample.

C. Warranty:

1. Shingle manufacturer’s 30 year warranty

2. Contractor's Warranty: Provide warranty for 5 years that the asphalt shingle roofing system, as installed, is free from defects in workmanship. When repairs due to defective workmanship are required during the Contractor's warranty period, the Contractor must make such repairs within 72 hours of notification. When repairs are not performed within the specified time, emergency repairs performed by others will not void the warranty.

D. Manufacturer's Installation Instructions:

1. Asphalt Shingles

2. Permanent Fall Protection Roof Anchors

1.04 QUALITY ASSURANCE

A. Perform work in accordance with the manufacturer's recommendations.

PART 2 PRODUCTS

2.01 ASPHALT SHINGLES

A. Heavy Weight, Dimensional Asphalt Shingle: Conforming to ASTM D 3018 Type I – Self-Sealing, UL Certification of ASTM D 3462, ASTM D 3161/UL997 110-mph Wind Resistance and UL Class A Fire Resistance, glass fiber mat base, ceramically colored/UV resistant mineral surface granules across entire face of shingle; algae-resistance; weight: 229 / 240 pounds per square; two piece laminate shingle.

B. Provide shingle manufacturer's lifetime warranty on installed work, agreeing to pay for repair or replacement of defective shingles as necessary.

C. Color: To match Certain-Teed Corporation, Designer Shingles, Landmark, color shall be Cottage Red.

1. Other approved equals with color subject to approval by COR. Materials can be rejected due to color disapproval.

2.02 SHEET MATERIALS

A. Underlayment

1. 3.5 Synthetic spun bonded poly propylene based underlayment ASTM D108 (Fire), ASTM G154 (UV).

2. Ice Dam Membrane: ASTM D1970; self-adhering polymer modified bituminous sheet material, slip resistant surface, 40 mils thick, 36 inches wide, with strippable release paper to expose adhesive surface.

2.03 FLASHING MATERIALS

A. Aluminum Sheet: ASTM B209, 3003 alloy, H/H temper; shop pre-coated with coating of selected color, 0.024" thick, Smooth

B. Drip Edge: Aluminum or steel factory fabricated and finished, in longest lengths possible.

C. Valley Flashing: Galvanized Steel: structural steel sheet, G90 zinc coating 26 gauge.

2.04 ACCESSORIES

A. Fasteners

1. Roofing Nails: Standard round wire shingle type, hot dipped zinc coated steel, minimum 13/64 inch diameter and 0.080 inch shank diameter, 1-1/4 inch of sufficient length to penetrate through roof sheathing.

2. Drip edge; aluminum or painted steel.

3. Aluminum Flashing: Aluminum finish exposed fasteners same color as flashing metal.

B. Plastic Cement

1. ASTM D2822, asphalt type with mineral fiber components, free of toxic solvents and asbestos, capable of setting within 24 hours at temperature of 75 degrees F.

2. Workability: The cement shall be of a consistency that will spread readily and permit trowelling smooth coatings, 1⁄16 to 1⁄4 in. thick, on prepared roofing, saturated felt, and metal surfaces at ambient temperatures above 50°F.

3. Behavior at 140°F: The cement shall show no evidence of blistering, and sag or slide shall be no greater than 1⁄4 in.

4. Pliability at 32°F: There shall be no cracking or separation of the cement from the metal.

C. Molded Pipe Seals

1. Factory molded rubber pipe seals in diameter for all pipe penetrating roof membrane.

D. Ventilation

1. The minimum required net free ventilating area shall be 1/300 of the area of the space ventilated, and provided 50 percent of the required ventilating area provided by ridge vents, with the balance of the required ventilation provided by shingle over intake vents. The removal of blocking between rafters at the top plate may be required to facilitate this.

2. Roofs with exposed rafter tails or no eave or cornice/soffit vents, shingle over intake vents shall be used for the lower portion of the space to be ventilated. Shingle over intake vents shall be located at the top plate and rafter intersection.

a. Ridge Vent: Shingle over type, minimum of 18 in^2/linear feet.
b. Shingle Over Intake Vent: minimum of 9 in^2/linear feet.
c. Ridge vent and Shingle Over Intake Vent shall be from the same manufacturer.
d. Roof Vent: Aluminum, low profile, compact vent, screened. NFA 40 (sq. in.)
e. Roof Vent Cap/Exhaust Vent: Use with round duct. Shall have a built-in back draft damper and bird screen. Galvanized steel. Baked enamel, black finish.

E. Permanent Fall Protection Roof Anchors

1. U-Bolt Roof Anchor: Stainless steel construction with thermoplastic flashing and weathertight anchor cap by DBA/SALA or Government Approved Equal.
2. Minimum Breaking Strength: 5,000 lbs.
3. Weight: 1.75 lbs.
4. 3/8 in. x 3 in. x 17.75 in.
5. Capacity: One person; 310 lbs.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify deck surfaces are dry, free of ridges, warps, or voids.

B. Verify roof openings are correctly patched prior to installing work of this section.

C. Verify that all abandoned pipes and conduits are removed below the roof line and roof deck is patched.

D. Verify that roof penetrations and plumbing stacks are in place and flashed to deck surface.

3.02 PREPARATION

A. Delivery, storage and handling.

1. Deliver materials in manufacturer's unopened, labeled containers.
2. Store materials to avoid water damage, and store rolled goods on end. Comply with manufacturer's recommendations for job-site storage and protection.

B. Project conditions.

1. Temporary Covers: At the end of each work day all exposed roof decking and holes are to be covered to prevent moisture penetration into the building in a means to withstand severe weather conditions typical of this area.

C. Sequencing and scheduling.

1. Coordinate roof installation with related work to insure proper installation sequence of flashing, fascia, drip edge, chimneys, vents and other related items.

3.03 INSTALLATION

A. Flashings

1. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.

B. Eave protection.

1. Place eave edge and gable edge metal flashings tight with fascia boards. Weather lap joints 2 inches and secure flange with nails.

2. Install ice dam membrane in accordance with manufacturer's instructions up 66" from lower edge of drip flashing.

3. Install per manufacturer's instructions.

C. Protective underlayment.

1. Place one ply of underlayment over entire roof, with ends and edges weather lapped minimum 6 inches. Stagger end laps of each consecutive layer. Fasten in place.

2. Install protective underlayment perpendicular to slope of roof and weather lap minimum 4 inches over eave protection.

D. Asphalt shingles.

1. Install shingles in accordance with manufacturer's instructions for installation in all seasons.

E. Valleys.

1. Open Valley

a. Mineral-surfaced

1) Valley lining of two plies of mineral-surfaced roll roofing complying with ASTM D 3909 or ASTM D 6380 shall be permitted. The bottom layer shall be 18 inches and the top layer a minimum of 36 inches wide.

b. Sheet metal

1) Place one layer of sheet metal flashings, 26 gauge (zinc-coated G90), minimum 24 inches wide, centered over open valleys and crimped to guide water. Weather lap joints minimum 2 inches, unless otherwise specified. Nail in place minimum 18 inches on center, one inch from edges.

c. At ridge, trim shingles from slope 1-1/2 inches from valley center line, lower ends should diverge from center line 1/8 inch per foot. Eave openings shall not exceed 8 inches. If valley exceeds 20 feet in length, change taper from 1/8 inch per foot to maintain a 3 inch opening at eave. Cement shingles to valley line with a 3 inch width of asphalt cement.

2. Closed Valley (Woven valley only)

a. Valley lining of one ply of smooth roll roofing complying with ASTM D 6380, Class S Type III, Class M Type II or ASTM D 3909 and at least 36 inches wide or types as described in Items 1 and 2 above shall be permitted. Specialty underlayment shall comply with ASTM D 1970.

3. Closed cut valley flashing may not be used. UFC 3-110-03 3-3.4

F. Shingle Over Intake Vent.

1. Install shingle over intake vent along entire eave in accordance with manufacturer's instructions.

G. Permanent Fall Protection Roof Anchors

1. Install fall arrest system in accordance with manufacturer's printed installation instructions.

END OF SECTION

SECTION 07 46 19

STEEL SIDING

PART 1 GENERAL

1.01 SCOPE

A. Provide steel siding work as shown and as specified.

1.02 REFERENCES

A. ASTM A755/A755M - Standard Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products.

1.03 SUBMITTALS

A. Product Data: Submit data on siding.

B. Manufacturer's Installation Instructions.

C. Warranty.

D. Samples: Submit two samples of siding, 12 x 10 inch in size illustrating finish color, sheen, and texture.

1.04 WARRANTY

A. Siding must have fifty-year material and a ten-year fade protection warranty.

PART 2 PRODUCTS

2.01 STEEL DUTCH-LAP SIDING MATERIALS

A. Preformed steel panels with double 5" dutch-lap profile, with concealed fastening system, and manufacturer's standard wood grained embossed PVC color and texture.

B. Color sample must closely match Gentek Pearl Grey.

C. Siding to be fabricated from nominal 29 gauge galvanized steel coil, with both sides zinc coated to a minimum of G-60 coating by continuous hot dipped galvanized method with a tensile strength PSI of 50,000 and a yield strength PSI of 35,000. All material to conform to ASTM A6531 and A653M-97.

2.02 ACCESSORIES

A. Preformed steel inside and outside corner posts, starter strips, drip caps, and trim channels, prefinished to match siding panels.

2.03 FASTENERS

A. Hot-dip galvanized siding or roofing nails of sufficient length to penetrate minimum of 1" into substrate.

B. Provide prefinished nails in color to match siding where face nailing is required.

PART 3 EXECUTION

3.01 PREPARATION

A. Before starting work verify no unsupported areas are present and assure sheathing is solidly attached.

3.02 INSTALLATION

A. Install vapor permeable building wrap in accordance with manufacturer's specifications.

B. Install foil tape to seal door and window fins.

C. Install siding in accordance with manufacturer's recommendations and acceptable construction practices.

D. Caulk around all windows, doors, and other penetrations of the siding.

END OF SECTION

SECTION 07 71 23

GUTTERS AND DOWNSPOUTS

PART 1 GENERAL

1.01 SCOPE

A. Section includes pre-finished aluminum gutters and downspouts.

1.02 REFERENCES

A. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate

1.03 SUBMITTALS

A. Shop Drawings: Indicate locations, configurations, jointing methods, fastening methods, locations, and installation details.

B. Color Chart for metal gutter, downspouts and brackets.

1.04 QUALITY ASSURANCE

A. Perform Work in accordance with SMACNA Manual.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope to drain.

B. During storage, prevent contact with materials capable of causing discoloration, staining, or damage.

PART 2 PRODUCTS

2.01 GUTTERS AND DOWNSPOUTS

A. Product Description:

1. Gutters: Aluminum; 5” K style.

2. Downspouts: Aluminum; Profile to be 3” x 4” open face.

3. Splash Blocks: Precast concrete.

2.02 COMPONENTS

A. Pre-Finished Aluminum Sheet: ASTM B209, manufacturer’s standard alloy and temper for specified finish; 0.032 inch thick; plain finish shop pre-coated with PVDF (polyvinylidene fluoride) coating; K style color shall be white, Box style color shall be bronze.

2.03 ACCESSORIES

A. Anchors and Supports: Profiled to suit gutters and downspouts.

1. Anchoring Devices: Type recommended by gutter fabricator.

2. Gutter Supports: Type recommended by gutter fabricator.

3. Downspout Supports: Type recommended by downspout fabricator.

B. Fasteners: Same material and finish as gutters and downspouts, with soft neoprene washers.

C. Primer: Zinc molybdate type.

D. Protective Backing Paint: Zinc molybdate alkyd.

E. Sealant: high-performance elastomeric gutter sealant for use in roofing, trim, architectural metal, manufacturing, and general construction applications with a minimum 1 year warranty.

2.04 FABRICATION

A. Form gutters and downspouts of profiles and sizes specified.

B. Fabricate with required connection pieces.

C. Form sections square and accurate in size, in maximum possible lengths, free of distortion or defects detrimental to appearance or performance.

D. Hem exposed metal edges.

2.05 FACTORY FINISHING

A. Modified silicone or acrylic polyester coating: Baked enamel system conforming to AAMA 2603.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify surfaces are ready to receive gutters and downspouts.

3.02 PREPARATION

A. Paint concealed metal surfaces and surfaces in contact with dissimilar metals with protective backing paint to minimum dry film thickness of 15 mil.

3.03 INSTALLATION

A. Sheet Metal: Join lengths with formed seams sealed watertight. Flash and seal gutters to downspouts and accessories.

B. Install gutters to insure proper drainage.

C. Gutter joints shall be 1.5 inch lap, riveted and fully sealed using a high-performance elastomeric gutter sealant for use in roofing, trim, architectural metal, manufacturing, and general construction applications. All corners shall be mitered joints fully sealed.

D. Gutters shall be fully secured to building using gutter straps on every seam to support the front edge. Gutter straps shall be installed using stainless steel screws.

E. Downspouts shall be installed plumb and securely attached with support straps every 48 inches.

F. Set splash blocks under downspouts.

END OF SECTION

SECTION 07 92 00

JOINT SEALANTS

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes joint sealants for the following applications, including those specified by reference to this Section:

1. Exterior joints in vertical surfaces and horizontal nontraffic surfaces.

2. Interior joints in vertical surfaces and horizontal nontraffic surfaces.

3. Interior joints in horizontal traffic surfaces.

1.02 PERFORMANCE REQUIREMENTS

A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

1.03 SUBMITTALS

A. Product Data: For each joint-sealant product indicated

B. Color Samples: For each type and color of joint sealant required, provide Samples with joint sealants in 1/2-inch-wide joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint sealants

1.04 QUALITY ASSURANCE

A. Preconstruction Field-Adhesion Testing: Before installing elastomeric sealants, field test their adhesion to Project joint substrates according to the method in ASTM C1193 that is appropriate for the types of Project joints.

B. Joints in mockups of assemblies specified in other Sections that are indicated to receive elastomeric joint sealants, which are specified by reference to this Section.

1.05 WARRANTY

A. Special Installer's Warranty: Installer's standard form in which Installer agrees to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of acceptance by the Government.

B. Special Manufacturer's Warranty: Manufacturer's standard form in which elastomeric sealant manufacturer agrees to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of acceptance by the Government.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in other Part 2 articles.

2.02 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.

B. Colors of Exposed Joint Sealants: As selected by COR.

2.03 ELASTOMERIC JOINT SEALANTS

A. Elastomeric Sealants: Comply with ASTM C920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C920 classifications for type, grade, class, and uses related to exposure and joint substrates.

B. Single-Component Pourable Neutral-Curing Silicone Sealant:

1. Type and Grade: S (single component) and P (pourable).

2. Class: 100/50.

3. Uses Related to Exposure: NT and T (traffic).

4. Uses Related to Joint Substrates: M, A, and O, as applicable to joint substrates indicated.

C. Single-Component Neutral-Curing Silicone Sealant:

1. Type and Grade: S (single component) and NS (nonsag).

2. Class: 50.

3. Use Related to Exposure: NT (nontraffic).

4. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.

5. Stain-Test-Response Characteristics: Nonstaining to porous substrates per ASTM C1248.

D. Single-Component Acid-Curing Silicone Sealant:

1. Type and Grade: S (single component) and NS (nonsag).

2. Class: 25.

3. Use Related to Exposure: NT (nontraffic).

4. Uses Related to Joint Substrates: G, A, and, as applicable to joint substrates indicated, O.

E. Single-Component Pourable Urethane Sealant:

1. Type and Grade: S (single component) and P (pourable).

2. Class: 25.

3. Use Related to Exposure: T (traffic).

4. Uses Related to Joint Substrates: M, A, and, as applicable to joint substrates indicated, O.

F. Latex Joint Sealants:

1. Latex Sealant: Comply with ASTM C834, Type O P, Grade NF.

2.04 JOINT-SEALANT BACKING

A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C1330, Type C (closed-cell material with a surface skin) O (open-cell material) B (bicellular material with a surface skin) or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.05 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 EXECUTION

3.01 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants.

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant.

a. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles

remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air.

2. Remove laitance and form-release agents from concrete.

a. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.

B. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.02 INSTALLATION

A. Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

B. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.

2. Do not stretch, twist, puncture, or tear sealant backings.

3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

C. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

D. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.

2. Completely fill recesses in each joint configuration.

3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.

2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.

3. Provide concave joint configuration per Figure 5A in ASTM C1193, unless otherwise indicated.

F. Installation of Preformed Silicone-Sealant System: Comply with manufacturer's written instructions.

G. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping, taking care not to pull or stretch material, producing seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures where expansion of sealant requires acceleration to produce seal, apply heat to sealant in compliance with sealant manufacturer's written instructions.

H. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.03 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Exterior and Interior horizontal nontraffic and traffic isolation and contraction joints in cast-in-place concrete slabs.

1. Joint Sealant: Single-component pourable neutral-curing silicone sealant.

2. Joint-Sealant Color: Match adjacent material.

B. Joint-Sealant Application: Exterior vertical control and expansion joints in unit masonry.

1. Joint Sealant: Single-component neutral-curing silicone sealant.

2. Joint-Sealant Color: Match adjacent material.

C. Joint-Sealant Application: Exterior vertical joints between different materials listed above.

1. Joint Sealant: Single-component neutral-curing silicone sealant.

2. Joint-Sealant Color: Match adjacent material.

D. Joint-Sealant Application: Exterior perimeter joints between masonry and frames of doors and windows.

1. Joint Sealant: Single-component neutral-curing silicone sealant.

2. Joint-Sealant Color: Manufacturer’s standard light gray at anodized aluminum frames. Match masonry at painted frames.

E. Joint-Sealant Application: Vertical control and expansion joints on exposed interior surfaces of exterior walls.

1. Joint Sealant: Paintable Latex sealant.

2. Joint-Sealant Color: Paint to match adjacent wall material.

F. Joint-Sealant Application: Interior perimeter joints of exterior openings.

1. Joint Sealant: Paintable Latex sealant.

2. Joint-Sealant Color: Paint to match adjacent material.

G. Joint-Sealant Application: Perimeter joints between interior wall surfaces and frames of interior doors and windows.

1. Joint Sealant: Paintable Latex sealant.

2. Joint-Sealant Color: Paint to match adjacent wall material.

END OF SECTION

SECTION 08 12 00

STANDARD STEEL FRAMES

PART 1 GENERAL

1.01 SCOPE

A. Exterior and Interior Steel Door Frames and Interior Window Frames.

1.02 REFERENCES

A. ANSI/SDI

1. A250.8-2003 - Recommended Specifications for Standard Steel Doors and Frames.

B. ASTM International

1. ASTM A653-10 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

C. Hollow Metal Manufacturers Association:

1. HMMA 802 - Manufacturing of Hollow Metal Doors and Frames.

2. HMMA 820 - Hollow Metal Frames.

3. HMMA 830 - Hardware Preparation and Locations for Hollow Metal Doors and Frames.

4. HMMA 840 - Installation and Storage of Hollow Metal Doors and Frames.

5. HMMA 850 - Fire Rated Hollow Metal Doors & Frames.

6. HMMA 890 - Technical Summary of Hollow Metal by HMMA.

D. National Fire Protection Association:

1. NFPA 80 - Standard for Fire Doors, Fire Windows.

2. NFPA 105 - Standard for the Installation of Smoke Door Assemblies and other Opening Protective's.

3. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies.

E. Underwriters Laboratories Inc.:

1. UL 10B - Fire Tests of Door Assemblies.

2. UL 10C - Positive Pressure Fire Tests of Door Assemblies.

PART 2 PRODUCTS

2.01 FRAMES

A. Exterior Frames: 14 gauge/0.067 inch thick material, with mechanically attached gasket.

B. Interior Frames: 16 gauge/0.053 inch thick material, base metal thickness.

C. Fire Rated Frames: Shall have manufacturer applied fire label.

2.02 ACCESSORIES

A. Silencers: Resilient rubber, fitted into drilled holes.

B. Primer: Zinc chromate type.

2.03 FABRICATION

A. Fabricated frames shall be set-up and continuously welded and ground smooth. Mitered corners not including stops to hairline accuracy shall have reinforcements with integral tabs for secure interlock of jambs to head, with spreader bars attached.

B. Fabricate frames with hardware reinforcement plates welded in place.

C. Reinforce frames wider than 48 inches with roll formed steel channels fitted tightly into frame head, flush with top.

D. Prepare frame for silencers. Provide three single silencers for single doors on strike side. Provide two single silencers on frame head at double doors without mullions.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that opening sizes and tolerances are acceptable.

B. Accept frames on site in manufacturer's packaging. Inspect for damage.

3.02 INSTALLATION

A. Install frames in accordance with HMMA 840 and HMMA 830 for hardware installation.

B. Caulk around doorjamb with exterior grade caulk. Caulk shall be 25 year, paintable, and able to withstand -50°F to 100°F.

C. Coordinate with wood frame and gypsum board wall construction for anchor placement. No less than 3 anchors shall be installed at each jamb of each frame for securing frame to wall construction. Anchor each jamb and mullion to floor through attached clip angles as recommended by manufacturer.

D. Touch-up factory finished frames.

3.03 ERECTION TOLERANCES

A. Frames shall be hung plumb and square.

END OF SECTION

SECTION 08 13 13

STANDARD STEEL DOORS

PART 1 GENERAL

1.01 SCOPE

A. Rated and non-rated doors and thermally insulated steel doors.

1.02 REFERENCES

A. ANSI A115 - Hardware Reinforcements for Steel Doors.

B. ANSI/SDI A250.8 1998 - SDI 100 - Standard Steel Doors and Frames.

C. ASTM A924 - Steel Sheet, Zinc Coated (Galvanized) by the Hot Dip Process.

D. ASTM C236 - Test Method for Steady State Thermal Performance of Building Assemblies by Means of a Guarded Hotbox.

E. ASTM E413 - Classification for Determination of Sound Transmission Class.

F. UL 10B and 10C - Fire Tests of Door Assemblies

1.03 SUBMITTALS

A. Shop Drawings: Provide the following information:

1. Door type.

2. Door size.

3. Fire Rating.

4. Hardware blocking requirements and location.

5. Vision panel or louver cutout size and location.

PART 2 PRODUCTS

2.01 DOORS

A. Exterior insulated doors (Non-thermally Broken): SDI-100, Level III, Extra heavy duty, Model 1.

2.02 DOOR CONSTRUCTION

A. Face: Steel sheet 16 gauge galvanized / galvannealed steel in accordance with ASTM 924

B. Core: Polystyrene foam.

C. Thermal Insulated Door: Minimum total insulation R value of 7, measured in accordance with ASTM C236.

D. Door lock edge reinforcing shall be one piece, full height 14 gauge channel, door hinge reinforcing 12 gauge channel, formed and tapped for hinges.

E. Top of exterior doors shall have continuous flush top cap welded to each face.

F. Doors prepped for locks.

G. Fire rated doors to have manufacturer applied fire label applied to edge of door.

2.03 FABRICATION

A. Fabricate doors with hardware reinforcement welded in place.

B. Factory primer: Zinc chromate type.

2.04 QUALITY ASSURANCE

A. Conform to requirements of ANSI/SDI-100.

PART 3 EXECUTION

3.01 EXAMINATION

A. Accept doors on site in manufacturer's packaging. Inspect for damage.

B. Verify that field measurements are as indicated on shop drawings.

C. Coordinate the work with door rough opening construction, door frame, and door hardware installation.

3.02 INSTALLATION

A. Verify that opening sizes and tolerances are acceptable.

B. Install doors in accordance with ANSI/SDI 100 and DHI.

3.03 ERECTION TOLERANCES

A. Door shall be hung plumb and square.

3.04 ADJUSTING

A. Adjust door for smooth and balanced door movement.

END OF SECTION

SECTION 08 14 16

FLUSH WOOD DOORS

PART 1 GENERAL

1.01 SCOPE

A. Solid core flush wood doors; flush and flush glazed configuration, fire-rated and non-rated.

1.02 REFERENCES

A. AWI - Quality Standards of the Architectural Woodwork Institute.

B. NWMA National Woodwork Manufacturer's Association: Industry Standards I.S. 1-69 "Wood Flush Doors".

C. NFPA 80 - Fire Doors and Windows

D. NFPA 252 - Standard Methods of Fire Tests for Door Assemblies

E. UL 10B - Fire Tests of Door Assemblies.

F. USGBC/LEED - US Green Building Council/Leadership in Energy and Environmental Design.

G. Warnock-Hersey - Certification Listings for Fire Doors.

1.03 SUBMITTALS

A. Product Data: Indicate door core materials, construction, and veneer species.

B. Shop Drawings: Provide the following information:

1. Door type.

2. Door size.

3. Fire Rating.

4. Hardware types and locations.

5. Hardware blocking requirements and location.

6. Vision panel or louver cutout size and location.

C. Warranty: Provide manufacturer's 5 year written guarantee for door assembly. Include coverage for delaminating of veneer, warping beyond specified installation tolerances, defective materials and telegraphing core construction.

PART 2 PRODUCTS

2.01 DOOR TYPE:

A. Flush Interior Doors: 1 3/4 inches thick; solid core construction.

2.02 DOOR CONSTRUCTION

A. Core

1. Non-rated doors - Solid core, Type PC-Particleboard. 28-32 lbs/cu. ft. density.

2. Fire rated doors - Mineral core.

B. Provide 1-1/2 inch thick side edge strips with exposed strip maple or beech, top and bottom edge strips 1-1/4 inch thickness of hardwood.

C. Doors shall be factory prepared to receive locking/latching hardware and window kits as applicable.

2.03 FLUSH DOOR FACING

A. Veneer Facing (Flush Interior Doors): AWI Premium quality species wood, plain sliced oak of manufacturer's standard thickness with end matched grain and hardwood cross bands for transparent finish.

B. Hot press bond face veneers and cross bands to core with waterproof adhesive conforming to NWMA I.S. 1-69 Type I.

2.04 ADHESIVE

A. Facing Adhesive: Type II - water resistant.

2.05 FABRICATION

A. Fabricate non-rated doors in accordance with ACI Quality Standards requirements.

B. Fabricate fire-rated doors in accordance with ACI quality standards and to UL and Warnock-Hersey requirements. Attach fire rating label to door.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that opening sizes and tolerances are acceptable.

B. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.02 INSTALLATION

A. Install fire rated and non-rated doors in accordance with AWI Quality Standard, NFPA 80 and to NFPA 101 requirements.

B. Trim non-rated door width by cutting equally on both jamb edges.

C. Trim door height by cutting bottom edges to a maximum of 3/4 inch. Trim fire door height at bottom edge only, in accordance with fire rating requirements.

D. Pilot drill screw and bolt holes.

E. Machine cut for hardware. Core for handsets and cylinders.

3.03 ADJUSTING

A. Install doors plumb and fit to frame with even margins between door and frame.

B. Install all finish hardware as specified.

C. Adjust door operation and hardware for smooth and balanced door movement.

D. Provide in place protection to door faces as required to prevent damage.

END OF SECTION

SECTION 08 53 00

VINYL CLAD DOUBLE-HUNG WOOD WINDOWS

PART 1 GENERAL

1.01 SCOPE

A. New vinyl clad double-hung wood windows with related trim and accessories.

B. Operating hardware and framed insect screens.

C. Weather stripping.

D. Foil tape sealant at perimeter of new window.

E. Siding and accessory items required for a complete installation.

1.02 REFERENCES

A. ASTM E283-84 - Rate of Air Leakage through Exterior Windows, Curtain Walls, and Doors.

B. ASTM E330-90 - Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

C. ASTM E547-86 - Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

D. ANSI/NWWDA IS-2 - Wood Windows.

E. ANSI/NWWDA IS-4 - Water Repellent Preservative Non-Pressure Treatment for Millwork.

1.03 SUBMITTALS:

A. Product Data:

1. Performance Requirements

2. Materials

3. Finish

4. Screen Frame

5. Hardware

B. Warranty

1. Provide ten (10) year manufacturer's written warranty including coverage of insulating glass units and delamination or separation of finish cladding from window member.

C. Quality Control

1. Manufacturers' statement. See QUALITY CONTROL.

PART 2 PRODUCTS

2.01 WINDOW UNITS

A. Type: Double-Hung Vinyl Clad.

B. Performance Requirements

1. Conform to performance requirements of high performance Thermopane Low E argon window with high performance Sun Low E coating to include the following characteristics:

   a. Center of Glass U Value: 32 max.

   b. Visible Light Transmission: 38% minimum.

   c. Ultra-Violet Transmission: 16% maximum.

   d. Shading Coefficient: 0.36.

   e. Solar Transmission: 26%.

   f. Design Windload: 40 psf.

   g. Glazing to comply with UFC 4-010-01, Standard 10

2. Air Infiltration: Windows shall meet the performance requirements of ASTM E283, except air infiltration shall not exceed .17 cfm per linear foot of sash crack when tested at 1.57 psf.

3. Vapor Seal of Operable Sash: Installed Window Unit: To withstand without failure, 73 degrees F at 40 percent relative humidity condition at design exterior ambient conditions while maintaining interior atmospheric pressure of one inch static pressure.

4. Water Infiltration: No water penetration when tested in accordance with ASTM E547 under static pressure of 2.86 psf after 15 minutes with water being applied at a rate of five gallons per hour per square foot.

5. Wind and Suction Loads Acting Normal to Plane of Window Unit: In accordance with applicable code.

6. Deflection: 0.4% of span maximum, when subjected to ASTM E330, with wind and suction loads acting normal to plane of glazed window unit, measured on any framing member at 20 psf.

C. Quality Assurance

1. Windows shall meet National Wood Window and Door Association (NWWDA) I.S. 2-88 as amended within this section.

2. For all windows not listed in the recommended manufacturer list in Section 2.01 all testing shall be conducted by an independent testing laboratory at the expense of the Contractor.

3. Windows chosen for laboratory testing shall represent units normally found in manufacturer's stock.

D. Materials

1. Wood frame members shall be western clear pine species; treated with a water repellent preservative after machining in accordance with NWWDA I.S.-4 and white interior finish.

2. Frame shall consist of a treated wood core with exterior surfaces clad in a white, color impregnated rigid vinyl extrusion.

3. The sashes shall be wood and treated with a preservative after machining. Exterior surfaces of the sash shall be clad in rigid vinyl or a factory coated polyurea or polyester urethane finish, color to match frame.

4. Glazing: Sash shall be factory glazed with elastic glazing sealant and snap-in rigid vinyl beads, color to match sash.

5. Glass: Shall be double-pane insulating 5/8 inch, R=2.0, Low E glass with argon gas space.

6. Weather stripping: Vinyl foam type and rigid vinyl. All weather stripping shall be factory installed.

7. Screens: Each operable sash shall be fitted with a window manufacturer's approved full screen including attaching hardware. Screens shall be easily removed.

   a. Screen frames shall be aluminum with factory applied finish.

   b. Screen cloth shall be installed in a manner to allow replacement.

   c. Screen cloth shall be 18/16 mesh; aluminum or fiberglass.

8. Provide compatible jamb and sill extensions required to complete work.

E. Finishes

1. Vinyl Cladding Color: Low sheen white.

2. Interior Surfaces: Pre-finished white.

F. Warranty

1. Provide ten (10) year manufacturer's written warranty including coverage of insulating glass units and delamination or separation of finish cladding from window member.

2.02 HARDWARE

A. One zinc die cast window lock shall be factory installed on each window.

B. One sash lift shall be factory installed on lower sash of each window.

C. Top and bottom sash shall be factory balanced. Balance system shall be designed to counterbalance weight of various sizes and glazings to assure easy operation.

PART 3 EXECUTION

3.01 INSPECTION

A. Prior to installation opening shall be inspected and surfaces shall be clean and dry.

B. Ensure that nail heads are driven flush with all surfaces in the opening and within three inches of opening.

C. Verify that rough opening size is correct. Sill plate shall be level.

3.02 PREPARATION

A. Provide required wood framing, blocking, and sheathing to complete the work.

B. Close and lock operating sash.

3.03 INSTALLATION

A. Install windows in strict accordance with manufacturer's instructions. Use only those accessories, sealants and tabs as provided with each window unit by its respective manufacturer.

B. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.

C. Align window plumb and level, free of warp or twist. Maintain dimensional tolerances, aligning with adjacent work.

D. Center window in opening, rest bottom of unit on existing sill plate, unless the drawings indicate a different mounting height.

E. Ensure air and vapor barrier is sealed to window frame. Install batt insulation in all in-filled wall areas and crevices around windows.

F. Provide thermal isolation where components penetrate or disrupt building insulation. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

G. Coordinate attachment and seal of perimeter air and vapor barrier materials with other installing trades.

H. Install operating hardware.

3.04 EXTERIOR FINISHING

A. Apply foil tape sealant around perimeter of window before siding is installed.

B. Check final installation against

3.05 INTERIOR FINISHING

A. Finish with solid oak casing.

3.06 TOLERANCES

A. Maximum Variation from Level or Plumb: Plus or minus 1/16 inch from true measurement.

B. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch from 10-foot straight edge.

3.07 ADJUSTING

A. Adjust operating hardware for smooth operation.

3.08 CLEANING

A. Clean surfaces to remove soil without using abrasive cleaners or solutions containing corrosive solvents.

B. Remove all labels from windows.

C. Leave window units in closed and locked position.

3.09 QUAILITY CONTROL

A. Provide a written statement indicating all windows installed in each building have been properly installed and are operating properly per the manufacturer's installation instructions.

END OF SECTION

SECTION 08 71 00

DOOR HARDWARE

PART 1 GENERAL

1.01 SCOPE

A. Hardware for interior and exterior doors.

B. Thresholds.

C. Weather-stripping.

1.02 REFERENCES

A. ANSI A115.2 - Door and Frame Preparation for Bored or Cylindrical Locks for 1-3/4 inch doors.

B. ANSI A115.9 - Door and Frame Preparation for Closer, Offset Hung, Single Acting.

C. ANSI A156.1 - Butts and Hinges.

D. ANSI A156.2 - Locks and Lock Trim.

E. ANSI A156.4 - Door Controls (Closers).

F. ANSI A156.6 - Architectural Door Trim.

G. NFPA 80 - Fire Doors and Windows.

H. NFPA 252 - Fire Tests of Door Assemblies.

1.03 SUBMITTALS:

A. Product Data:

1. Door Hardware.

PART 2 PRODUCTS

2.01 KEYING

A. All locksets to be of one manufacturer.

B. Keyed locks shall be able to accept interchangeable cores, 7 pin, Figure 8, manufactured by Best Lock Corporation. Interchangeable cores and two sets of blank keys will be provided by the Contractor. Keying, lock schedule and installation of permanent core by government. Contractor to provide temporary construction cores.

2.02 FINISHES

A. Finishes: Satin chrome unless otherwise specified.

PART 3 EXECUTION

3.01 EXAMINATION

A. Delivery, Storage, and Handling.

1. Contractor shall use construction cores in keyed locks during the progress of the project.

2. Package hardware items individually; label and identify each package with door opening code to match hardware schedule.

3.02 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions.

B. Maintain standard mounting heights for hardware from finished floor to center line of hardware item.

C. Adjust hardware for smooth operation.

D. Do not permit adjacent work to damage hardware or finish.

PART 4 HARDWARE SCHEDULE

4.01 HARDWARE GROUP 1: (NOT USED)

4.02 HARDWARE GROUP 2: EXTERIOR MECHANICAL ROOM DOUBLE DOOR

A. Hinges: 1 1/2 pair of 4 1/2" x 4 1/2" non-removable pin (NRP) butt plate hinges each leaf, 630 finish, ANSI A5112.

B. Lock, Cylinder: Entry door lock two lever, ANSI F86 Function, 626 Finish, Grade 1. Mount on active leaf.

C. Overhead Stops and Holders: ANSI/ BHMA 156.8, CO2511, stop with shock absorber effective at all times. Hold open and release by push and pull on door, except when exposed control is set in inactive position. Mount on active and inactive leaf.

D. Threshold: Aluminum extrusion mill finish, 6063-T6 alloy, saddle type.

E. Weather-stripping: Neoprene mechanically fastened at head and sides.

F. Sweep: Aluminum, solid neoprene insert, surface mounted, ANSI R3B415.

G. Astragal: Grey primer steel astragal 1/8" x 2". Apply to active door leaf.

H. Flush Bolts: Manual flush bolt for metal doors, mounted top and bottom at inactive leaf. Chrome finish.

4.03 HARDWARE GROUP 3: (NOT USED)

4.04 HARDWARE GROUP 4: EXTERIOR DOOR

A. Hinges: 1 1/2 pair of 4 1/2" x 4 1/2" non-removable pin (NRP) butt plate, 630 finish, ANSI A5112.

B. Lock, Cylinder: Entry door lock two levers, ANSI F82 Function, 626 Finish, Grade 1.

C. Door Closer: ANSI C02021, parallel arm mounting, 689 finish, Function PT4D, PT4G, PT4H, inside building mounting with integrated door bumper. Provide sleeve mounting through door slab for all bolts.

D. Threshold: Aluminum extrusion mill finish, 6063-T6 alloy, saddle type.

E. Weather-stripping: Neoprene mechanically fastened at head and sides.

F. Sweep: Aluminum, solid neoprene insert, surface mounted, ANSI R3B415.

4.05 HARDWARE GROUP 5: STORAGE, CLOSET, OR INTERIOR MECHANICAL ROOM DOOR

A. Hinges: 1 1/2 pair of 4 1/2" x 4 1/2" non-removable pin (NRP) butt plate hinges each leaf, 652 finish, ANSI A8112.

B. Lock, Cylinder: Entry door lock two lever, ANSI F86 Function, 626 Finish, Grade 1. Each leaf.

C. Wall Bumper: ANSI/ BHMA 156.16, L02251, 626 finish

4.06 HARDWARE GROUP 6: OFFICE DOOR

A. Hinges: 1 1/2 pair of 4 1/2" x 4 1/2" non-removable pin (NRP) butt plate hinges each leaf, 652 finish, ANSI A8112.

B. Lock, Cylinder: Entry door lock two lever, ANSI F82 Function, 626 Finish, Grade 1.

C. Wall Bumper: ANSI/ BHMA 156.16, L02251, 626 finish

4.07 HARDWARE GROUP 7: (NOT USED)

4.08 HARDWARE GROUP 8: (NOT USED)

4.09 HARDWARE GROUP 9: TOILET ROOM – SINGLE USE

A. Hinges: 1 1/2 pair of 4 1/2" x 4 1/2" non-removable pin (NRP) butt plate hinges each leaf, 652 finish, ANSI A8112.

B. Lock, Cylinder: Privacy lock two lever, ANSI F76 Function, 626 Finish, Grade 1.

C. Wall Bumper: ANSI/ BHMA 156.16, L02251, 626 finish

D. Kick Plate: ANSI A156.6 J102; .050 minimum thickness, 10 inches x door width, stainless steel, mounted on the push side of he door, 654 finish.

END OF SECTION

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SECTION 08 80 00

GLAZING

PART 1 GENERAL

1.01 SCOPE

A. Provide glass and glazing for the following:

1. Storefront.

2. Entrances.

3. Mirrors.

1.02 SUBMITTALS

A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.

B. Shop Drawings: Submit shop drawings indicating material characteristics, details of construction, connections, and relationship with adjacent construction.

C. Warranty: Submit manufacturer's standard warranty. Include labor and materials to repair or replace defective materials.

1. Laminated Glass: Manufacturer's 4 year warranty.

2. Coated Glass: Manufacturer's 5 year warranty.

3. Insulating Glass: Manufacturer's 10 year warranty.

4. Mirror Glass: Manufacturer's 10 year warranty.

1.03 QUALITY ASSURANCE

A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 MATERIALS

A. Manufacturers: AFG Industries, Cardinal IG, Libby Owens Ford, Viracon, or approved equal.

B. Glass:

1. Primary Glass Products: Clear float, tinted float, patterned, and wire glass, ASTM C 1036.

2. Heat-Treated Glass Products: Heat-strengthened, tempered, coated, and spandrel glass, ASTM C 1048.

3. Laminated Glass Units: Polyvinyl butyral interlayer.

4. Sealed Insulating Glass Units: ASTM E 774, Class A.

5. Mirrors: Silvering and protective coatings.

6. High-Performance Coatings: Low e (low emissivity) type.

7. Blast resistant glazing at exterior windows and doors shall be as required by UFC 4-010-01, standard 10.

C. Glazing Accessories:

1. Elastomeric glazing sealants.
2. Preformed glazing tapes.
3. Glazing gaskets.
4. Setting blocks, spacers, and compressible filler rods.
5. Mirror adhesive.

PART 3 EXECUTION

3.01 INSTALLATION

A. Inspect framing and report unsatisfactory conditions in writing.

B. Comply with GANA "Glazing Manual" and manufacturer's instructions and recommendations. Use manufacturer's recommended spacers, blocks, primers, sealers, gaskets and accessories.

C. Install glass with uniformity of pattern, draw, bow and roller marks.

D. Install sealants to provide complete wetting and bond and to create a substantial wash away from glass.

E. Set mirrors on stainless steel clips and adhere to wall with mirror adhesive.

F. Remove and replace damaged glass and glazing. Wash, polish and protect all glass supplied under this section.

END OF SECTION

SECTION 09 29 00

GYPSUM BOARD SYSTEMS

PART 1 GENERAL

1.01 SCOPE

A. Gypsum board.

B. Taped and sanded joint treatment.

C. Light splatter texture finish.

1.02 REFERENCES

A. ASTM C630 - Water Resistant Gypsum Backing Board.

B. ASTM C840-99 - Application and Finishing of Gypsum Board.

C. ASTM C1002-04 - Steel Drill Screws for the Application of Gypsum Board.

D. ASTM C1396 - Standard Specification for Gypsum Board.

E. GA-214 - Recommended Levels of Gypsum Board Finish.

F. GA-216 - Application and Finishing of Gypsum Board.

G. GA-600-03 - Fire Resistance Design Manual.

1.03 QUALITY ASSURANCE

A. Perform Work in accordance with GA-214, GA-216 and GA-600.

PART 2 PRODUCTS

2.01 GYPSUM BOARD MATERIALS: ASTM C1396; TYPE X.

A. Standard Gypsum Board: 5/8 inch thick, maximum available length in place; ends square cut, tapered edges.

B. Mold Resistant Gypsum Board: 5/8 inch thick, maximum available length in place; ends square cut, tapered edges.

2.02 ACCESSORIES

A. Corner Beads: Metal.

B. Edge Trim: GA 216; Type L or J bead.

C. Joint Materials: GA 216; reinforcing tape, joint compound.

D. Fasteners: ASTM C1002, Type W and GA-216.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that site conditions are ready to receive work.

3.02 GYPSUM BOARD INSTALLATION

A. Install gypsum board in accordance with GA-216 and manufacturer's instructions.

B. Erect single layer fire rated gypsum board, with edges and ends occurring over firm bearing.

C. Place corner beads at external corners. Use longest practical length. Place edge trim where gypsum board abuts dissimilar materials.

3.03 CONTROL JOINTS

A. Provide one-piece joint assembly of non-corrosive metal or extruded vinyl with continuous non-perforated expansion strip for insertion into joint and perforated flanges for attachment to face of wallboard.

B. Gypsum panel surfaces, other than fire rated assemblies, shall be isolated with control joints or other means for every partition or furring run which exceeds 20 feet.

3.04 JOINT TREATMENT

A. Finish in accordance with GA-214 Level 4.

3.05 TEXTURE FINISH

A. Spray finish texture coating in accordance with manufacturer's instructions.

B. Smooth, non-aggregated, light orange peel spray texture.

3.06 ERECTION TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from Flat Surface: 1/8 inch in 10 feet.

END OF SECTION

SECTION 09 30 13

CERAMIC TILE

PART 1 GENERAL

1.01 SCOPE

A. Section includes ceramic tile for floors and walls using thin-set application method; cementitious backer board as tile substrate, thresholds at door openings, and ceramic accessories.

1.02 REFERENCES

A. American National Standards Institute:

1. ANSI A108.1 - Installation of Ceramic Tile, A collection.

2. ANSI A108.1A - Specifications for Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar.

3. ANSI A108.1B - Specifications for Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex Portland Cement Mortar.

4. ANSI A108.1C - Specifications for Contractors Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar -or- Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex Portland Cement Mortar.

5. ANSI A108.4 - Specifications for Ceramic Tile Installed with Organic Adhesives or Water-Cleanable Tile Setting Epoxy Adhesive.

6. ANSI A108.5 - Specifications for Ceramic Tile Installed with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar.

7. ANSI A108.7 - Specifications for Electrically Conductive Ceramic Tile Installed with Conductive Dry-Set Portland Cement Mortar.

8. ANSI A108.8 - Specifications for Ceramic Tile Installed with Chemical-Resistant Furan Mortar and Grout.

9. ANSI A108.10 - Specifications for Installation of Grout in Tilework.

10. ANSI A118.1 - Standard Specification for Dry-Set Portland Cement Mortar.

11. ANSI A118.4 - Latex-Portland Cement Mortar.

12. ANSI A118.5 - Chemical-Resistant Furan Mortar and Grout.

13. ANSI A118.6 - Ceramic Tile Grouts.

14. ANSI A118.9 - Test Methods and Specifications for Cementitious Backer Units.

15. ANSI A136.1 - Organic Adhesives for Installation of Ceramic Tile.

16. ANSI A137.1 - Ceramic Tile.

B. ASTM International:

1. ASTM C847 - Standard Specification for Metal Lath.

C. Tile Council of America:

1. TCA - Handbook for Ceramic Tile Installation.

1.03 SUBMITTALS

A. Product Data: Submit data for ceramic tile, describing physical, and performance characteristics; sizes, patterns, colors available, and method of installation.

B. Samples: Submit 2 each full size samples of ceramic tile.

1.04 QUALITY ASSURANCE

A. Perform Work in accordance with TCA Handbook and ANSI A108 Series/A118 Series.

B. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

C. Installer: Installer must use manufacturer recommended installation procedures and materials.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect adhesives and grouts from freezing or overheating.

1.06 ENVIRONMENTAL REQUIREMENTS

A. Do not install adhesives and grouts in unventilated environment.

B. Maintain ambient and substrate temperature within manufacturer's tolerances during installation and curing of mortar materials.

PART 2 PRODUCTS

2.01 TILE

A. Acceptable Manufacturers:

1. American Olean Tile Co.

2. Dal-Tile International.

3. Government approved equal.

2.02 COMPONENTS

A. Ceramic Tile (Flooring): ANSI A137.1, conforming to the following:

1. Moisture Absorption: 0.5 to 3.0 percent.

2. Size: To match existing or 12 inch by 12 inch.

3. Shape: Square.

4. Edge: Square.

5. Surface Finish: Matte glazed.

6. Color: Earth tones to be selected by the COR.

B. Ceramic base: ANSI A137.1, conforming to the following:

1. Moisture Absorption: 0.5 to 3.0 percent.

2. Size: To match existing or 4 inch by 12 inch.

3. Shape: Square.

4. Edge: Square.

5. Surface Finish: Matte glazed.

6. Color: Earth tones to be selected by the COR.

C. Ceramic Tile (Walls): ANSI A137.1, conforming to the following:

1. Moisture Absorption: 0.5 to 3.0 percent.

2. Size: To match existing or 4 inch square.

3. Shape: Square.

4. Edge: Square.

5. Surface Finish: Glazed.

6. Color: Earth tones to be selected by the COR.

D. Ceramic Tile (Accessories): ANSI A137.1, conforming to the following:

1. Moisture Absorption: 0.5 to 3.0 percent.

2. Size: Manufacturer's standard for accessory pieces.

3. Surface Finish: Glazed.

4. Color: Earth tones to be selected by the COR.

2.03 ACCESSORIES

A. Adhesive Materials:

1. Tile Setting Adhesive: Elastomeric and waterproof.

B. Grout Materials:

1. Standard Grout: Latex-Portland cement type as specified in ANSI A118.6.

2. Color: As selected by the COR.

C. Cleavage Membrane: No. 15 asphalt saturated felt.

D. Cementitious Backer Board: ANSI A118.9; High density, cementitious, glass fiber reinforced, 1/2 inch thick; 2 inch wide coated glass fiber tape for joints and corners.

E. Grout Sealer:

1. Manufacturer's standard product for sealing grout joints that does not change color or appearance of grout.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify surfaces are ready to receive work.

3.02 PREPARATION

A. Protect surrounding work from damage.

B. Vacuum clean surfaces.

C. Seal substrate surface cracks with manufacturer approved filler.

D. Install cementitious backer board per manufacturer's recommendations.

3.03 INSTALLATION

A. Install tile and grout in accordance with applicable requirements of ANSI A108.1 through A108.10 and TCA Handbook recommendations.

B. Do not interrupt tile pattern through openings.

C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners, align floor, base and wall joints.

D. Place tile with joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints watertight, without voids, cracks, excess mortar, or excess grout.

1. Ceramic Tile: 1/8 inch joint width.

E. Install ceramic accessories rigidly in prepared openings.

F. Sound tile after setting. Replace hollow sounding units.

G. Keep existing expansion/control joints free of adhesive or grout.

H. Apply sealant to joints.

I. Allow tile to set for a minimum of 24 hours prior to grouting.

J. Grout tile joints. Use standard grout.

K. Grout Sealer: Apply grout sealer to cementitious grout joints according to grout sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer on tile faces by wiping with soft cloth.

L. Installation Method:

1. Floors: Thin-Set.

2. Walls: Mastic.

3.04 CLEANING

A. Clean tile and grout surfaces per manufacturer's recommendations.

3.05 PROTECTION OF INSTALLED CONSTRUCTION

A. Do not permit traffic over finished floor surface for 2 days after installation.

END OF SECTION

SECTION 09 51 10

SUSPENDED ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SCOPE

A. Suspended metal grid ceiling system and perimeter trim.

B. Acoustical tile.

1.02 REFERENCES

A. ASTM C635 - Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings.

B. ASTM C636 - Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.

C. ASTM E1264 - Classification of Acoustical Ceiling Products.

D. NFPA 101 - Life Safety Code.

E. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth.

F. Underwriters Laboratories Inc.:

1. UL - Fire Resistance Directory.

G. Ceilings and Interior Systems Construction Association:

1. CISCA - Acoustical Ceilings: Use and Practice.

1.03 SUBMITTALS

A. Product Data: Submit data on metal grid system components, acoustic units.

B. Samples: Submit two samples 6x6 inch illustrating material and finish of acoustic units.

C. Samples: Submit two samples each, 6 inches long, of suspension system main runner, cross runner, and perimeter molding.

D. Manufacturer's Installation Instructions: Submit special procedures, perimeter conditions requiring special attention.

1.04 ENVIRONMENTAL REQUIREMENTS

A. Maintain uniform temperature of minimum 60 degrees Fahrenheit and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

1.05 PERFORMANCE REQUIREMENTS

A. Suspension System: Rigidly secure acoustic ceiling system including integral mechanical and electrical components with maximum deflection of 1: 240.

PART 2 PRODUCTS

2.01 SUSPENSION SYSTEM MATERIALS

A. Non-Fire Rated Grid: ASTM C635, intermediate duty; exposed T components die cut and interlocking.

1. Exposed Grid Surface Width: 15/16 inch.

2. Grid Finish: ASTM C635, manufacturer's standard coating and finishes for normal use environment. Matte white painted finish.

B. Moldings: Channel or angle type with smooth, matte white painted finish. Moldings are to match the grid system.

C. Accessories: Stabilizer bars, clips, splices, edge moldings and hold down clips required for suspended grid system.

D. Support Wires: Galvanized, soft annealed, mild wire; minimum 12 gauge (0.016" diameter).

2.02 ACOUSTICAL UNIT MATERIALS

A. Acoustical Panels (ACT 1): ASTM E1264, conforming to the following:

1. Size: 24 x 24 inches.

2. Thickness: 5/8 inches.

3. Composition: Mineral.

4. Light Reflectance: 75 percent.

5. NRC Range: .50 to .60.

6. STC Range: 35 to 39.

7. Edge: Square, 4 edges.

8. Surface Color: Manufacturer's standard factory applied white paint finish.

9. Surface Finish: Non-directional fissured.

B. Acoustical Panels (ACT 2): Vinyl faced gypsum board panels:

1. Size: 24 x 24 inches x 5/8” thick

2. Finish: White, vinyl faces

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.

B. Ensure that all interior wet work is dry.

C. Verify that layout of hangers will not interfere with other work.

3.02 INSTALLATION - LAY-IN GRID SUSPENSION SYSTEM

A. Install suspension system in accordance with ASTM C636, manufacturer's instructions and as supplemented in this section.

B. Locate system on room axis according to reflected plan.

C. Install after major above ceiling work is complete. Coordinate the location of hangers with other work.

D. Supply hangers or inserts for installation. Space not more than 6 inches in from each end, and not more than 4 feet on center between ends of members to be supported.

E. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

F. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

G. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability. Support fixture loads by supplementary hangers located within 6 inches of each corner; or support components independently.

H. Do not eccentrically load system, or produce rotation of runners.

I. Install edge molding at intersection of ceiling and vertical surfaces, using longest practical lengths. Miter corners. Provide edge moldings at junctions with other interruptions.

3.03 INSTALLATION - ACOUSTICAL UNITS

A. Install suspension system in accordance with ASTM C635, ASTM C636 and as supplemented in this section.

B. Install system capable of supporting imposed loads to deflection of 1/240 maximum.

C. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

D. Lay directional patterned units one way with pattern parallel to longest room axis. Fit border trim neatly against abutting surfaces.

E. Install units after above ceiling work is complete.

F. Install acoustical units level, in uniform plane, and free from twist, warp and dents.

G. Cut panels to fit irregular grid and perimeter edge trim.

H. Balance border areas to avoid units of less than 1/2 unit width wherever possible. Wherever ceiling area is a multiple of full size acoustic units used in the work, balance alignment to be square and true and install only full size units for entire ceiling, including borders.

3.04 ERECTION TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

END OF SECTION

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SECTION 09 65 10

RESILIENT RUBBER FLOORING

PART 1 GENERAL

1.01 SCOPE

A. The work of this Section includes:

1. Rubber sheet flooring.
2. Rubber tile flooring.
3. Vinyl wall base.
4. Subfloor preparation.
5. Initial/First Cleaning after installation.

1.02 REFERENCES

A. ASTM D3389 - Standard test method for coated fabrics abrasion resistance (rotary platform, double-head abrader).

B. ASTM E84 - Standard test method for surface burning characteristics of building materials.

C. ASTM E648 Rev A - Standard test method for critical radiant flux of floor covering systems using a radiant heat energy source.

D. ASTM E662 - Standard test methods for specific optical density of smoke generated by solid materials.

E. ASTM F150 - Standard test method for electrical resistance of conductive and static dissipative resilient flooring.

F. ASTM F710 - Standard practice for preparing concrete floors to receive resilient flooring.

G. ASTM F1344 - Standard specification for rubber floor tile.

H. ASTM F1860 - Standard specification for rubber sheet floor covering with backing.

I. ASTM F1859 - Standard specification for rubber sheet floor covering without backing.

J. ASTM F1861 - Standard specification for resilient wall base.

K. ASTM F1869 - Standard test method for measuring moisture vapor emission rate of concrete subfloor using anhydrous calcium chloride.

L. ASTM F2169 - Standard specification for resilient stair treads.

M. ASTM F2170 - Standard test method for determining relative humidity in concrete floor slabs using in-situ probes.

N. FTM 4046 101 - Static decay.

O. ESD STM 97.2 - Floor materials and footwear - Voltage measurement on a person.

P. ESD S7.1 100 - Resistive characterization of flooring materials.

Q. NFPA 253 - Test method for critical radiant flux of floor covering systems using a radiant energy source.

R. NFPA 258 - Test method for specific density of smoke generated by solid materials.

S. ASTM D2240 - Test Method for Measuring Durometer Hardness

1.03 SUBMITTALS

A. Product Data:

1. Rubber flooring.

2. Rubber Accessories.

3. Adhesive

B. Samples: Submit two 6 by 6 inch verification samples of each type of product specified in color selected by COR.

C. Warranty:

1. Provide manufacturer's standard one-year warranty against defects in manufacturing and workmanship of resilient flooring products. Provide manufacturer's standard limited wear warranty/conductivity warranty as specified under each product as applicable.

2. The manufacturer shall provide a warranty that their product will withstand five post-application freeze/thaw (winter/summer) cycles.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. All products shall be from the same manufacturer.

1. Nora Systems, Inc. 9 Northeastern Blvd. Salem , NH 03079 warr 800 -332-NORA (6672)

2. American Biltrite Ltd. - Marathon Oasis Resilient Rubber Flooring, 440-B Britannia Road, East, Mississauga, Ontario, Canada L4Z 1X9 telephone: 800-479-0190, or fax: 800-810-5731.

3. R.C.A. Rubber Company.

4. Government approved equal.

2.02 RESILIENT FLOORING

A. Rubber Sheet for Commercial Traffic:

1. Wear Surface: Smooth surface, minimum of 0.08 inches thickness. Rubber content 30%, +/- 2%.

2. Material: Rubber with abundant natural fillers and environmentally compatible color pigments.

3. Limited Wear Warranty: 5 years.

4. Standard: ASTM F1859 rubber sheet floor covering without backing.

5. Abrasion Resistance: Taber abrasion test, ASTM D3389, H-18 wheel, 500 gram load, 1000 cycles, gram weight loss not greater than 0.70.

6. Hardness: ASTM D2240, Shore A, equal to or greater than 85.

7. Slip Resistance: Static coefficient of friction (James Test): ASTM D2047, equal to or greater than 0.5.

8. Asbestos-Free: Products shall contain no asbestos.

9. Flammability: ASTM E648; NFPA 253; NBSIR 75-950 result to be not less than 0.07 watts per square inch, Class 1.

10. Smoke Density: ASTM E662, NFPA 258, NBS smoke density, less than 450.

11. Burn Resistance: Cigarette and solder burn resistance.

12. Halogen-Free: Products shall contain no halogens.

13. PVC-Free: Products shall contain no poly-vinyl-chloride.

14. IAQ: Product shall meet Green Guard requirements.

15. Color: As selected by COR.

B. Rubber Accessories:

1. Stringers: 0.11 inches thick.

   a. Color to match cove base.

2. Cove Stick

   a. Color: Neutral

   b. Size: 3/8” x 1/8” x 1-5/8”

   c. Angle: 90^0

3. Cove Cap:

   a. Vinyl/Rubber: Color to match flooring.

   b. Metal: Anodized aluminum.

4. Cove Base:

   a. Color to match flooring.

   b. Thickness: Approximately 1/8”.

   c. Conform to ASTM-F-1861.

5. Transition:

   a. Color to match flooring.

C. Primers and Adhesives:

1. As recommended by the flooring manufacturer. The adhesive shall withstand five post-application freeze/thaw (winter/summer) cycles.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that spaces to receive resilient flooring are suitable for installation. Do not proceed with work until unsatisfactory conditions are corrected. Comply with manufacturer's recommendations including the following:

1. Substrates shall be dry and clean.

2. Substrates shall be free of depressions, raised areas, or other defects which would telegraph through installed flooring.

3. Temperature of resilient flooring and substrate shall be within specified tolerances.

4. Moisture condition and adhesive bond tests shall be performed as specified.

B. For applications on cementitious underlayment, verify curing, hardening, or breaking compounds have not been used. If there are any, do not proceed until compounds have been removed per manufacturer’s recommendations.

C. Perform moisture condition test in each major area, minimum 1 per 1,000 square feet, prior to installation. Moisture condition shall not exceed 3 pounds per 1,000 square feet per 24 hour day, in accordance with ASTM F1869 or ASTM F2170, minimum 1 per 1,000 square feet prior to installation. Relative humidity shall not exceed 75%. Do not proceed with work until results of moisture condition tests are within manufacturer’s recommended limits.

D. Perform adhesive bond test in each major area, minimum 1 per 1,000 square feet, prior to installation. Examine after 72 hours to determine whether bond is solid and no moisture is present. Do not proceed with work until results of bond test are within manufacturer’s recommended limits.

E. Deliver materials in labeled packages. Store and handle in strict compliance with manufacturer's recommendations. Protect from damage due to weather, excessive temperatures, and construction operations.

F. Deliver materials sufficiently in advance of installation to condition materials to room temperature prior to installation.

3.02 PREPARATION

A. Maintain a temperature of 68 degrees F plus or minus 5 degrees F in spaces to receive resilient flooring. Specified temperature shall be maintained at least 48 hours before, during, and 48 hours after installation.

B. Comply with ASTM F710 and manufacturer's recommendations for surface preparation. Wood sub floors shall be skim coated with an approved cementitious underlayment prior to installation of flooring material. (See Section 03 54 00).

3.03 INSTALLATION

A. Install resilient flooring in accordance with manufacturer’s printed installation instructions. Comply with the following:

1. Lay out resilient flooring to provide equal size at perimeter. Adjust layout as necessary to eliminate resilient flooring which is cut to less than half full width.
2. Install expansion joints perpendicular to the long axis of the room.
3. Lay resilient flooring parallel to the long axis of the room.
4. Lay resilient flooring with arrows in the same direction (excluding borders and some flash coving methods).
5. Install resilient flooring without cracks or voids at seams. Lay seams together without stress. Remove excess adhesive immediately.
6. Scribe resilient flooring neatly at perimeter and obstructions.
7. Extend resilient flooring into reveals, closets, and similar openings.
8. Install reducer strips at exposed edges.
9. Do not mix manufacturing batches of a color within the same area.
10. Do not install defective or damaged resilient flooring.

B. Install resilient wall base in accordance with manufacturer's printed installation instructions. Install in longest practical lengths. Tightly adhere to substrate. Fill voids due to seams in substrate materials with manufacturer's recommended filler material.

C. Install resilient stair treads and accessories in accordance with manufacturer's printed installation instructions. Install reducer strips at exposed edges. Tightly adhere to substrate only where recommended by manufacturer. Fill voids due to seams in substrate materials with manufacturer's recommended filler material.

D. Seamless flooring installation: Route seams and weld together with coordinated colored heat welding rod or cold weld with coordinated colored cold weld compound in accordance with resilient flooring manufacturer's recommendations.

E. Flash coving of sheet good: Extend flooring up the wall in a flash-coved method (6 inches), with resilient flooring manufacturer's recommendations. Provide cove stick and manufacturer's recommended clip-on cap piece. All vertical internal and external seams shall be cold welded with coordinated colored cold weld compound. Follow resilient flooring manufacturer's flash-coving instructions.

3.04 CLEANING AND PROTECTION

A. Touch-up and repair minor damage to eliminate all evidence of repair. Remove and replace work which cannot be satisfactorily repaired.

B. Contractor shall perform "Initial/First Cleaning after installation", as per manufacturer's maintenance instructions/recommendation, to include but not limited to buffing of floor.

C. Protect completed work from damage and construction operations and inspect immediately before final acceptance of project.

END OF SECTION

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SECTION 09 78 13

FIBER REINFORCED PLASTIC

PART 1 GENERAL

1.01 SCOPE

A. Provide fiber reinforced plastic (FRP) and accessories.

B. Provide all miscellaneous blocking, framing, and backing materials to install glass board and accessories.

1.02 REFERENCES

A. ASTM E84 - Surface Burning Characteristics of Building Materials.

1.03 SUBMITTALS

A. Product Data:

1. FRP and Accessories

2. Adhesive

3. Sealant

PART 2 PRODUCTS

2.01 MATERIALS

A. FRP: White fiberglass reinforced plastic (FRP) panel with a nominal thickness of .090 inch; FSI single sided skin, pebble surface finish.

B. Accessories: Provide FRP manufacturer's compatible inside and outside corner strips, end caps and division bars and/ or joining strips. Color to match FRP panels.

C. Fasteners: Attach to studs and joists with high-impact thermoplastic drive rivets 24" o.c.; minimum length of one inch, 1/4 inch diameter; color shall match panel color.

D. Adhesive: Provide moisture resistant adhesive compatible with FRP and substrate.

E. Sealant: 25 year white or clear silicone. Remove all excess with solvent.

PART 3 EXECUTION

3.01 PREPARATION

A. Provide all framing, blocking and shims to support wall finishes.

B. Provide backing materials for support of glass board panels. Install backing materials so surface of new FRP is flush and level with existing FRP.

C. Insure backing materials surface is dry, smooth, level, and free of dirt and grease.

D. Delivery, Storage And Handling

1. Do not store materials outside.

3.02 INSTALLATION

A. FRP shall be installed with adhesive and fasteners acclimated to ambient temperature and humidity ranges for 48 hours.

B. Install panels, trim, and accessories tight to wall base and/or floor.

C. Verify fastener location on glass board panels before installation. Drill 3/8 inch fastener holes before attaching FRP to walls. Cut panels to allow for 1/8 inch expansion in necessary items. Follow manufacturer's recommended fastener spacing.

D. Attach accessories according to manufacturer's instructions. Accessories shall be installed in continuous lengths only. Set FRP panels into accessories with a continuous line of sealant.

E. Drill holes into wall and ceiling, at predrilled locations, to allow installation of 24" o.c. fasteners.

F. Seal joints between new FRP and existing materials, equipment, wall base, etc. with sealant.

3.03 CLEANING

A. Clean surfaces using methods and materials that will not damage finishes.

B. Remove excess adhesive and sealant and prepare for punch list.

PART 4 SCHEDULE

4.01 FRP INSTALLATION LOCATIONS

A. Install around janitor slop sink to extend a minimum of 24" beyond the edge of sink and to a height of 48" minimum.

END OF SECTION

SECTION 09 91 00

PAINTING

PART 1 GENERAL

1.01 SCOPE

A. Surface preparation and field application of paints, and coatings.

1.02 REFERENCES

A. ASTM D16 - Standard Terminology Relating to Paint, Varnish, Lacquer, and Related Products.

B. ASTM D4442/D4444 - Test Method for Moisture Content of Wood.

1.03 SUBMITTALS

A. Samples: Manufacturer’s Color Chart.

1.04 ENVIRONMENTAL REQUIREMENTS

A. Provide continuous ventilation and heating of facilities to maintain surface and ambient temperatures above 55 degrees Fahrenheit for 24 hours before, during, and 48 hours after application of finishes, unless required otherwise by manufacturer’s instructions.

B. Follow the manufacturer's instructions for the minimum application temperatures for latex paints.

C. Provide lighting level of 80 ft candles (860 x measured mid-height at substrate surface.)

PART 2 PRODUCTS

2.01 MATERIALS

A. Exterior.

USE	**PAINT TYPE**	**GLOSS**
Metal (Ferrous Primer)	Alkyd	N/A
Metal (Non- Ferrous Primer)	Alkyd	N/A
Wood (Primer)	Latex Wood Primer	N/A
Metal (Ferrous or Non Ferrous Paint)	Alkyd	Gloss
Wood (Paint)	Latex	Satin
Wood (Solid Latex Stain)	Latex	Stain
Wood (Solid Alkyd Stain)	Alkyd	Stain
Wood (Transparent/Semi-Transparent Stain)	Latex	Stain
Slate/Fiber Cement	Latex	Satin

B. Interior

USE	PAINT TYPE	GLOSS
Metal (Ferrous Primer)	Alkyd	N/A
Metal (Non- Ferrous Primer)	Alkyd	N/A
Gypsum Board (Primer)	Latex	N/A
Wood (Primer)	Latex Wood Primer	N/A
Metal (Ferrous or Non Ferrous Paint)	Alkyd	Gloss
Gypsum Board (Paint)	Latex	Egg Shell
Wood (Paint)	Latex	Egg Shell
Wood (Stain)	Alkyd	Stain
Wood (Sealer)	Polyurethane	Satin

C. Use standard material fillers and putty compatible with specified items and substrate to fill holes or indentations.

D. Coatings: Ready mixed except field catalyzed coatings. Prepare pigments to a soft paste consistency capable of being readily and uniformly dispersed to a homogeneous coating; good flow and brushing properties; capable of drying or curing free of streaks or sags.

E. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners, and other materials not specifically indicated but required to achieve the finishes specified; commercial quality.

F. All coatings shall be the products of one manufacturer.

2.02 FINISHES

A. Refer to schedule at end of section for surface finish.

PART 3 EXECUTION

3.01 EXAMINATION

A. Delivery, Storage, And Protection

1. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

2. Container labeling to include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

3. Store paint materials at minimum ambient temperature of 45 degrees Fahrenheit and a maximum of 90 degrees Fahrenheit, in ventilated area, and as required by manufacturer's instructions.

4. Take precautionary measures to prevent fire hazards and spontaneous combustion.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

D. Test shop applied primer for compatibility with subsequent cover materials.

E. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below manufacturer's recommended values and the following maximums:

1. Plaster and Gypsum Wallboard: 12 percent.

2. Interior Wood: 15 percent, measured in accordance with ASTM D4442.

3. Concrete: 8 percent.

3.02 PREPARATION

A. Remove electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.

B. Correct defects and clean surfaces which affect the work of this section.

C. Shellac and seal all surfaces which may bleed through surface finishes.

D. Gypsum Board Surfaces: Fill minor defects with filler compound. Spot prime defects after repair.

E. Interior Wood Items Scheduled to Receive Painted Finish: Wipe off dust and grit prior to sealing. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried. Sand lightly between coats.

F. Metal Doors Scheduled for Painting: Seal top and bottom edges with finish paint.

3.03 PROTECTION

A. Protect elements surrounding the work of this section from damage or disfiguration.

B. Repair damage to other surfaces caused by work of this section.

C. Furnish drop cloths, shields, and other protective methods to prevent spray or droppings from disfiguring other surfaces.

D. Remove temporary protective wrappings provided by others.

E. Provide "WET PAINT" signs as required to protect newly-painted finishes.

F. Remove empty paint containers from site.

3.04 APPLICATION

A. Apply products in accordance with manufacturer's instructions.

B. Do not apply finishes to surfaces that are not dry.

C. Apply each coat of paint slightly darker than preceding coat, unless otherwise approved.

D. Apply each coat to uniform finish.

E. Seal back surfaces of interior and exterior woodwork with varnish.

3.05 MECHANICAL AND ELECTRICAL EQUIPMENT

A. Remove grilles, covers, and panels on mechanical and electrical systems from location and paint separately unless item is supplied with factory finish. Reinstall all removed items.

B. Finish paint primed equipment to color selected.

C. Prime and paint insulated and bare pipes, conduit, boxes, insulated and bare ducts, hangers, brackets, collars, and supports except where items are shop finished.

D. Replace identification markings on mechanical or electrical equipment when painted over or splattered.

E. Remove cover plates of all switches and receptacles. Protect remaining items with coverings before painting operations. After painting operation is complete, reinstall all removed items. Remove protective coverings.

F. Paint exposed conduit and electrical equipment occurring in finished areas. Color and texture to match adjacent surfaces.

G. Paint both sides and edges of plywood backboards for electrical before installing backboards and mounting equipment on them.

3.06 CLEANING

A. Promptly remove paint where spilled, splashed, or spattered.

B. Maintain premises free of unnecessary accumulation of tools, equipment, surplus materials, and debris.

C. Collect cotton waste cloths and material which may constitute a fire hazard, place in closed metal containers, and remove daily from site.

PART 4 SCHEDULES

4.01 COLOR SCHEDULE

A. Gypsum walls.

1. Match Sherwin Williams, SW6385, Dover White.

B. Interior painted trim.

1. Match Sherwin Williams, SW6126, Navajo White.

C. Interior painted metal doors and frames.

1. Match Sherwin Williams, SW7066, Gray Matters (wood frame bldgs).

2. Match Sherwin-Williams, SW7034, Status Bronze (masonry bldgs).

D. Exterior metal railings, doors and frames.

1. Match Sherwin Williams, SW7066, Gray Matters (wood frame bldgs).

2. Match Sherwin-Williams, SW7034, Status Bronze (masonry bldgs).

E. Skirting.

1. Match Sherwin Williams, SW7066, Gray Matters.

F. Interior wood doors, casing, base and jambs.

1. Match MinWax 210B Golden Oak.

4.02 PAINTING SCHEDULE- EXTERIOR

A. Metal Items (Factory Primed) Metal Doors and Frames.

1. Prime: touch up shop prime coat or prime unprimed steel.

2. Paint: 2 coats.

B. Metal Items: Railings and miscellaneous items supplied with factory final finish.

1. Prime: touch up shop prime coat or prime unprimed steel.

2. Paint: 2 coats.

C. Skirting:

1. Prime: as specified.

2. Paint: 2 coats.

4.03 PAINTING SCHEDULE- INTERIOR

A. Metal Items: Factory primed metal doors and frames.

1. Prime: touch-up shop prime coat or prime unprimed steel.

2. Paint: 2 coats.

B. Metal Items: Doors, frames and miscellaneous items not supplied with factory final finish.

1. Prime: touch-up shop coat or prime unprimed metal.

2. Paint: 2 coats.

C. Gypsum Board: Walls and ceiling

1. Texture: light splatter or orange peel

2. Prime: 1 coat drywall primer

3. Paint: 2 coats.

D. Window Trim:

1. Stain

2. Follow with two coats of polyurethane.

END OF SECTION

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SECTION 10 28 13

TOILET AND JANITORIAL ACCESSORIES

PART 1 GENERAL

1.01 SCOPE

A. Toilet and janitorial accessories.

B. Attachment hardware.

C. Grab Bars.

1.02 REFERENCES

A. FS WW-D-1908 - Dispenser, Toilet Paper, Cabinet.

B. FS WW-P-541/8B - Plumbing Fixtures (Accessorized, Hand Use) (Detail Specification).

C. FS DD-M-00411B & AM-1 - Mirrors, Glass.

1.03 SUBMITTALS

A. Provide product data on accessories describing size, finish, details of function and attachment methods.

1. Toilet Tissue Dispenser
2. Paper Towel Dispenser
3. Mirror
4. Grab Bars
5. Soap Dispenser
6. Soap Dish
7. Robe Hook
8. Clothes Hanger Unit
9. Signs

PART 2 PRODUCTS

2.01 MATERIALS

A. Toilet Tissue Dispenser: Double roll, surface mounted, chrome plated steel, with roll locking mechanism and tension spring control.

B. Paper Towel Dispenser: Surface mounted, stainless, 22 gauge construction, satin chrome finish. Hinged door panel for filling. Provide two keys for door lock to accommodate 400 single fold paper towels.

C. Mirror: 18”X36” Mirror with roll formed channel frame and 5 ½” wide integral stainless steel shelf.

D. Grab Bars: 1-1/2" O.D. heavy duty stainless steel with concealed mounting.

E. Soap Dispenser: Brushed stainless steel finish, 40 ounce capacity.

F. Soap Dish: Extra heavy duty soap dish shall be fabricated of 7 gauge (0.1875") satin finish stainless steel and have holes for drainage. Overall dimensions to be a minimum 5"W x 2-1/8"H x 2-3/4"D.

G. Robe Hook: Double Robe Hook unit shall be fabricated of alloy 18-8 stainless steel, type 304. Post shall be 1/2″ x 1″ rectangular tubing with formed mounting flange and bracket welded on end. Bow plate shall be internally welded. Wall mounting plate shall be included. Surface finish shall be satin finish. A stainless steel set screw shall be provided on bottom of flange to lock unit to wall mounting plate.

H. Clothes Hanger Unit: See Drawing A-2. Unit to be able to fasten directly to wall Install backer boards behind sheetrock finish for a non-exposed appearance. Side members to be of oak wood, stained to match chair rail and window casing or all chrome. Dimension to be 15-1/2” wide, 36” long, 5’6” above the floor.

I. Signs: ADA compliant Braille signs. Blue in color with raised white letters, borders and symbol. Provide (1) for each restroom.

J. Sanitary Napkin Disposal: Surface-mounted sanitary napkin disposal shall be type-304 stainless steel with all-welded construction; exposed surfaces shall have satin finish. Door shall be secured to cabinet with a full-length stainless steel piano-hinge and equipped with a tumbler lock. Unit shall have a self-closing panel covering disposal opening. Panel shall have bottom edge hemmed for safety, be secured to door with a spring-loaded, full-length stainless steel piano-hinge, and equipped with an international graphic symbol identifying sanitary napkin disposal. Unit shall be furnished with a removable, leak-proof, rigid molded polyethylene receptacle. Receptacle shall have a capacity of 1.2-gal. (4.6-L). Manufacturer’s service and parts manual shall be provided to the Government.

2.02 FABRICATION

A. Weld and grind smooth joints of fabricated components.

B. Form exposed surfaces from single sheet of stock, free of joints.

C. Form surfaces flat without distortion. Maintain flat surfaces without scratches or dents.

D. Back paint components where contact is made with building finishes to prevent electrolysis.

E. Shop assemble components and package complete with anchors and fittings.

F. Provide steel anchor plates, adapters, and anchor components for installation.

G. Hot dip galvanize exposed and painted ferrous metal and fastening devices.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that site conditions are ready to receive work.

B. Beginning of installation means acceptance of existing conditions.

3.02 PREPARATION

A. Deliver inserts and rough-in frames to site at appropriate time for installation.

B. Provide templates and rough-in measurements as required.

C. Verify exact location of accessories for installation.

3.03 INSTALLATION

A. Install fixtures, accessories and items in accordance with manufacturer's instructions.

B. Install plumb and level, securely and rigidly anchored to substrate. Surface mounted items shall have a wood backer installed during rough-in construction.

END OF SECTION

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SECTION 10 44 00

FIRE EXTINGUISHER AND CABINETS

PART 1 GENERAL

1.01 SCOPE

A. Fire extinguisher and cabinets.

1.02 REFERENCES

A. UL 1093 - Fire Extinguishers.

1.03 SUBMITTALS

A. Provide product data on fire extinguisher and cabinets- describing size, finish, details of function and attachment methods.

PART 2 PRODUCTS

2.01 EXTINGUISHERS

A. General Use: provide a dry chemical type fire extinguisher meeting the following requirements:

1. Class: A:B:C
2. Size: 10#
3. Completely rechargeable
4. With flexible hose and pressure gauge

B. Specialized Use: provide fire extinguishers meeting code requirements for all rooms and areas containing moderate or high hazard classifications, including, but not limited to:

1. Kitchens
2. Vehicle repair or storage facilities, garages
3. Workshops
4. Painting or coating operations

2.02 CABINETS

A. Provide cabinets suitable for housing 10 lb. capacity extinguishers, semi-recessed, 2-1/2 inch rolled edge trim, for shallow wall installation.

B. Construction

1. One-piece tubular door frames, mitered and welded.
2. One-piece metal trim frame, to suit cabinet style required.
3. Weld joints and grind smooth.
4. Provide manufacturer's standard steel box with white baked enamel exterior finish.

C. Doors shall be bubble type, one-piece molded clear 1/4 inch acrylic, with catch.

D. Door Hardware. Continuous type hinge permitting door to open 180 degrees. Provide either lever handle with cam action latch, or door pull and friction latch.

2.03 FINISHES

A. Extinguisher Cabinet: Steel with enamel finish; color to be white.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify cabinet rough openings for correct size and location.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install cabinets plumb and level in wall openings at heights as indicated in manufacturer's installation instructions or as otherwise dictated by code requirements.

C. Secure rigidly in place.

END OF SECTION

SECTION 22 05 23

GENERAL DUTY VALVES FOR PLUMBING

PART 1 GENERAL

1.01 SCOPE

A. Section Includes:

1. Ball valves.
2. Butterfly valves.
3. Gate valves.
4. Globe or angle valves.
5. Plug valves.
6. Flow controls.
7. Mixing Valves.
8. Relief valves.
9. Spring loaded check valves.
10. Swing check valves.
11. Flanges, unions, and couplings.

1.02 REFERENCES

A. ANSI Z21.22 - Relief Valves for Hot Water Supply Systems.

B. MSS SP 67 - Butterfly Valves.

C. MSS SP 70 - Cast Iron Gate Valves, Flanged and Threaded Ends.

D. MSS SP 71 - Cast Iron Swing Check Valves, Flanged and Threaded Ends.

E. MSS SP 78 - Cast Iron Plug Valves, Flanged and Threaded Ends.

F. MSS SP 80 - Bronze Gate, Globe, Angle and Check Valves.

G. MSS SP 85 - Cast Iron Globe & Angle Valves, Flanged and Threaded.

H. MSS SP 110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

1.03 SUBMITTALS

A. Product Data: Submit manufacturers catalog information with valve data and ratings for each service.

B. Manufacturer's Installation Instructions: Submit hanging and support methods, joining procedures.

PART 2 PRODUCTS

2.01 PLUMBING VALVES

A. Ball Valves:

1. 4 inches and Smaller: MSS SP 110, Class 150, 400 psi, bronze, two piece body, chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle solder or threaded ends.

B. Butterfly Valves:

1. 1-1/2 inches and Larger: MSS SP 67, 200 psi CWP, cast or ductile iron body. Nickel-plated ductile iron disc, resilient replaceable seat, wafer, lug or grooved ends, extended neck.

C. Flow Controls:

1. Construction: Class 125, Brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet.

2. Calibration: Control flow within 5 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum minimum pressure 3.5 psi.

D. Gate Valves:

1. 3 inches and Smaller: MSS SP 80, Class 125, bronze body, bronze trim, rising stem, hand-wheel, inside screw, solid wedge disc, solder or threaded ends.

2. 2 inches and Larger: MSS SP 70, Class 125, iron body, bronze trim, outside screw and yoke, hand-wheel, solid wedge disc, flanged ends. Furnish chain-wheel operators for valves 6 inches and larger mounted over 8 feet above floor.

E. Globe Valves:

1. 3 inches and Smaller: MSS SP 80, Class 125, bronze body, bronze trim, hand-wheel, bronze disc, solder or threaded ends.

2. 2 inches and Larger: MSS SP 85, Class 125, iron body, bronze trim, hand-wheel, outside screw and yoke, renewable bronze plug-type disc, renewable seat, flanged ends. Furnish chain-wheel operators for valves 6 inches and larger mounted over 8 feet above floor.

F. Mixing Valves:

1. 3/4"; Meet or exceed ASSE 1017 and CSA B125 Standards; Adjustable temp range of 40 degrees - 160 degrees Fahrenheit; Pressure range up to 125 psi; Brass or bronze construction.

G. Plug Valves:

1. 2-1/2 inches and Larger: MSS SP 78, 175 psi CWP, cast iron body and plug, pressure lubricated, teflon or Buna N packing, flanged or grooved ends. Furnish lever operator with setscrew.

2. Pressure Relief:

a. Construction: AGA Z21.22 certified, bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated.

3. Temperature and Pressure Relief:

a. Construction: ANSI Z21.22 certified, bronze body, Teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, temperature relief maximum 210 degrees Fahrenheit, capacity ASME Section IV certified and labeled.

H. Spring Loaded Check Valves:

1. Class 125, iron body, bronze trim, stainless steel springs, bronze disc, Buna N seals, wafer style ends.

I. Swing Check Valves:

1. 3 inches and Smaller: MSS SP 80, Class 125, bronze body and cap, bronze swing disc with rubber seat, solder or threaded ends.

2. 2 inches and Larger: MSS SP 71, Class 125, iron body, bronze swing disc, flanged or grooved ends.

2.02 FLANGES, UNIONS, AND COUPLINGS

A. Unions for Pipe 2 inches and Smaller:

1. Ferrous Piping: 150 psig malleable iron, threaded.

2. Copper Pipe: Bronze, soldered joints.

B. Flanges for Pipe 2 inches and Larger:

1. Ferrous Piping: 150 psig forged steel, slip-on.

2. Copper Piping: Bronze.

C. Gaskets: 1/16-inch thick preformed neoprene.

D. Grooved and Shouldered Pipe End Couplings:

1. Housing Clamps: Malleable iron to engage and lock designed to permit some angular deflection, contraction, and expansion.

E. Accessories: Steel bolts, nuts, and washers.

F. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify piping system is ready for installation.

3.02 INSTALLATION

A. Quality assurance.

1. Perform Work in accordance with State of Wisconsin Administrative Code, Military Handbook 1008C and the National Fire Protection Association.

B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

C. Install valves with stems upright or horizontal, not inverted.

D. Use grooved mechanical couplings and fasteners only in accessible locations.

E. Install unions downstream of valves and at equipment or apparatus connections. Do not use direct welded or threaded connections to valves, equipment or other apparatus.

F. Install gate, ball or butterfly valves for shut-off and to isolate equipment, part of systems, or vertical risers.

G. Provide spring loaded check valves on discharge of water pumps.

H. Provide plug valves in natural gas systems for shut-off service.

I. Use only butterfly valves in chilled and condenser water systems for throttling and isolation service.

J. Use lug end butterfly valves to isolate equipment.

K. Use valves of all bronze construction for fuel oil service.

L. Use 3/4 inch ball valves with cap for drains at main shut-off valves, low points of piping, bases of vertical risers, and at equipment.

END OF SECTION

SECTION 22 11 26

DOMESTIC WATER PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Domestic water piping, within 5 feet of building.
2. Domestic water piping, above grade.
3. Pressure gages.
4. Pressure gage taps.
5. Thermometers.
6. Flow control valves.
7. Water pressure reducing valves.
8. Relief valves.
9. Strainers.
10. Hose bibs.
11. Backflow preventers.
12. Water hammer arrestors.

B. Refer to other Division 22 sections for general duty valves, water heaters and associated plumbing fixtures.

1.02 REFERENCES

A. American National Standards Institute:

1. ANSI Z21.22 - Relief Valves for Hot Water Supply Systems.

B. American Society of Mechanical Engineers:

1. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
2. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
3. ASME B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes.
4. ASME B31.9 - Building Services Piping.
5. ASME B40.1 - Gauges - Pressure Indicating Dial Type - Elastic Element.
6. ASME Section VIII - Boiler and Pressure Vessel Code - Pressure Vessels.
7. ASME Section IX - Boiler and Pressure Vessel Code - Welding and Brazing Qualifications.

C. American Society of Sanitary Engineering:

1. ASSE 1010 - Performance Requirements for Water Hammer Arresters.

2. ASSE 1011 - Performance Requirements for Hose Connection Vacuum Breakers.

3. ASSE 1012 - Performance Requirements for Backflow Preventer with Intermediate Atmospheric Vent.

4. ASSE 1013 - Performance Requirements for Reduced Pressure Principle Backflow Preventers and Reduced Pressure Fire Protection Principle Backflow Preventers.

5. ASSE 1019 - Performance Requirements for Vacuum Breaker Wall Hydrants, Freeze Resistant, Automatic Draining Type.

6. ASSE 5013 - Performance Requirements for Reduced Pressure Principle Backflow Preventers (RP) and Reduced Pressure Fire Protection Principle Backflow Preventers (RFP).

7. ASSE 5015 - Performance Requirements for Testing Double Check Backflow Prevention Assemblies (DC) and Double Check Fire Protection Backflow Prevention Assemblies (RPDF).

D. ASTM International:

1. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

2. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.

3. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures.

4. ASTM A536 - Standard Specification for Ductile Iron Castings.

5. ASTM B32 - Standard Specification for Solder Metal.

6. ASTM B42 - Standard Specification for Seamless Copper Pipe, Standard Sizes.

7. ASTM B88 - Standard Specification for Seamless Copper Water Tube.

8. ASTM B584 - Standard Specification for Copper Alloy Sand Castings for General Applications.

9. ASTM D1785 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.

10. ASTM D2235 - Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.

11. ASTM D2239 - Standard Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameters.

12. ASTM D2241 - Standard Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter.

13. ASTM D2447 - Standard Specification for Polyethylene (PE) Plastic Pipe, Schedules 40 and 80, Based on Outside Diameter.

14. ASTM D2464 - Standard Specification for Threaded Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.

15. ASTM D2466 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.

16. ASTM D2467 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.

17. ASTM D2564 - Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.

18. ASTM D2609 - Standard Specification for Plastic Insert Fittings for Polyethylene (PE) Plastic Pipe.

19. ASTM D2661 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe and Fittings.

20. ASTM D2846/D2846M - Standard Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Hot- and Cold-Water Distribution Systems.

21. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.

22. ASTM D3035 - Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter.

23. ASTM D3139 - Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.

24. ASTM D 3311 - Standard Specification for Drain, Waste, and Vent (DWV) Plastic Fittings Patterns.

25. ASTM E1 - Standard Specification for ASTM Thermometers.

26. ASTM E77 - Standard Test Method for Inspection and Verification of Thermometers.

27. ASTM F437 - Standard Specification for Threaded Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80.

28. ASTM F438 - Standard Specification for Socket-Type Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40.

29. ASTM F439 - Standard Specification for Socket-Type Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80.

30. ASTM F441/F441M - Standard Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80.

31. ASTM F442/F442M - Standard Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe (SDR-PR).

32. ASTM F493 - Standard Specification for Solvent Cements for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe and Fittings.

33. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers.

34. ASTM F 891 - Standard Specification for Coextruded Poly(Vinyl Chloride) (PVC) Plastic Pipe With a Cellular Core.

35. ASTM F1281 - Standard Specification for Crosslinked Polyethylene/Aluminum/Crosslinked Polyethylene (PEX-AL-PEX) Pressure Pipe.

36. ASTM F1282 - Standard Specification for Polyethylene/Aluminum/Polyethylene (PE-AL-PE) Composite Pressure Pipe.

37. ASTM F1476 - Standard Specification for Performance of Gasketed Mechanical Couplings for Use in Piping Applications.

E. American Welding Society:

1. AWS A5.8 - Specification for Filler Metals for Brazing and Braze Welding.

F. American Water Works Association:

1. AWWA C104 - American National Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.

2. AWWA C105 - American National Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems.

3. AWWA C110 - American National Standard for Ductile-Iron and Grey-Iron Fittings, 3 in. through 48 in. (75 mm through 1200 mm), for Water and Other Liquids.

4. AWWA C111 - American National Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

5. AWWA C151 - American National Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water.

6. AWWA C651 - Disinfecting Water Mains.

7. AWWA C700 - Cold-Water Meters - Displacement Type, Bronze Main Case.

8. AWWA C701 - Cold-Water Meters - Turbine Type, for Customer Service.

9. AWWA C702 - Cold-Water Meters - Compound Type.

10. AWWA C706 - Direct-Reading, Remote-Registration Systems for Cold-Water Meters.

11. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4 in. through 12 in., for Water Distribution.

12. AWWA C901 - Polyethylene (PE) Pressure Pipe and Tubing, 1/2 in. through 3 in., for Water Service.

13. AWWA C950 - Fiberglass Pressure Pipe.

14. AWWA M6 - Water Meters - Selection, Installation, Testing, and Maintenance.

G. Manufacturers Standardization Society of the Valve and Fittings Industry:

1. MSS SP 58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.
2. MSS SP 67 - Butterfly Valves.
3. MSS SP 69 - Pipe Hangers and Supports - Selection and Application.
4. MSS SP 70 - Cast Iron Gate Valves, Flanged and Threaded Ends.
5. MSS SP 71 - Cast Iron Swing Check Valves, Flanged and Threaded Ends.
6. MSS SP 78 - Cast Iron Plug Valves, Flanged and Threaded Ends.
7. MSS SP 80 - Bronze Gate, Globe, Angle and Check Valves.
8. MSS SP 85 - Cast Iron Globe & Angle Valves, Flanged and Threaded.
9. MSS SP 89 - Pipe Hangers and Supports - Fabrication and Installation Practices.
10. MSS SP 110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

H. National Electrical Manufacturers Association:

1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

I. Plumbing and Drainage Institute:

1. PDI WH201 - Water Hammer Arrester Standard.

J. Underwriters Laboratories Inc.:

1. UL 393 - Indicating Pressure Gauges for Fire-Protection Service.
2. UL 404 - Gauges, Indicating Pressure, for Compressed Gas Service.

1.03 SUBMITTALS

A. Section 01 33 00 - Submittals: Submittal procedures.

B. Product Data:

1. Piping: Submit data on pipe materials, fittings, and accessories. Submit manufacturer's catalog information.
2. Valves: Submit manufacturers catalog information with valve data and ratings for each service.
3. Domestic Water Specialties: Submit manufacturers catalog information, component sizes, rough-in requirements, service sizes, and finishes.
4. Pumps: Submit pump type, capacity, certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable. Include electrical characteristics and connection requirements.

C. Manufacturer's Installation Instructions: Submit installation instructions for pumps, valves and accessories.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.04 CLOSEOUT SUBMITTALS

A. Section 01 33 00 - Submittals: Closeout procedures.

B. Project Record Documents: Record actual locations of valves and equipment.

C. Operation and Maintenance Data: Submit spare parts list, exploded assembly views and recommended maintenance intervals.

1.05 QUALITY ASSURANCE

A. For drinking water service, provide valves complying with NSF 61.

B. Perform Work in accordance with all applicable codes.

1.06 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

B. Installer: Company specializing in performing Work of this section with minimum three years experience.

1.07 PRE-INSTALLATION MEETINGS

A. Section 01 10 10 - General Requirements: Pre-installation meeting.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Section 01 10 10 - General Requirements: Product storage and handling requirements.

B. Accept valves and equipment on site in shipping containers with labeling in place. Inspect for damage.

C. Provide temporary protective coating on cast iron and steel valves.

D. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

E. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

1.09 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.10 WARRANTY

A. Section 01 10 10 - General Requirements: Product warranties and product bonds.

PART 2 PRODUCTS

2.01 DOMESTIC WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Ductile Iron Pipe: AWWA C151.

1. Fittings: AWWA C110, ductile iron, standard thickness.

2. Joints: AWWA C111, rubber gasket with rods.

3. Jackets: AWWA C105 polyethylene jacket or Double layer, half lapped, 10 mil polyethylene tape.

B. Copper Tubing: ASTM B88, Type K annealed.

1. Fittings: ASME B16.18, cast copper, or ASME B16.22, wrought copper.

2. Joints: Compression connection or Brazed, AWS A5.8 BCuP silver/phosphorus/copper alloy with melting range 1190 to 1480 degrees F

C. PVC Pipe: ASTM D1785, Schedule 40 or ASTM D2241, SDR-26 for 160 psig pressure rating polyvinyl chloride (PVC) material.

1. Fittings: ASTM D2466, Schedule 40, PVC

2. Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement.

D. PVC Pipe: AWWA C900 Class 150, polyvinyl chloride (PVC) material.

1. Fittings: AWWA C110, ductile iron, standard thickness.

2. Joints: ASTM D3139 compression gasket ring.

E. Copper Tubing: ASTM B42, Temper H80 hard drawn, or Temper O61 annealed.

1. Fittings: ASME B16.18 cast copper alloy or ASME B16.22 wrought copper and bronze.

2. Joints:

a. ASTM B32, Alloy Grade Sb5 tin-antimony, or Alloy Grade Sn95 tin-silver, lead free solder

b. AWS A5.8 Classification BcuP-3 or BcuP-4 silver braze.

F. Copper Tubing: ASTM B42, Temper O61 annealed.

1. Fittings: ASME B16.26 cast bronze.

2. Joints: Flared.

G. Polyethylene Pipe: ASTM D2239 SIDR 19, or ASTM D2447 Schedule 40.

1. Fittings: ASTM D2609, Polyethylene.

2. Joints: Mechanical with stainless steel clamps.

2.02 DOMESTIC WATER PIPING, ABOVE GRADE

A. Copper Tubing: ASTM B88, Type L or K drawn.

1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.

2. Joints:

a. ASTM B32, Alloy Grade Sb5 tin-antimony, or Alloy Grade Sn95 tin-silver, lead free solder

b. AWS A5.8 Classification BCuP-3 or BCuP-4 silver braze.

B. Copper Tubing: ASTM B88, Type L or K, drawn, rolled grooved ends.

1. Fittings: ASME B16.18 cast copper alloy, or ASME B16.22 wrought copper and bronze, or ASTM B584 bronze sand castings, grooved ends.

2. Joints: Grooved mechanical couplings meeting ASTM F1476.

a. Housing Clamps: ASTM A395/A395M and ASTM A536 ductile iron, enamel coated, compatible with copper tubing sizes, to engage and lock designed to permit some angular deflection, contraction, and expansion.

b. Gasket: Elastomer composition for operating temperature range from -30 degrees F to 230 degrees F

c. Accessories: Stainless steel bolts, nuts, and washers.

C. PEX Tubing: (oxygen bearing, cross-linked Polyethylene): ASTM F876-04

1. Fittings: ASTM F1807 Brass insert compression type.

2. Joints: ASTM F1807 Copper crimp rings

2.03 VALVES

A. Refer to spec section General Duty Valves for Plumbing.

2.04 PRESSURE GAGES

A. Manufacturers:

1. Ashcroft

2. Watts Regulator Co

3. Wilkins Water Control

4. Or approved equal

B. Gage: ASME B40.1, [UL 393] [UL 404] with bourdon tube, rotary brass movement, brass socket, front calibration adjustment, black scale on white background.

1. Case: Steel.

2. Bourdon Tube: Brass.

3. Dial Size: 2 inch or 4-1/2 inch

4. Mid-Scale Accuracy: (2) two percent.

5. Scale: both Psi and kPa.

2.05 PRESSURE GAGE TAPS

A. Needle Valve: Stainless Steel, 1/4 inch NPT for minimum 300 psi.

B. Ball Valve: Brass or Stainless Steel, 1/4 inch NPT for 250 psi.

C. Pulsation Damper: Pressure snubber, brass with 1/4 inch NPT connections.

2.06 STEM TYPE THERMOMETERS

A. Thermometer: ASTM E1, red appearing mercury, lens front tube, cast aluminum case with enamel finish.

1. Size: 7-inch scale.

2. Window: Clear glass or Lexan.

3. Stem: Brass, 3/4 inch NPT, 3-1/2 inch long.

4. Accuracy: 2 percent.

5. Calibration: Both degrees F and degrees C.

2.07 FLOW CONTROL VALVES

A. Manufacturers:

1. Watts Regulator Co.

2. Wilkins Water Control

3. Leonard Valve Co.

4. Or approved equal

B. Construction: Class 125, Brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet, combination blow-down or back-flush drain.

C. Calibration: Control flow within 5 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum minimum pressure 5 psi.

2.08 WATER PRESSURE REDUCING VALVE

A. Manufacturers:

1. Watts Regulator Co

2. Wilkins Water Control.

3. Leonard Valve Co.

4. Or approved equals

B. 2 inches and Smaller: MSS SP 80, bronze body, stainless steel and thermoplastic internal parts, fabric reinforced diaphragm, strainer, threaded and single union ends.

C. 2 inches and Larger: MSS SP 85, cast iron body, bronze fitted, elastomeric diaphragm and seat disc, flanged.

2.09 RELIEF VALVES

A. Manufacturers:

1. Watts Regulator Co.

2. Wilkins Water Control

3. Leonard Valve Co.

4. Or approved equals

B. Pressure Relief:

1. ANSI Z21.22 certified, bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated.

C. Temperature and Pressure Relief:

1. ANSI Z21.22 certified, bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, temperature relief maximum 210 degrees F capacity ASME certified and labeled.

2.10 STRAINERS

A. 2 inch and Smaller: Threaded brass body for 175 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.

B. 1-1/2 inch to 4 inch: Class 125, flanged iron body, Y pattern with 1/16-inch stainless steel perforated screen.

C. 5 inch and Larger: Class 125, flanged iron body, basket pattern with 1/8 inch stainless steel perforated screen.

2.11 HOSE BIBS

A. Interior: Bronze or brass with integral mounting flange, replaceable hexagonal disc, hose thread spout, chrome plated where exposed with hand wheel, with vacuum breaker in conformance with ASSE 1011.

B. Interior Mixing: Bronze or brass, wall mounted, double service faucet with hose thread spout, integral stops, chrome plated where exposed with hand wheels, and vacuum breaker in conformance with ASSE 1011.

2.12 BACKFLOW PREVENTERS

A. Manufacturers:

1. Watts Regulator Co

2. Wilkins Water Control.

3. Or approved equal.

B. Reduced Pressure Backflow Preventers:

1. Comply with ASSE 1013.

2. Bronze body, with bronze internal parts and stainless steel springs.

3. Two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve opening under back pressure in case of diaphragm failure; non-threaded vent outlet; assembled with two gate valves, strainer, and four test cocks.

C. Double Check Valve Assemblies: Comply with ASSE ASSE 1015 or AWWA C510; Bronze body with corrosion resistant internal parts and stainless steel springs; two independently operating check valves with intermediate atmospheric vent.

2.13 WATER HAMMER ARRESTORS

A. ASSE 1010; stainless steel or copper construction, bellows or piston type sized in accordance with PDI WH-201.

B. Pre-charged suitable for operation in temperature range 34 to 250 degrees F, maximum 150 psi working pressure.

PART 3 EXECUTION

3.01 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside, before assembly.

3.02 INSTALLATION - THERMOMETERS AND GAGES

A. Install one pressure gage for each pump, locate taps before strainers and on suction and discharge of pump; pipe to gage.

B. Install gage taps in piping.

C. Install pressure gages with pulsation dampers. Provide ball valve to isolate each gage.

D. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inches for installation of thermometer sockets. Allow clearance from insulation.

E. Provide instruments with scale ranges selected according to service with largest appropriate scale.

F. Install gages and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.

G. Adjust gages and thermometers to final angle, clean windows and lenses, and calibrate to zero.

3.03 INSTALLATION - ABOVE GROUND PIPING

A. Install non-conducting dielectric connections wherever jointing dissimilar metals.

B. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

C. Install piping to maintain headroom without interfering with use of space or taking more space than necessary.

D. Group piping whenever practical at common elevations.

E. Slope piping and arrange systems to drain at low points.

F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

H. Provide access where valves and fittings are not accessible. Coordinate size and location of access doors.

I. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

J. Provide support for utility meters in accordance with requirements of utility companies.

K. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting.

L. Install domestic water piping in accordance with ASME B31.9.

M. Sleeve pipes passing through partitions, walls and floors.

N. Install firestopping at fire rated construction perimeters and openings containing penetrating sleeves and piping.

O. Install unions downstream of valves and at equipment or apparatus connections.

P. Install valves with stems upright or horizontal, not inverted.

Q. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.

R. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

S. Install globe or ball valves for throttling, bypass, or manual flow control services.

T. Provide lug end butterfly valves adjacent to equipment when functioning to isolate equipment.

U. Provide spring loaded check valves on discharge of water pumps.

V. Provide flow controls in water circulating systems as indicated on Drawings.

W. Install potable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibs.

X. Pipe relief from valves, back-flow preventers and drains to nearest floor drain.

Y. Test backflow preventers in accordance with ASSE 5013

Z. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to lavatories, sinks, or washing machine outlets.

3.04 INSTALLATION - SERVICE CONNECTIONS

A. Provide new water service complete with approved reduced pressure back-flow preventer and water meter with by-pass valves, pressure reducing valve, and strainer.

B. Provide sleeve in wall for service main and support at wall with reinforced-concrete bridge. Caulk enlarged sleeve and make watertight with pliable material. Anchor service main inside to concrete wall.

3.05 FIELD QUALITY CONTROL

A. Section 01 10 10 - General Requirement: Field inspecting, testing, adjusting, and balancing.

B. Test domestic water piping system in accordance withal applicable codes.

3.06 CLEANING

A. Prior to starting work, verify system is complete, flushed and clean.

B. Verify pH of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).

C. Inject disinfectant, free chlorine in liquid, powder and tablet or gas form, throughout system to obtain residual from 50 to 80 mg/L.

D. Bleed water from outlets to obtain distribution and test for disinfectant residual at minimum 15 percent of outlets.

E. Maintain disinfectant in system for 24 hours.

F. When final disinfectant residual tests less than 25 mg/L, repeat treatment.

G. Flush disinfectant from system until residual concentration is equal to incoming water or 1.0 mg/L.

H. Take samples no sooner than 24 hours after flushing, from 5 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

END OF SECTION

SECTION 22 13 16

SANITARY DRAIN/WASTE/VENT PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Sanitary sewer piping buried within 5 feet of building.
2. Sanitary sewer piping above grade.
3. Floor drains.
4. Cleanouts.
5. Backwater valves.

B. Refer to other Division 22 spec sections for plumbing fixtures, supports and anchors, and general duty valves for plumbing.

1.02 REFERENCES

A. American Society of Mechanical Engineers:

1. ASME A112.14.1 - Backwater Valves.
2. ASME A112.14.3 - Grease Interceptors.
3. ASME A112.14.4 - Grease Removal Devices.
4. ASME A112.21.1 - Floor Drains.
5. ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings.
6. ASME B16.3 - Malleable Iron Threaded Fittings.
7. ASME B16.4 - Gray Iron Threaded Fittings.
8. ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings (DWV).
9. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV.
10. ASME B31.9 - Building Services Piping.

B. ASTM International:

1. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings.
2. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
3. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings.
4. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.
5. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures.

6. ASTM A536 - Standard Specification for Ductile Iron Castings.
7. ASTM B32 - Standard Specification for Solder Metal.
8. ASTM B42 - Standard Specification for Seamless Copper Pipe, Standard Sizes.
9. ASTM B43 - Standard Specification for Seamless Red Brass Pipe, Standard Sizes.
10. ASTM B75 - Standard Specification for Seamless Copper Tube.
11. ASTM B88 - Standard Specification for Seamless Copper Water Tube.
12. ASTM B251 - Standard Specification for General Requirements for Wrought Seamless Copper and Copper-Alloy Tube.
13. ASTM B302 - Standard Specification for Threadless Copper Pipe, Standard Sizes.
14. ASTM B306 - Standard Specification for Copper Drainage Tube (DWV).
15. ASTM C14 - Standard Specification for Concrete Sewer, Storm Drain, and Culvert Pipe.
16. ASTM C76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
17. ASTM C443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.
18. ASTM C478 - Standard Specification for Precast Reinforced Concrete Manhole Sections.
19. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
20. ASTM C1053 - Standard Specification for Borosilicate Glass Pipe and Fittings for Drain, Waste, and Vent (DWV) Applications.
21. ASTM D1785 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
22. ASTM D2235 - Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.
23. ASTM D2241 - Standard Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter.
24. ASTM D2464 - Standard Specification for Threaded Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
25. ASTM D2466 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
26. ASTM D2467 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
27. ASTM D2564 - Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.

28. ASTM D2661 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe and Fittings.

29. ASTM D2665 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings.

30. ASTM D2729 - Standard Specification for Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

31. ASTM D2751 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings.

32. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.

33. ASTM D3034 - Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

34. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

35. ASTM F628 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe with a Cellular Core.

36. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers.

37. ASTM F1476 - Standard Specification for Performance of Gasketed Mechanical Couplings for Use in Piping Applications.

C. Cast Iron Soil Pipe Institute:

1. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications.

2. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications.

D. Plumbing and Drainage Institute:

1. PDI G101 - Standard Testing and Rating Procedure for Grease Interceptors.

1.03 SUBMITTALS

A. Shop Drawings: Indicate dimensions, weights, and placement of openings and holes for sewage-ejectors, and manholes.

B. Product Data:

1. Piping: Submit data on pipe materials, fittings, and accessories. Submit manufacturers catalog information.

2. Pumps: Submit pump type, capacity, certified pump curves showing pump performance characteristics with pump and system operating point plotted.

Include NPSH curve when applicable. Include electrical characteristics and connection requirements.

C. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.04 CLOSEOUT SUBMITTALS

A. Section 01 10 10 - General Requirements: Closeout procedures.

B. Project Record Documents: Record actual locations of equipment and clean-outs.

C. Operation and Maintenance Data: Submit frequency of treatment required for interceptors. Include, spare parts lists, exploded assembly views for pumps and equipment.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with all applicable codes.

1.06 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

B. Installer: Company specializing in performing work of this section with minimum three years experience.

1.07 PRE-INSTALLATION MEETINGS

A. Section 01 10 10 - General Requirements: Pre-installation meeting.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Section 01 10 10 - General Requirements: Product storage and handling requirements.

B. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

1.09 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.10 WARRANTY

A. Section 01 10 10 - General Requirements: Product warranties and product bonds.

PART 2 PRODUCTS

2.01 SANITARY SEWER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Cast Iron Soil Pipe: ASTM A74, service weight, bell and spigot or plain ends.

1. Fittings: Cast iron, ASTM A74.

2. Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets or lead and oakum.

B. Cast Iron Pipe: CISPI 301, hub-less.

1. Fittings: Cast iron, CISPI 301.

2. Joints: CISPI 310, neoprene gasket and stainless steel clamp and shield assemblies.

C. Ductile Iron Pipe: AWWA C150 or AWWA C151, 150 minimum pressure class, bell and spigot or plain ends.

1. Fittings: AWWA C110, ductile iron, standard thickness.

2. Joints: AWWA C111, rubber gasket joint devices.

D. Concrete Pipe: ASTM C14, Class 1; un-reinforced, bell and spigot or plain ends.

1. Fittings: Concrete pipe, ASTM C14.

2. Joints: ASTM C443, rubber compression gasket.

E. ABS Pipe: ASTM D2751, SDR 23.5, Acrylonitrile-Butadiene-Styrene (ABS) material, bell and spigot style solvent sealed ends.

1. Fittings: ABS, ASTM D2751.

2. Joints: ASTM D2235, solvent weld.

F. ABS Pipe: ASTM F628, Acrylonitrile-Butadiene-Styrene (ABS) material.

1. Fittings: ABS.

2. Joints: ASTM D2235, solvent weld.

G. ABS Pipe: ASTM D2661, Acrylonitrile-Butadiene-Styrene (ABS) material.

1. Fittings: ABS, ASTM D2661.

2. Joints: ASTM D2235, solvent weld.

H. PVC Pipe: ASTM D2729, polyvinyl chloride (PVC) material, bell and spigot solvent sealed ends.

1. Fittings: PVC, ASTM D2729.

2. Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement.

I. PVC Pipe: ASTM D1785, Schedule 40, polyvinyl chloride (PVC) material, bell and spigot style solvent sealed joint ends.

1. Fittings: ASTM D2466, Schedule 40, PVC.

2. Joints: ASTM D2855, solvent weld with ASTM D2564 Solvent cement.

J. Copper Tube: ASTM B88, Type K.

1. Fittings: ASME B16.23, cast bronze, or ASME B16.29 wrought copper.

2. Joints: ASTM B32, Alloy Grade Sb5 tin-antimony, or Alloy Grade Sn95 tin-silver, lead free solder

K. PVC Pipe: ASTM D2665 or ASTM D3034 SDR 26, polyvinyl chloride (PVC) material.

1. Fittings: PVC, ASTM D2665 or ASTM D3034.

2. Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement.

2.02 SANITARY SEWER PIPING, ABOVE GRADE

A. Cast Iron Pipe: ASTM A74, service weight.

1. Fittings: Cast iron, ASTM A74.

2. Joints: ASTM C564, rubber gasket joint devices or lead and oakum.

B. Cast Iron Pipe: CISPI 301, hub-less, service weight.

1. Fittings: Cast iron, CISPI 301.

2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.

C. Copper Tube: ASTM B88, Type K or L.

1. Fittings: ASME B16.23, cast bronze, or ASME B16.29, wrought copper.

2. Joints: ASTM B32, Alloy Grade Sb5 tin-antimony, or Alloy Grade Sn95 tin-silver, lead free solder

D. PVC Pipe: ASTM D2729, polyvinyl chloride (PVC) material.

1. Fittings: ASTM D2729, PVC.

2. Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement.

E. PVC Pipe: ASTM D2665, polyvinyl chloride (PVC) material.

1. Fittings: ASTM D2665, PVC.

2. Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement.

F. PVC Pipe: ASTM D1785 Schedule or ASTM D2241 SDR-26 for not less than 150 psi pressure rating, polyvinyl chloride (PVC) material.

1. Fittings: ASTM D2466, Schedule 40, PVC

2. Joints: ASTM D2855, solvent weld with ASTM D2564 Solvent cement.

2.03 FLOOR DRAINS

A. Manufacturers:

1. Zurn Co.

2. JR Smith Co

3. Josam

4. Or approved equal

B. Floor Drain (FD-1): ASME A112.21.1; galvanized, cast iron two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable nickel-bronze strainer.

2.04 CLEANOUTS

A. Exterior Surfaced Areas (CO-1): Round cast nickel bronze access frame and non-skid cover.

B. Exterior Unsurfaced Areas (CO-2): Line type with lacquered cast iron body and round epoxy coated cover with gasket.

C. Interior Finished Floor Areas (CO-3): Lacquered cast iron body with anchor flange, reversible clamping collar, threaded top assembly, and round scored cover with gasket in service areas and round depressed cover with gasket to accept floor finish in finished floor areas.

D. Interior Finished Wall Areas (CO-4): Line type with lacquered cast iron body and round epoxy coated cover with gasket, and round stainless steel access cover secured with machine screw.

E. Interior Unfinished Accessible Areas (CO-5): Calked or threaded type. Provide bolted stack cleanouts on vertical rainwater leaders.

2.05 BACK WATER VALVES

A. Manufacturers:

1. Watts Regulator Co.
2. Zurn Co
3. JR Smith Co
4. Josam
5. Or approved equal

B. Cast Iron: ASME A112.14.1; galvanized cast iron body and cover, brass valve, 6 inch extension sleeve, and access cover.

C. Plastic: PVC body and valve, 6 inch extension sleeve, and access cover.

PART 3 EXECUTION

3.01 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

D. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

3.02 INSTALLATION - BURIED PIPING SYSTEMS

A. Verify connection size (to existing piping system), location, and invert are as indicated on Drawings.

B. Establish elevations of buried piping with not less than 5 ft of cover.

C. Establish minimum separation of pipe from other domestic water services in accordance with code.

D. Remove scale and dirt on inside of piping before assembly.

E. Install pipe to elevation as indicated on Drawings.

F. Place bedding material at trench bottom to provide uniform bedding for piping, level bedding materials in one continuous layer not exceeding 4 inches compacted depth. Install pipe on prepared bedding.

G. Route pipe in straight line.

H. Pipe Cover and Backfilling:

1. Maintain optimum moisture content of fill material to attain required compaction density.

2. After hydrostatic test, evenly backfill entire trench width by hand placing backfill material and hand tamping in 4 inches compacted cover over top of jacket.

3. Evenly and continuously backfill remaining trench depth in uniform layers with backfill material.

4. Do not use wheeled or tracked vehicles for tamping.

3.03 INSTALLATION - ABOVE GROUND PIPING

A. Establish invert elevations, slopes for drainage to 1/8 inch per foot unless indicated otherwise on plans. Maintain gradients.

B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Provide clearances at cleanout for snaking drainage system.

C. Encase exterior cleanouts in concrete flush with grade.

D. Install floor cleanouts at elevation to accommodate finished floor.

E. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

F. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

G. Install piping to maintain headroom. Do not spread piping, conserve space.

H. Group piping whenever practical at common elevations.

I. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

J. Provide clearance in hangers and from structure and other equipment for installation of insulation.

K. Provide access where valves and fittings are not accessible. Coordinate size and location of access doors.

L. Install piping penetrating roofed areas to maintain integrity of roof assembly.

M. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

N. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting.

O. Install bell and spigot pipe with bell end upstream.

P. Sleeve pipes passing through partitions, walls and floors.

Q. Install fire stop at fire rated construction perimeters and openings containing penetrating sleeves and piping.

R. Support cast iron drainage piping at every joint.

3.04 INSTALLATION - PUMPS

A. Install sump pumps in basins with sufficient space for free movement of automatic floats in pit. Verify functional on/off operation.

B. Provide line sized soft seated check valve on pump discharge unless noted otherwise on plans.

3.05 FIELD QUALITY CONTROL

A. Test sanitary waste and vent piping system in accordance with all applicable codes.

END OF SECTION

SECTION 22 33 00

ELECTRIC DOMESTIC WATER HEATERS

PART 1 GENERAL

1.01 SCOPE

A. Section Includes:

1. Electric water heaters.

B. Related Sections:

1. Refer to other Division 22 spec sections.

1.02 SUBMITTALS

A. Product Data: Submit dimensioned drawings of water heaters indicating components and connections to other equipment and piping. Indicate pump type, capacity and power requirements. Submit certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable. Submit electrical characteristics and connection locations.

B. Operation and Maintenance Data: Submit replacement part numbers and availability.

PART 2 PRODUCTS

2.01 ELECTRIC WATER HEATER - 1

A. Manufacturers:

1. Bosch.

2. AO Smith.

3. Rheem.

4. Bradford White.

5. GE.

6. Bock.

7. Or approved equal.

B. Type: Factory-assembled and wired, electric, horizontal storage.

1. Capacity:

a. Storage capacity: see schedule below.

b. Heating element size: Upper 0, Lower element 1500 Watt.

c. Maximum working pressure: 150 PSI.

2. Tank: Glass lined welded steel, thermally insulated with minimum 2 inches polyurethane encased in corrosion-resistant steel jacket; baked-on enamel finish.

3. Controls: Automatic immersion water thermostat; externally adjustable temperature range from 60 to 140 degrees F flanged or screw-in nichrome elements, high temperature limit thermostat.

4. Accessories: Brass water connections and dip tube drain valve, magnesium anode, and ASME rated temperature and pressure relief valve.

2.02 ELECTRIC WATER HEATER - 2

A. Type: Factory-assembled and wired, electric, horizontal storage.

B. Capacity:

1. Storage capacity: see schedule below.

2. Heating element size: Upper 0, Lower element 1500 Watt.

3. Maximum working pressure: 150 PSI.

C. Tank: Glass lined welded steel, thermally insulated with minimum 2 inches polyurethane encased in corrosion-resistant steel jacket; baked-on enamel finish.

D. Controls: Automatic immersion water thermostat; externally adjustable temperature range from 60 to 140 degrees F flanged or screw-in nichrome elements, high temperature limit thermostat.

E. Accessories: Brass water connections and dip tube drain valve, magnesium anode, and ASME rated temperature and pressure relief valve.

PART 3 EXECUTION

3.01 EXAMINATION

A. Complies with ASHRE 90.1-1999 for construction of water heaters.

B. Perform Work in accordance with State of Wisconsin and Federal codes.

C. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

D. Installer: Company specializing in performing Work of this section with minimum three years documented experience approved by manufacturer.

3.02 PREPARATION

A. Verify field measurements prior to fabrication.

B. Accept water heaters on site in original labeled cartons. Inspect for damage.

C. Protect heat exchangers and tanks with temporary inlet and outlet caps. Maintain caps in place until installation.

3.03 INSTALLATION

A. Maintain manufacturer's recommended clearances around and over water heaters.

B. Install water heaters on shelves as shown on drawings.

C. Install water heater trim and accessories furnished loose for field mounting.

D. Install electrical devices furnished loose for field mounting.

E. Install the following piping accessories for electric water heaters.

1. On hw supply:
    a. Thermometer well and thermometer.
    b. Pressure gage.
    c. Shutoff valve.
2. On cw or return:
    a. Strainer.
    b. Shutoff valve.

END OF SECTION

SECTION 22 40 00

PLUMBING FIXTURES

PART 1 GENERAL

1.01 SCOPE

A. Plumbing Fixtures

1. Fixtures

2. Hangers and carriers

3. Fixture valves and trim

4. Faucets

1.02 REFERENCES

A. ASME B31.9 - Building Service Piping.

B. ASME Boiler and Pressure Vessel Code.

C. ASME B00090 Sec IX - Welding and Brazing Qualifications.

D. ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings Class 25, 125, 250 and 800.

E. ASME B16.3 - Malleable Iron Threaded Fittings.

F. ASME B16.4 - Cast Iron Threaded Fittings Class 125 and 250.

G. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.

H. ASME B16.22 - Wrought Copper and Bronze Solder Joint Pressure Fittings.

I. ASTM A53 - Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless.

J. ASTM B88 - Seamless Copper Water Tube

K. ASTM A53 - Pipe, Steel, Black and Hot-dipped Zinc Coated (Galvanized), Welded and Seamless, for Ordinary Uses.

L. ASTM A234 - Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.

M. ASTM B32 - Solder Metal.

N. ASTM D1785 - Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.

O. ASTM D2466 - Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.

PART 2 PRODUCTS

2.01 URINAL (UR)

A. Bowl: ANSI/ASME A112.19.2; vitreous china, wall hung, washout urinal w/shields, integral trap, removable steel strainer, 3/4” top spud, steel support hangar. Wall hung carrier.

B. Flush Valve: ASME A112.19.2-2003, ASSE 1037; exposed chrome plated, lever operated flush valve, and vacuum breaker; 1/8 gallon per flush volume.

2.02 LAVATORY (LAV)

A. ANSI/ASME A112.19.2; vitreous china wall-hung lavatory 18 x 20 minimum, with 4” high back, drillings on 4” centers, rectangular basin with splash lip front over flow and soap depression.

B. Trim shall be ASME A112.18 a chrome plated combination supply fitting with pop-up waste water economy operator single lever handle, maximum 1.5 gpm flow rate. Chrome plated 17 gauge brass P-trap with clean out plug and arm with escutcheon.

C. Carrier: ANSI/ASME A112.6.1; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, concealed arm supports, bearing plate and studs.

2.03 WATER CLOSET

A. WC-1

B. Bowl: ANSI/ASME A112.19.2 floor mounted, handicapped height, siphon jet vitreous china closet bowl, with elongated rim, dual-flush, tank toilet, and china bolt caps.

1. Toilet type: Two-piece
2. Bowl shape: Elongated front
3. Flush type: Class Five
4. Water Consumption: Full: 1.6 gpf, Reduced: 1.1 gpf
5. Rough-in: 12"
6. Rim height: ADA accessible

2.04 SERVICE SINK (MB)

A. Mop Service Basin. Unit to be one-piece molded fiberglass using extreme heat and pressure. Height shall be 12" with not less than 1" wide shoulder. Size 24"x36" with integrally molded, self-draining shelf. Drain shall be integrally molded, complete with drain seal for installation of 3" ABS, PVC (Sch. #80) and iron pipe. Removable stainless steel strainer. Performance tested to meet or exceed ANSI Specifications Z 124.2, Z 124.6

B. Trim: ASME A112.18.1; exposed wall type supply with cross lever handles, spout wall brace, vacuum breaker, hose and spout, strainers eccentric adjustment inlets, integral screwdriver stops with covering caps and adjustable threaded wall flanges.

PART 3 EXECUTION

3.01 EXAMINATION

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

E. Valves: Manufacturer's name and pressure rating marked on valve body.

3.02 PREPARATION

A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.03 INSTALLATION

A. Install in accordance with UFC 3-240-01, IPC, NSF 18, and manufactures instructions.

B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

C. Route piping in orderly manner and maintain gradient.

D. Install piping to maintain headroom, conserve space, and not interfere with use of space.

E. Group piping whenever practical at common elevations.

F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

G. Provide clearance for installation of insulation and access to valves and fittings.

H. Provide access where valves and fittings are not exposed.

I. Purge all supply piping at full line pressure to clear of construction debris, filings, dirt, and foreign matter prior to installation of faucets, and fittings.

J. Install valves with stems upright or horizontal, not inverted.

3.04 CLEANING AND ADJUSTING

A. Clean plumbing fixtures and equipment.

B. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

C. Do not permit use of fixtures before final acceptance.

END OF SECTION

SECTION 23 00 10

MECHANICAL GENERAL PROVISIONS

PART 1 GENERAL

1.01 SCOPE

A. General Requirements.

1. Provide mechanical work including labor, equipment, and materials to meet requirements as specified herein including references and associated specifications.

2. Provide drawings to depict the extent and general arrangement of the heating and plumbing systems including equipment and routing of piping.

3. Provide coordination through the KO/COR for all work. Coordination must accommodate building occupancy and connected building systems, and various skilled trades. Coordinate the work of all trades including skilled trades to accomplish the performance of the work and avoid delays.

4. Provide industry accepted workmanship for all work to meet requirements of specifications including the fitting of new equipment, devices and components into each space as specified in the design specifications and as shown on the drawings.

5. Provide attention to detail and quality of workmanship to meet requirements, to maintain all required code clearances around all new and existing equipment and connected components, and to allow for adequate and acceptable clearance space for entry, safety, service, and maintenance.

6. Apply the most stringent criteria where there is a conflict between standards, design guides, manuals, laws, and codes to meet all requirements.

B. Equipment and Materials:

1. Equipment and materials must meet the requirements of all design specifications and drawings, product requirements, and all standards, design guides, manuals, laws and codes referenced in the specifications, contract documents and as specified herein.

1.02 REFERENCES (MOST RECENT EDITIONS UNLESS OTHERWISE STATED HEREIN)

A. ANSI/AMCA 210, Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating (2016; also referred to as ANSI/ASHRAE 51).

B. ANSI/AHRI Standard 575, Method of Measuring Machinery Sound Within an Equipment Space.

C. ARPM IP-20, Specifications for Drives Using Classical V-Belts and Sheaves (2015).

D. ARPM IP-22, Specifications for Drives Using Narrow V-Belts and Sheaves (2015).

E. ASTM A48/A48M-03, Standard Specification for Gray Iron Castings (2016).

F. ASTM A109/A109M, Standard Specification for Steel, Strip, Carbon (0.25 Maximum Percent), Cold-Rolled (2016).

G. ASTM C155, Standard Classification of Insulating Firebrick (2013).

H. ASTM A193/A193M, Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications (2016).

I. ASTM A194/A194M, Specification for Carbon Steel, Alloy Steel, and Stainless Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both (2017).

J. ASTM A240/A240M, Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications (2016a).

K. ASTM A424/ A424M-09a, Standard Specification for Steel, Sheet, for Porcelain Enameling (2016).

L. ASTM A568/A568M-15, Standard Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements.

M. ASTM A653/A653M-15e1, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process (2015).

N. ASTM A666-15, Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar (2015).

O. ASTM A693-16, Standard Specification for Precipitation-Hardening Stainless and Heat-Resisting Steel Plate, Sheet, and Strip (2016).

P. ASTM B209-14, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (2014).

Q. AWS D1.1, Structural Welding Code - Steel (2015).

R. IEEE C2 - National Electrical Safety Code (2017).

S. NEMA MG 1, Motors and Generators (2016).

T. NEMA MG 10, Energy Management Guide for Selection and Use of Fixed Frequency Medium AC Squirrel-Cage Polyphase Induction Motors (2017).

U. NEMA MG 11, Energy Management Guide for Selection and Use of Single-Phase Motors (2012).

V. NFPA 70-2017, National Electrical Code.

W. QQ-S-775E, Steel Sheets, Carbon, Zinc Coated (Galvanized) by the Hot Dip Process.

X. UL 378, Standard for Draft Equipment (2006).

Y. UL 900, Standard for Air Filter Units (2015).

1.03 SUBMITTALS

A. Product Data including shop drawings, salient characteristics, and certifications.

B. Qualifications.

PART 2 PRODUCTS

2.01 GENERAL

A. All equipment and materials must be manufactured by manufacturers that are routinely engaged in the manufacture of such products. All products of the same type must be from the same manufacturer.

B. All new equipment and materials must have a history of dependable and satisfactory use for a minimum period of five (5) years prior to bid opening; must be certified, factory tested, UL listed and marked, and must meet all requirements of specifications; must fully integrate with existing building systems, and must be capable of support by a service organization.

PART 3 EXECUTION

3.01 PREPARATION

A. Complete all project coordination and preliminary work tasks before installation of equipment units and materials.

3.02 INSTALLATION

A. Provide installation of all mechanical equipment and materials in compliance with manufacturer's published data and recommendations.

3.03 TESTING AND VERIFICATION

A. Provide performance testing and verification in compliance with all associated Specifications.

END OF SECTION

SECTION 23 05 23

GENERAL DUTY VALVES FOR HVAC PIPING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Ball valves.

1.02 REFERENCES

A. ASTM International:

1. ASTM A216/A216M - Standard Specification for Steel Castings, Carbon, Suitable for Fusion Welding, for High-Temperature Service.

2. ASTM D1785 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.

3. ASTM D4101 - Standard Specification for Propylene Injection and Extrusion Materials.

B. Manufacturers Standardization Society of the Valve and Fittings Industry:

1. MSS SP 67 - Butterfly Valves.

2. MSS SP 70 - Cast Iron Gate Valves, Flanged and Threaded Ends.

3. MSS SP 71 - Cast Iron Swing Check Valves, Flanged and Threaded Ends.

4. MSS SP 78 - Cast Iron Plug Valves, Flanged and Threaded Ends.

5. MSS SP 80 - Bronze Gate, Globe, Angle and Check Valves.

6. MSS SP 85 - Cast Iron Globe & Angle Valves, Flanged and Threaded.

7. MSS SP 110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

C. Underwriters Laboratories Inc.:

1. UL 842 - Valves for Flammable Fluids.

1.03 SUBMITTALS

A. Product Data: Submit manufacturers catalog information with valve data and ratings for each service.

B. Valve schedule: Submit a valve schedule showing sizes and types of valves to be utilized for each service. Include range of service sizes that each valve type maybe utilized.

C. Manufacturer's Installation Instructions: Submit hanging and support methods, joining procedures.

1.04 QUALITY ASSURANCE

A. Perform Work in accordance with all applicable codes

1.05 DELIVERY, STORAGE, AND HANDLING

A. Section 01 10 10 - General Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

C. Provide temporary protective coating on cast iron and steel valves.

PART 2 PRODUCTS

2.01 BALL VALVES

A. Manufacturers:

1. Crane Valve, North America.

2. Hammond Valve.

3. Milwaukee Valve Company.

4. NIBCO, Inc..

5. Stockham Valves & Fittings.

6. Or approved equal.

B. (BA-7) 1/4 inch to 1 inch: MSS SP 110, Class 125, two piece, threaded ends, bronze body, chrome plated bronze ball, reinforced teflon seats, blow-out proof stem, lever handle, UL 842 listed for flammable liquids and LPG, full port.

C. (BA-8) 1-1/4 inch to 3 inch: MSS SP 110, Class 125, two piece, threaded ends, bronze body, chrome plated bronze ball, reinforced teflon seats, blow-out proof stem, lever handle, UL 842 listed for flammable liquids and LPG, conventional port.

PART 3 EXECUTION

3.01 EXAMINATION

A. Section 01 10 10 - General Requirements: Verification of existing conditions before starting work.

B. Verify piping system is ready for valve installation.

3.02 INSTALLATION

A. Install valves with stems upright or horizontal, not inverted.

B. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.

C. Install 3/4 inch ball valves with cap for drains at main shut-off valves, low points of piping, bases of vertical risers, and at equipment.

D. Install valves with clearance for installation of insulation and allowing access.

E. Provide access where valves and fittings are not accessible. Coordinate size and location of access doors.

F. Install Work in accordance with all applicable codes.

3.03 VALVE APPLICATIONS

A. Install shutoff and drain valves at locations indicated on drawings in accordance with this section.

B. Install ball, butterfly or gate valves (type is depending on size/service) for shut-off and to isolate equipment, part of systems, or vertical risers.

C. Install ball valves in natural gas systems for shut-off service.

3.04 SCHEDULES

A. Contractor shall provide a valve schedule similar to the following that represents the proposed valves to be used in the project. Submit a valve schedule showing sizes and types of valves to be utilized for each service. Include range of service sizes that each valve type maybe utilized.

B. Valve Service:

SYSTEM DESCRIPTION	SHUTOFF	THROTTLING	CHECK
Natural Gas	BA-7, BA-8	-	-

END OF SECTION

SECTION 23 05 40

SUPPORTS AND ANCHORS

PART 1 GENERAL

1.01 SCOPE

A. Provide pipe, duct, fixture hangers, supports, and associated anchors to meet requirements as specified herein.

B. Provide equipment bases and supports.

C. Provide sleeves and seals.

D. Provide flashing and sealing fixtures and pipe stacks.

1.02 REFERENCE

A. ASME B31.1, Power Piping.

B. MSS SP-58, Pipe Hangers and Supports - Materials, Design and Manufacturer.

C. MSS SP-69, Manufacturers Standardization Society Pipe Hangers and Supports - Selection and Application.

D. NFPA 54, Natural Gas Piping.

PART 2 PRODUCTS

2.01 PIPE HANGERS AND SUPPORTS

A. Hydronic and Plumbing Piping.

1. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron, adjustable swivel, split ring.

2. Hangers for Pipe Sizes 2 inches and over: Carbon steel, adjustable clevis.

3. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

4. Wall Support for Pipe Sizes to 3 inches: Cast iron hook.

5. Wall Support for Pipe Sizes 4 inches and over: Welded steel bracket and wrought steel clamp.

6. Vertical Support: Steel riser clamp.

7. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

2.02 DUCTWORK SUPPORT

A. Support ductwork in accordance with SMACNA HVAC Duct Construction Standards, Figure 5-5, except supporting ductwork with secure wire method is not allowed.

B. Support with 3/32 inch, 7 x 7, stainless steel air-craft cable, with matching fastener rated for 50% of actual load, will be allowed on round ductwork under 12 inches if installed as detailed, with cable double looped on duct and at point of support.

2.03 SLEEVES

A. Sleeves for Pipes through Walls, Footings, and Potentially Wet Floors: Form with steel pipe or 18 gauge galvanized steel.

B. Sleeves for Pipes through Fire Rated and Fire Resistive Floors and Walls, and Fireproofing: Prefabricated fire rated sleeves including seals, UL listed.

C. Sleeves for Round Ductwork: Form with galvanized steel.

D. Sleeves for Rectangular Ductwork: Form with galvanized steel or wood.

E. Fire Stopping Insulation: Glass fiber type, non-combustible.

F. Caulk: Acrylic sealant.

2.04 FABRICATION

A. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

B. Design hangers without disengagement of supported pipe.

C. Provide sheet lead packing between hanger and support and piping.

PART 3 EXECUTION

3.01 PREPARATION

A. Install in accordance with manufacturer's instructions.

3.02 INSTALLATION

A. Inserts.

1. Provide inserts for placement in concrete form work.

B. Pipe Hangers and Supports.

1. Support horizontal piping.

2. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.

3. Place a hanger within 12 inches of each horizontal elbow.

4. Use hangers with 1-1/2 inch minimum vertical adjustment.

5. Support horizontal cast iron pipe adjacent to each hub, with 5 feet maximum spacing between hangers.

6. Support vertical piping at every floor. Support vertical cast iron pipe at each floor at hub.

7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

8. Support riser piping independently of connected horizontal piping.

9. Provide copper plated or plastic hangers and supports for copper piping.

10. Design hangers for pipe movement without disengagement of supported pipe.

11. Prime coat exposed steel hangers and support. Hangers and supports located in crawl spaces, pipe shafts, mechanical room, and suspended ceiling spaces are not considered exposed.

C. Ductwork.

1. Sheet metal screws may be used on duct hangers, transverse joints and other SMACNA approved locations if the screw does not extend more than 1/2 inch into the duct.

2. For adequate space in installations of hangers and supports, make allowances for beams, pipes or other obstructions in building construction and for work of other contractors. Transform, divide or offset ducts as required, in accordance with SMACNA HVAC Duct Construction Standards, Figure 4-7, except do not reduce duct to less than six inches in any dimension and do not exceed a 4:1 aspect ratio.

3. Provide frames constructed of angles or channels for support of coils, filters, dampers or other devices installed in duct systems, and make all connections to such equipment including equipment furnished by others. Secure frames with gaskets and screws or nut, bolts and washers.

4. Install duct to pitch toward outside air intakes and drain to outside of building. Solder or seal seams to form watertight joints.

D. Equipment Bases and Supports.

1. Provide templates, anchor bolts, and accessories for mounting and anchoring fixtures.

2. Provide rigid anchors for pipes after vibration isolation components are installed.

E. Sleeves.

1. Where piping or ductwork penetrates floor, ceiling, or wall, close off space between pipe or duct and adjacent work with fire stopping insulation and caulk seal. Provide close fitting metal collar or escutcheon covers at both sides of penetration.

2. Install white plastic escutcheons at finished surfaces.

END OF SECTION

SECTION 23 05 93

TESTING, ADJUSTING, AND BALANCING

PART 1 GENERAL

1.01 SCOPE

A. General: The scope of work shall include all new HVAC systems installed as part of the project as indicated within the plans and specifications. Scope of services shall also include any re-balancing of existing systems that have been affected as part of the building remodel. As a minimum, the following existing HVAC and plumbing systems shall be re-balanced; toilet exhaust fans, furnace supply air flows, Domestic hot water circulation pump flows.

B. Balancing shall be done by a contractor who specializes in air and hydronic balancing and testing. Contractor's personnel completing this work shall be experienced and trained specifically in balancing systems. Testing shall NOT proceed until the Mechanical, Electrical and Controls scope of work has been completed fully and that all systems have been functional tested. Balancing contractor shall warrant solely that the systems are set to the values established by the plans and specifications.

C. Measurement of final operating condition of HVAC systems.

1.02 REFERENCES

A. AABC National Standards for Field Measurement and Instrumentation, Total System Balance.

B. ASHRAE 1984 Systems Handbook - Chapter 37, Testing, Adjusting and Balancing.

C. NEBB Procedural Standards for Testing, Balancing and Adjusting of Environmental Systems.

D. HVAC Duct Leakage Manual

1. https://law.resource.org/pub/us/cfr/ibr/005/smacna.hvac.1985.html

1.03 SUBMITTALS:

A. Work Sheets

1. Submit final test reports.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION

3.01 EXAMINATION

A. Before commencing work, verify that systems are complete and operable. Ensure the following:

1. Equipment is operable and in a safe and normal condition.

2. Temperature control systems are installed complete and operable.

3. Proper thermal overload protection is in place for electrical equipment.

4. Final filters are clean and in place. If required, install temporary media in addition to final filters.

5. Duct systems are clean of debris.

6. Correct fan rotation.

7. Fire and volume dampers are in place and open.

8. Access doors are closed and duct end caps are in place.

9. Air outlets are installed and connected.

10. Duct system leakage has been minimized (per SMACNA and ASHRAE guidelines)

11. Service and balance valves are open.

B. Report any defects or deficiencies noted during performance of services to the COR, and Inspector.

C. Promptly report abnormal conditions in mechanical systems or conditions which prevent system balance.

D. If, for design reasons, system cannot be properly balanced, report as soon as observed.

E. Beginning of work means acceptance of existing conditions.

3.02 PREPARATION

A. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to COR to facilitate spot checks during testing.

B. Provide additional balancing devices as required.

C. Quality assurance.

1. Agency shall be company specializing in the adjusting and balancing of systems specified in this section with minimum three years documented experience or certified by AABC. Perform work under supervision of AABC certified test and balance engineer or NEBB certified testing, balancing and adjusting supervisor.

2. Total system balance shall be performed in accordance with AABC national standards for field measurement and instrumentation, total system balance or NEBB procedural standards for testing, balancing and adjusting of environmental systems.

D. Sequencing and scheduling.

1. Sequence work to commence after completion of systems and schedule completion of work before substantial completion of project.

2. Schedule and provide assistance in final adjustment and test of life safety system with fire authority.

3.03 INSTALLATION

A. Installation tolerances.

1. Adjust air handling systems to plus or minus 10 percent for supply systems and plus or minus 10 percent for return and exhaust systems from figures indicated.

B. Adjusting.

1. Recorded data shall represent actually measured or observed condition.

2. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

3. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

4. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

5. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the COR.

C. Air system procedure.

1. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities.

2. Make air quantity measurements in ducts by pitot tube traverse of entire cross sectional area of duct.

3. Measure air quantities at air inlets and outlets.

4. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.

5. Use volume control devices to regulate air quantities only to extent that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.

6. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by manual balancing damper regulation.

7. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.

8. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.

9. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.

10. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.

11. Where modulating dampers are provided, take measurements and balance at extreme conditions.

12. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inches positive static pressure.

a. Where controls exist and system designs provide for VFD-driven supply and return/exhaust fans, the controls should automatically adjust the return/exhaust fans to account for building

pressurization issues (to ensure slightly positive pressurization as indicated)

D. Reports

1. Provide reports in soft cover, letter size, bound manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.

2. Balance and Data report forms

a. Submit reports on AABC National Standards for Total System Balance or NEBB forms.

b. Forms shall include the following information:

1) Title Page: Company name; Company address; Company telephone number; Project name; Project location

2) Project Architect: Project Engineer; Project Contractor; Project altitude

3) Instrument List: Instrument; Manufacturer; Model; Serial number; Range; Calibration date.

4) Air Moving Equipment:

a) Manufacturer, size, horsepower and brake horsepower

b) Amperage (nameplate, corrected full load and final operating)

c) Motor current characteristics, starter size, heater size

d) RPM (design and final operating)

e) Fan suction and discharge static pressure (operating)

f) Method of testing CFM

5) Exhaust Fan Data: Location; Manufacturer; Model; Air flow - specified and actual; Total static pressure (total external) - specified and actual; Inlet pressure; Discharge pressure; Fan RPM.

6) Exhaust/Return/Outside Air duct distribution system Data:

a) Identification/location;

b) Design air flow versus Actual air flow;

c) Air temperatures of each duct system. Design mixed air temperature/ratio of OA and RA versus Actual mixed air ratio

d) Duct Traverse: Duct size, Area, velocity. Design flows versus Actual flows

7) Sound Level Report: Location; Octave bands - equipment off; Octave bands - equipment on.

8) Duct Leak Test: Description of ductwork under test; Duct design operating pressure; Duct design test static pressure; Duct capacity, air flow; Maximum allowable leakage duct capacity times leak factor; Test apparatus - Blower, Orifice, tube size, Orifice size, Calibrated; Test static pressure; Test orifice differential pressure; Leakage.

c. Reports shall provide a written description of any equipment deficiencies that was encountered during the Testing and Balancing work activities so that appropriate corrective actions such as repair/replacement of mechanical components can be made.

END OF SECTION

SECTION 23 07 00

MECHANICAL INSULATION

PART 1 GENERAL

1.01 SCOPE

A. Section Includes:

1. HVAC piping insulation, jackets and accessories.

2. HVAC equipment insulation, jackets and accessories.

3. HVAC ductwork insulation, jackets, and accessories.

1.02 REFERENCES

A. ASTM International:

1. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.

2. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

3. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

4. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric).

5. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement.

6. ASTM C449/C449M - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement.

7. ASTM C450 - Standard Practice for Fabrication of Thermal Insulating Fitting Covers for NPS Piping, and Vessel Lagging.

8. ASTM C533 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation.

9. ASTM C534 - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.

10. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation.

11. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.

12. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.

13. ASTM C585 - Standard Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System).

14. ASTM C591 - Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation.

15. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation.

16. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.

17. ASTM C921 - Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.

18. ASTM C1071 - Standard Specification for Thermal and Acoustical Insulation (Glass Fiber, Duct Lining Material).

19. ASTM C1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.

20. ASTM C1290 - Standard Specification for Flexible Fibrous Glass Blanket Insulation Used to Externally Insulate HVAC Ducts.

21. ASTM D1785 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.

22. ASTM D4637 - Standard Specification for EPDM Sheet Used in Single-Ply Roof Membrane.

23. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials.

24. ASTM E162 - Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source.

B. Sheet Metal and Air Conditioning Contractors':

1. SMACNA - HVAC Duct Construction Standard - Metal and Flexible.

C. Underwriters Laboratories Inc.:

1. UL 1978 - Standard for Safety for Grease Ducts.

1.03 SUBMITTALS

A. Product Data: Submit product description, thermal characteristics and list of materials and thickness for each service, and location.

B. Manufacturer's Installation Instructions: Submit manufacturers published literature indicating proper installation procedures.

1.04 QUALITY ASSURANCE

A. Test pipe insulation for maximum flame spread index of 25 and maximum smoke developed index of not exceeding 50 in accordance with ASTM E84.

B. Pipe insulation manufactured in accordance with ASTM C585 for inner and outer diameters.

C. Factory fabricated fitting covers manufactured in accordance with ASTM C450.

D. Duct insulation, Coverings, and Linings: Maximum 25/50 flame spread/smoke developed index, when tested in accordance with ASTM E84, using specimen procedures and mounting procedures of ASTM E 2231.

E. Insulation shall be installed in a professional workmanlike manner per the 2012, 7th edition MICA standards manual (Midwest Insulation Contractors Association).

1.05 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum (3) three years of experience.

B. Applicator: Company specializing in performing work of this section with minimum (1) year experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Section 01 10 10 - General Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.

C. Protect insulation from weather and construction traffic, dirt, water, chemical, and damage, by storing in original wrapping.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers for Insulation Products:

1. CertainTeed.
2. Knauf.
3. Johns Manville.
4. Owens-Corning.
5. Aeroflex. Aerocell.
6. Armacell, LLC. Armaflex.
7. Nomaco. K-flex.
8. Or approved equal.

2.02 PIPE INSULATION

A. TYPE P-5: ASTM C534, Type I, flexible, closed cell elastomeric insulation, tubular.

1. Thermal Conductivity: 0.27 at 75 degrees F.
2. Operating Temperature Range: Range: Minus 70 to 180 degrees F.

2.03 PIPE INSULATION JACKETS

A. Vapor Retarder Jacket:

1. ASTM C921, white Kraft paper with glass fiber yarn, bonded to aluminized film.
2. Water Vapor Permeance: ASTM E96/E96M; 0.02 perms.

B. PVC Plastic Pipe Jacket:

1. Product Description: ASTM D1785, One piece molded type fitting covers and sheet material, off-white color.

2. Thickness: 15 mil

3. Connections: Brush on welding adhesive.

C. General: All jacketed insulation to be installed exterior of the building shall be suitable for outdoor, weatherproof applications. Submittals must clearly indicated materials and methods of installation are per manufacturers requirements.

D. Aluminum Pipe Jacket:

1. ASTM B209.

2. Thickness: 0.025 inch thick sheet.

3. Finish: Smooth or Embossed.

4. Joining: Longitudinal slip joints and 2 inch laps.

5. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.

6. Metal Jacket Bands: 1/2 inch wide; 0.015 inch thick aluminum, or 0.010 inch thick stainless steel.

E. Field Applied Glass Fiber Fabric Jacket System:

1. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.

2. Glass Fiber Fabric:

a. Cloth: Untreated; 9 oz/sq yd weight.

b. Blanket: 1.0 lb/cu ft density.

c. Weave: 10 x 10.

3. Indoor Vapor Retarder Finish:

a. Cloth: Untreated; 9 oz/sq yd weight.

b. Vinyl emulsion type acrylic, compatible with insulation, black or white color.

2.04 PIPE INSULATION ACCESSORIES

A. Vapor Retarder Lap Adhesive: Compatible with insulation.

B. Covering Adhesive Mastic: Compatible with insulation.

C. Piping 1-1/2 inches diameter and smaller: Galvanized steel insulation protection shield. MSS SP-69, Type 40. Length: Based on pipe size and insulation thickness.

D. Closed Cell Elastomeric Insulation Pipe Hanger: Polyurethane insert with aluminum or stainless steel jacket, single piece construction with self-adhesive closure. Thickness to match pipe insulation.

2.05 DUCTWORK INSULATION

A. TYPE D-1: ASTM C1290, Type III, flexible glass fiber, commercial grade with factory applied reinforced aluminum foil jacket meeting ASTM C1136, Type II.

1. Thermal Conductivity: 0.27 at 75 degrees F
2. Maximum Operating Temperature: 250 degrees F
3. Density: 1.5 pound per cubic foot.

B. TYPE D-2: ASTM C612, Type IA or IB, rigid glass fiber, with factory applied all service facing meeting ASTM C1136, Type II.

1. Thermal Conductivity: 0.23 at 75 degrees F
2. Density: 2.25 pound per cubic foot

C. TYPE D-4: ASTM C1071, Type I, flexible, glass fiber duct liner with coated air side.

1. Thermal Conductivity: 0.28 at 75 degrees F
2. Density: 1.5 pound per cubic foot
3. Maximum Operating Temperature: 250 degrees F
4. Maximum Air Velocity: 6,000 feet per minute

D. TYPE D-5: ASTM C1071, Type II, rigid, glass fiber duct liner with coated air side.

1. Thermal Conductivity: 0.23 at 75 degrees F
2. Density: 3.0 pound per cubic foot
3. Maximum Operating Temperature: 250 degrees F
4. Maximum Air Velocity: 4,000 feet per minute

E. TYPE D-6: ASTM C534, Type II, flexible, closed cell elastomeric insulation, sheet.

1. Thermal Conductivity: 0.27 at 75 degrees F.
2. Service Temperature Range: Range: Minus 58 to 180 degrees F

F. TYPE D-7: ASTM C534, Type II, flexible, closed cell elastomeric insulation, sheet laminated with white thermoplastic rubber membrane.

1. Thermal Conductivity: 0.27 at 75 degrees F
2. Service Temperature Range: Range: Minus 58 to 180 degrees F

2.06 DUCTWORK INSULATION JACKETS

A. General: All jacketed insulation to be installed exterior of the building shall be suitable for outdoor, weatherproof applications. Submittals must clearly indicated materials and methods of installation are per manufacturers requirements.

B. Aluminum Duct Jacket:

1. ASTM B209.
2. Thickness: 0.025 inch thick sheet.
3. Finish: Smooth or Embossed.
4. Joining: Longitudinal slip joints and 2 inch laps.

5. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.

6. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum, or 0.010 inch thick stainless steel.

C. Vapor Retarder Jacket:

1. Kraft paper with glass fiber yarn and bonded to aluminized film.

2. Water Vapor Permeance: ASTM E96/E96M; 0.02 perms

3. Secure with pressure sensitive tape.

D. Canvas Duct Jacket: UL listed, 6 oz/sq yd, plain weave cotton fabric with fire retardant lagging adhesive compatible with insulation.

E. Outdoor Duct Jacket: Asphalt impregnated and coated sheet, 36 lb/square

2.07 DUCTWORK INSULATION ACCESSORIES

A. Vapor Retarder Tape:

1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

B. Vapor Retarder Lap Adhesive: Compatible with insulation.

C.

D. Adhesive: Waterproof , ASTM E162 fire-retardant type.

E. Liner Fasteners: Galvanized steel, self-adhesive pad with integral head.

F. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

G. Lagging Adhesive: Fire retardant type with maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

H. Impale Anchors: Galvanized steel, 12 gage self-adhesive pad.

I. Adhesives: Compatible with insulation.

J. Membrane Adhesives: As recommended by membrane manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify piping, and ductwork has been tested before applying insulation materials.

B. Verify surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION - PIPING SYSTEMS

A. Piping Exposed to View in Finished Spaces: Locate insulation and cover seams in least visible locations.

B. Continue insulation through penetrations of building assemblies or portions of assemblies having fire resistance rating of one hour or less. Provide intumescent firestopping when continuing insulation through assembly. Finish at supports, protrusions, and interruptions. Refer to plans of penetrations of assemblies with fire resistance rating greater than one hour.

C. Piping Systems Conveying Fluids Below Ambient Temperature:

1. Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.

2. Furnish factory-applied or field-applied vapor retarder jackets. Secure factory-applied jackets with pressure sensitive adhesive self-sealing longitudinal laps and butt strips. Secure field-applied jackets with outward clinch expanding staples and seal staple penetrations with vapor retarder mastic.

3. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor retarder adhesive or PVC fitting covers.

D. Glass Fiber Board Insulation:

1. Apply insulation close to equipment by grooving, scoring, and beveling insulation. Fasten insulation to equipment with studs, pins, clips, adhesive, wires, or bands.

2. Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. On cold equipment, use vapor retarder cement.

3. Cover wire mesh or bands with cement to a thickness to remove surface irregularities.

E. Polyisocyanurate Foam Insulation:

1. Wrap elbows and fitting with vapor retarder tape.

2. Seal butt joints with vapor retarder tape.

F. Inserts and Shields:

1. Piping 1-1/2 inches Diameter and Smaller: Install galvanized steel shield between pipe hanger and insulation.

2. Piping 2 inches Diameter and Larger: Install insert between support shield and piping and under finish jacket.

a. Insert Configuration: Minimum 6 inches long, of thickness and contour matching adjoining insulation; may be factory fabricated.

b. Insert Material: Compression resistant insulating material suitable for planned temperature range and service.

3. Piping Supported by Roller Type Pipe Hangers: Install galvanized steel shield between roller and inserts.

G. Insulation Terminating Points:

1. Coil Branch Piping 1 inch and Smaller: Terminate hot water piping at union upstream of the coil control valve.

2. Chilled Water Coil Branch Piping: Insulate chilled water piping and associated components up to coil connection.

3. Condensate Piping: Insulate entire piping system and components to prevent condensation.

H. Closed Cell Elastomeric Insulation:

1. Push insulation on to piping.

2. Miter joints at elbows.

3. Seal seams and butt joints with manufacturer's recommended adhesive.

4. When application requires multiple layers, apply with joints staggered.

5. Insulate fittings and valves with insulation of like material and thickness as adjacent pipe.

I. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor): Finish with canvas jacket sized for finish painting.

J. Piping Exterior to Building: Provide vapor retarder jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor retarder cement. Cover with aluminum or stainless steel jacket with seams located at 3 or 9 o'clock position on side of horizontal piping with overlap facing down to shed water or on bottom side of horizontal piping.

K. Prepare pipe insulation for finish painting.

3.03 INSTALLATION - DUCTWORK SYSTEMS

A. Duct dimensions indicated on Drawings are finished inside dimensions.

B. Insulated ductwork conveying air below ambient temperature:

1. Provide insulation with vapor retarder jackets.

2. Finish with tape and vapor retarder jacket.

3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.

4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

C. Insulated ductwork conveying air above ambient temperature:

1. Provide with or without standard vapor retarder jacket.

2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.

D. Ductwork Exposed in Mechanical Equipment Rooms or Finished Spaces (below 10 feet above finished floor): Finish with canvas jacket sized for finish painting.

E. External Glass Fiber Duct Insulation:

1. Secure insulation with vapor retarder with wires and seal jacket joints with vapor retarder adhesive or tape to match jacket.

2. Secure insulation without vapor retarder with staples, tape, or wires.

3. Install without sag on underside of ductwork. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift ductwork off trapeze hangers and insert spacers.

4. Seal vapor retarder penetrations by mechanical fasteners with vapor retarder adhesive.

5. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.

F. External Elastomeric Duct Insulation:

1. Adhere to clean oil-free surfaces with full coverage of adhesive.

2. Seal seams and butt joints with manufacturer's recommended adhesive.

3. When application requires multiple layers, apply with joints staggered.

4. Insulate standing metal duct seams with insulation of like material and thickness as adjacent duct surface. Apply adhesive at joints with flat duct surfaces.

5. Lift ductwork off trapeze hangers and insert spacers.

G. Duct Liner:

1. Adhere insulation with adhesive for 90 percent coverage.

2. Secure insulation with mechanical liner fasteners. Comply with SMACNA Standards for spacing.

3. Seal and smooth joints. Seal and coat transverse joints.

4. Seal liner surface penetrations with adhesive.

5. Cut insulation for tight overlapped corner joints. Support top pieces of liner at edges with side pieces.

H. Ducts Exterior to Building:

1. Install insulation according to external duct insulation paragraph above.

2. Provide external insulation with vapor retarder jacket.

3. Finish with mineral fiber outdoor duct jacket, or aluminum duct jacket, or membrane duct jacket.

4. Calk aluminum jacket seams at flanges and joints. Located major longitudinal seams on bottom side of horizontal duct sections.

I. Prepare duct insulation for finish painting.

3.04 SCHEDULES

A. Cooling Services Piping Insulation Schedule:

PIPING SYSTEM	INSULATION TYPE	PIPE SIZE	INSULATION THICKNESS inches
Condensate Piping from Cooling Coils	P-5	All sizes	0.5
Refrigerant Suction	P-5	All sizes	0.5

Refrigerant Hot Gas	P-5	All sizes	0.5

B. Ductwork Insulation Schedule:

DUCTWORK SYSTEM	INSULATION TYPE	INSULATION THICKNESS inches
Combustion Air	D-2	1.5
Outside Air Intake	D-2	1.5
Supply Ducts (internally insulated)	D-4, D-5	1.0
Return Ducts (internally insulated)	D-4, D-5	0.5
Supply Ducts (externally insulated) Thickness indicated is installed thickness.	D-1, D-2, D-6	1.0
Return Ducts (externally insulated) Thickness indicated is installed thickness.	D-1, D-2, D-6	1.0
Supply, Return, or Exhaust Air ducts (exterior to building on roof)	D-2, D-7	2.0
Exhaust Ducts Within 10 feet of Exterior Openings Thickness indicated is installed thickness.	D-1, D-2	1.0
Exhaust Ducts Exposed to Outdoor Air	D-2	2.0
Transfer Air Ducts (internally insulated)	D-4	0.5

END OF SECTION

SECTION 23 09 13

HVAC INSTRUMENTATION

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Control panel enclosures.
2. Humidistats.
3. Thermostats.
4. Time clocks.
5. Alarm system.
6. Control air dampers.
7. Electric damper actuators.
8. Control valves.
9. Electric valve actuators.
10. Outside air measuring and modulation device.
11. Direct digital control system components.
12. Duct-mounted smoke detector.
13. Differential pressure monitor.

1.02 REFERENCES

A. Air Movement and Control Association International, Inc.:

1. AMCA 500 - Test Methods for Louvers, Dampers, and Shutters.

B. American Society of Heating, Refrigerating and Air-Conditioning Engineers:

1. ASHRAE 62 - Ventilation for Acceptable Indoor Air Quality.

C. American Society of Mechanical Engineers:

1. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
2. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

D. ASTM International:

1. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
2. ASTM A536 - Standard Specification for Ductile Iron Castings.
3. ASTM B32 - Standard Specification for Solder Metal.
4. ASTM B88 - Standard Specification for Seamless Copper Water Tube.
5. ASTM B280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.

6. ASTM D2737 - Standard Specification for Polyethylene (PE) Plastic Tubing.

E. American Welding Society:

1. AWS A5.8 - Specification for Filler Metals for Brazing and Braze Welding.

F. National Electrical Manufacturers Association:

1. NEMA DC 3 - Residential Controls - Electrical Wall Mounted Room Thermostats.

2. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

G. National Fire Protection Association:

1. NFPA 72 - National Fire Alarm Code.

2. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilating Systems.

H. Underwriters Laboratories, Inc.:

1. UL 1820 - Fire Test of Pneumatic Tubing for Flame and Smoke Characteristics.

1.03 SUBMITTALS

A. Shop Drawings: Indicate operating data, system drawings, wiring diagrams, and written detailed operational description of sequences.

B. Product Data: Submit description and engineering data for each control system component. Include sizing as required.

C. Manufacturer's Installation Instructions: Submit installation requirements for each control component.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

CLOSEOUT SUBMITTALS

E. Section 01 10 10 - General Requirements: Closeout procedures.

F. Project Record Documents: Record actual locations of control components, including panels, thermostats, and sensors.

G. Operation and Maintenance Data: Submit inspection period, cleaning methods, recommended cleaning materials, and calibration tolerances.

1.04 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

B. Installer: Company specializing in performing Work of this section with minimum three years experience.

1.05 PRE-INSTALLATION MEETINGS

A. Section 01 10 10 - General Requirements: Pre-installation meeting.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Section 01 10 10 - General Requirements: Product storage and handling requirements.

B. Accept controls on site in original factory packaging Inspect for damage.

1.07 COORDINATION

A. Coordinate installation of control components in duct and piping systems with work of other trades.

PART 2 PRODUCTS

2.01 CONTROL COMPONENT MANUFACTURERS

A. Manufacturers:

1. Trane Tracer Summit system
2. Carrier i-Vu Controls.
3. Delta Controls
4. Honeywell.
5. Seimens Controls
6. Johnson Controls Inc.
7. Alerton
8. Automated Logic
9. Distech
10. Or approved equal

2.02 AIR SUPPLY PIPING AND TUBING

A. Copper Tubing: ASTM B280, drawn.

1. Fittings: ASME B16.22 wrought copper.
2. Joints: Braze, AWS A5.8 BCuP silver/phosphorus/copper alloy with melting range 1190 to 1480 degrees F.

B. Copper Tubing: ASTM B88, Type K, drawn.

1. Fittings: ASME B16.18, cast brass, or ASME B16.22 solder wrought copper.
2. Joints: ASTM B32, Alloy Grade Sb5 tin-antimony, or Alloy Grade Sn95 tin-silver, lead free solder or AWS A5.8 Classification BCuP-3 or BCuP-4 silver braze.

C. Copper Tubing: ASTM B88, Type K, annealed.

1. Fittings: ASME B16.18, cast brass, or ASME B16.22 solder wrought copper.
2. Joints: [ASTM B32, Alloy Grade Sb5 tin-antimony, or Alloy Grade Sn95 tin-silver, [lead free] solder] [AWS A5.8 Classification BCuP-3 or BCuP-4 silver braze.]

D. Virgin Polyethylene Non-metallic Tubing: ASTM D2737, with flame-retardant harness for multiple tubing.

1. Fittings: Polyethylene.

2. Joints: Compression or push-on type.

2.03 CONTROL PANEL ENCLOSURES

A. Furnish for each system under automatic control with relays and controls mounted in cabinet and temperature indicators, pressure gages, pilot lights, push buttons and switches flush on cabinet panel face.

B. Construction: NEMA 250, Type [1] [3] [4] [7] [9] steel enclosure.

C. Covers: Continuous hinge, held closed by [flush latch operable by [screwdriver] [key]] [hasp and staple for padlock].

D. Enclosure Finish: Manufacturer's standard enamel.

2.04 HUMIDISTATS

A. Room Humidistats:

1. Wall mounted, proportioning type.

2. Throttling range: Adjustable, 2 percent, relative humidity.

3. Operating range: 20 to 80 percent.

4. Maximum temperature: 110 degrees F.

5. Cover: Concealed set point.

B. Duct Humidistats:

1. Insertion, proportioning type.

2. Throttling range: Adjustable, 2 percent, relative humidity.

3. Operating range: 20 to 100 percent.

4. Maximum temperature: 150 degrees F.

C. High Limit Duct Humidistat:

1. Insertion, two-position type.

2. Throttling range: Adjustable 2 percent relative humidity.

3. Operating range: 20 to 100 percent.

4. Maximum temperature: 150 degrees F.

2.05 THERMOSTATS

A. Electric Room Thermostats:

1. Type: NEMA DC 3, 24 volts, with setback/setup temperature control.

2. Service: cooling and heating

3. Covers: Locking with concealed set point.

B. Line Voltage Thermostats:

1. Integral manual On/Off/Auto selector switch, single or two-pole.
2. Dead band: Maximum 2 degrees F.
3. Cover: Locking with concealed set point.
4. Load (Motor) capacity rating.

C. Room Thermostat Accessories:

1. Thermostat Covers: Brushed aluminum.
2. Insulating Bases: For thermostats located on exterior walls.
3. Thermostat Guards: Locking transparent plastic mounted on separate base.
4. Adjusting Key: Matching device.

D. Outdoor Reset Thermostat:

1. Remote bulb or bimetal rod and tube type, proportioning action with adjustable throttling range, adjustable set point.
2. Scale range: -10 to 70 degrees F.

E. Immersion Thermostat: Remote bulb or bimetallic rod and tube type, proportional action with adjustable set point and adjustable throttling range.

F. Air-stream Thermostats:

1. Remote bulb or bimetallic rod and tube type, proportional action with adjustable set point in middle of range and adjustable throttling range.
2. Averaging service remote bulb element: either 7.5 feet or 20 feet in length as appropriate for application.
3. Furnish with flange and shield.

G. Electric Low Limit Duct Thermostat:

1. Snap acting, single pole, single throw, manual reset switch tripping when temperature sensed across any 12 inches of bulb length is equal to or below set point.
2. Bulb length: Minimum 20 feet.
3. Furnish one thermostat for every 20 sq. ft of coil surface.

H. Electric High Limit Duct Thermostat:

1. Snap acting, single pole, single throw, manual reset switch tripping when temperature sensed across any 12 inches of bulb length is equal to or above set point.
2. Bulb length: Minimum 20 feet.
3. Furnish one thermostat for every 20 sq. ft of coil surface.

I. Fire Thermostats:

1. UL labeled, factory set in accordance with NFPA 90A.
2. Normally closed contacts, manual reset.

2.06 TIME CLOCKS

A. Seven-day programming switch timer with synchronous timing motor and seven-day dial. Continuously charged Ni-cad battery driven for power failure with 8 hour carry over and multiple switch trippers to control systems for minimum of two and maximum of eight signals each day with two normally open and two normally closed output switches.

****

Programmable clock is best option for applications requiring more than one time clock.

****

B. Solid-state programmable time control with [_____] separate programs, 24 hour battery carry over [duty cycling] [individual on/off/auto switches for each program] [7 day programming] [365 day calendar with 20 programmable holidays] [choice of fail safe operation for each program] [system fault alarm].

2.07 ALARM SYSTEM

A. Enclosure Construction: NEMA 250, Type [1] [3] [4] [7] [9] [_____].

B. Furnish alarm panel with individual indication, horn, silenced acknowledge switch, and test switch.

C. At alarm condition indication, light flashes and alarm sounds. Horn stops when acknowledge switch is pushed and system indicates alarm conditions by continuous light until trouble condition has cleared. Alarm sounds again when second alarm occurs before first one has cleared.

D. Furnish remote panels with duplicate functions of primary panel. Furnish alarm silence/acknowledge switch to acknowledge alarm from each panel.

E. Furnish dry contacts at main alarm panel for use with remote alarm monitoring system to indicate [each] alarm condition.

2.08 CONTROL AIR DAMPERS

A. Performance: Test in accordance with AMCA 500.

B. Frames: Galvanized steel or extruded aluminum, welded or riveted with corner reinforcement, minimum 12 gage.

C. Blades: Galvanized steel or extruded aluminum, maximum blade size 6 inches wide, 48 inches long, minimum 22 gage, attached to minimum 1/2 inch shafts with set screws.

D. Blade Seals: Synthetic elastomeric or neoprene mechanically attached, field replaceable.

E. Jamb Seals: Stainless steel spring.

F. Shaft Bearings: Oil impregnated sintered bronze or graphite impregnated nylon sleeve, with thrust washers at bearings

G. Linkage Bearings: Oil impregnated sintered bronze or graphite impregnated nylon.

H. Outside Air Damper Leakage: Maximum leakage rate of 3.0 cfm per square foot at 1.0 inches wg pressure differential.

I. Damper Leakage: Less than one percent based on approach velocity of 2000 fpm and 4 inches wg

****** [OR] ******

J. Maximum Pressure Differential: 6 inches wg.

K. Temperature Limits: - 40 to 200 degrees F.

2.09 ELECTRIC DAMPER ACTUATORS

A. Operation: [Two-position] [Reversing type proportional motor], [spring-return].

B. Enclosure Rating: NEMA 250 Type [1] [3] [4] [7] [9].

C. Mounting: Direct mount.

D. Stroke: 90 seconds end to end full stroke, 15 seconds return to normal for spring return.

E. Protection: Electronic stall protection.

F. Control Input: 0-10 VDC or 0-20 mA DC.

G. Power: Nominal [24] or [120] volt AC.

H. Torque: Size for minimum 150 percent of required duty.

I. Duty cycle: rated for 65,000 cycles.

J. Accessories:

1. Cover mounted transformer.
2. Auxiliary potentiometer.
3. Damper linkage.
4. Direct drive feedback potentiometer.
5. Output position feedback (0-10 VDC).
6. Field selectable rotational, spring return direction, field adjustable zero and span.
7. End switch.

2.10 CONTROL VALVES

A. Globe Pattern:

B. 2 inches and Smaller: Bronze body, bronze trim, rising stem, renewable composition disc, screwed ends [with back seating capacity packable under pressure].

C. 2-1/2 inches and Larger: Iron body, bronze trim, rising stem, plug-type disc, flanged ends, renewable seat and disc.

D. Hydronic Systems:

1. Rate for service pressure of 125 psig at 250 degrees F
2. Replaceable plugs and seats of stainless steel.
3. Sizing: Size for 3 psig maximum pressure drop at design flow rate.

4. Furnish two-way valves with equal percentage characteristics. Furnish three way valves with linear characteristics. Size two way valve actuators to close valves against pump shut off head.

E. Ball Valves:

1. Threaded ends for 2-way valves 3 inches and smaller. Threaded ends for 3-way valves 2 inches and smaller.

2. Forged brass body, chrome plated brass ball and blowout proof stem and EPDM O-rings with minimum 600 psig rating.

3. Fluid Temperature Range: minus 20 to 250 degrees F.

4. Sizing: 3 psig maximum pressure drop at design flow rate.

5. Flow Characteristics: Furnish 2-way valves with equal percentage characteristics. Furnish 3-way valves with equal percentage characteristic through control port and linear characteristic through bypass port.

6. Size 2-way valve actuators to close valves against pump shut off head.

F. Butterfly Valves:

1. Service Pressure Rating: 125 psig at 250 degrees F.

2. Construction: ASTM A126 cast-iron or ASTM A536 ductile-iron body and bonnet, extended neck, stainless-steel stem, field-replaceable EPDM or Buna N sleeve and stem seals.

3. Body Style: Wafer, or Lug.

4. Disc: Stainless steel.

5. Resilient replaceable seat for service to 250 degrees F

a. Size for 1 psig maximum pressure drop at design flow rate.

G. Terminal Unit Control Valves:

1. Brass body, Class 250, nickel plated brass ball, with optimizer insert for modulating applications, blow out resistant stem, threaded ends.

2. Two or three way as indicated in schedule or on Drawings.

3. Integral actuator.

4. Spring return required for unit ventilator heating valves and other terminal equipment with outside air.

5. Furnish non-spring return valves with manual override capability built into actuator.

6. Minimum Fluid Temperature: 20 degrees F.

7. Maximum Operating Conditions: 250 degrees F.

8. Sizing: 4 psig maximum pressure drop at design flow rate, to close against pump shutoff head.

9. Flow Characteristics: Furnish two-way and three-way valves with equal percentage characteristics.

2.11 ELECTRIC VALVE ACTUATORS

A. Fully factory assembled. Size to operate with sufficient reserve power to provide smooth modulating action or two-position action under every condition.

B. Motor: Permanent split-capacitor or shaded-pole type. Gear trains completely oil immersed and sealed. Furnish spring-return motors with integral spiral-spring mechanism in housings designed for easy removal for service or adjustment of limit switches, auxiliary switches, or feedback potentiometer.

C. Actuator: Direct-coupled type non-hydraulic designed for minimum 100,000 full-stroke cycles at rated torque. Furnish actuator with rating of not less than twice thrust needed for actual operation of valve.

1. Coupling: V-bolt and V-shaped, toothed cradle.

2. Overload Protection: Electronic overload or digital rotation-sensing circuitry.

3. Fail-Safe Operation: Mechanical, spring-return mechanism. Furnish external, manual gear release on non-spring-return actuators.

4. Furnish spring-return actuators with manual override. Complete manual override to take no more than 10 turns.

5. Power Requirements:

a. Two-Position Spring Return: 24 volt AC or DC, maximum 10 vA.

b. Modulating: 24 volt AC, maximum 15 vA.

6. Proportional Signal: 0 to 10 volt dc or 4 to 20 mA, and 0 to 10 volt dc position feedback signal.

7. Temperature Rating: minus 22 to 140 degrees F

8. Run Time: 60-300 seconds open, 40 seconds closed (spring-return).

D. Size for torque required for valve close-off at maximum pump differential pressure, regardless of water loop system pressures.

2.12 OUTSIDE AIR MEASURING AND MODULATION DEVICE

****

Device velocity range is between 300 fpm to 2,000 fpm.

****

A. Factory assembled damper, airflow monitor, actuator, and accessories.

B. Damper and airflow measurement assembly sized to accommodate outside airflow as scheduled and indicated on Drawings.

C. Construction:

1. Frame: Extruded aluminum.

2. Blades:

a. Modulating Air Control:

1) Style: Airfoil-shaped, single-piece.

2) Action: Parallel.

3) Orientation: Horizontal.

4) Material: Heavy gage 6063-T5 extruded aluminum.

5) Width: Maximum 5 inches

b. Stationary Sensing:

1) Style: Airfoil-shaped, single-piece.

2) Orientation: Horizontal.

3) Material: Heavy gage 6063-T5 extruded aluminum.

4) Width: Maximum 5-1/4 inches .

5) Finish: Anodized.

D. Bearings: Self-lubricating molded synthetic sleeve, turning in extruded hole in frame.

1. Seals:

a. Blade: Extruded rubber. Mechanically attached to blade edge.

b. Jamb: Stainless steel, flexible metal compression type.

c. Linkage: Concealed in frame.

d. Axles: Minimum 1/2 inch diameter plated steel, hex-shaped, mechanically attached to blade.

e. Mounting: Vertical.

f. Electric Actuator: 24 V, 60 Hz, modulating, with position feedback.

2. Digital Controller: Application specific controller. Programming logic and calibration in nonvolatile EPROM. Controller uses generic 0 - 10 vdc inputs and outputs for interface to building automation system.

3. Air Straightener Section: 3 inches deep section contained in 5 inch long sleeve attached to damper-airflow monitor frame.

4. Finish: Mill aluminum.

E. Performance Data:

1. Temperature Rating: Withstand -40 to 140 degrees F.

2. Accuracy: Plus or minus 5 percent.

3. Leakage: Maximum of 2.0 cfm per square foot at 1.0 inches wg pressure differential.

4. Measures from 15 percent to 100 percent of unit nominal air flow.

5. Adjusts air flow for temperature variations.

6. Provides 2 to 10 volt DC signal corresponding to actual air flow.

2.13 DIRECT DIGITAL CONTROL SYSTEM COMPONENTS

A. Temperature Sensors:

1. Type: Resistance temperature detector (RTD) or thermistor.

2. Accuracy:

a. Plus or minus 1 degree F for standard applications. Where high accuracy is required, furnish accuracy of plus or minus 0.2 degrees F.

b. Sensing Accuracy: Plus or minus 0.5 degree F.

c. Display Accuracy and Resolution: Minimum of plus or minus 1 degree F.

3. Built-in communications port.

4. Space Sensors: Digital with LCD display, day-night override button, and set point slide adjustment override options. Set point slide adjustment capable of being software limited by automation system to limit amount of room adjustment.

5. Outside Air Sensors: Watertight inlet fitting, furnish with shield from direct sunlight (recommend mounting on north side of building, out of direct sunlight and away from any sources of heat from building exhaust or other heat sources).

6. Duct Temperature Sensors:

a. Rigid or averaging type as indicated in sequence of operations. Averaging sensor minimum length: 8 feet in length.

b. Duct Cross Sections Greater Than 30 square feet: Furnish serpentine averaging element (at least 17 feet in length) to sense stratified air temperatures.

7. Piping Temperature Sensors: Furnish with separable brass well.

B. Humidity Sensors:

1. Type: Capacitance or bulk polymer resistance.

2. Drift: Not to exceed 3 percent of full scale per year.

3. Room Sensors:

a. Sensing Range: 0 to 100 percent.

b. Accuracy of plus or minus 5 percent relative humidity.

4. Duct Sensors:

a. Sensing Range: 0 to 100 percent.

b. Accuracy of plus or minus 5 percent relative humidity.

c. Furnish with sampling chamber.

d. Element guard.

e. Mounting plate.

5. Outdoor Air Humidity Sensors:

   a. Sensing Range: 20 to 95 percent relative humidity.

   b. Suitable for ambient conditions of minus 40 to 170 degrees F

   c. Accuracy: Plus or minus 2 percent relative humidity at 77 degrees F

   d. Element guard.

   e. Mounting plate.

C. Differential Pressure Switches:

1. Furnish as specified in sequences of operation for status purposes in air and water applications.

2. Fully adjustable differential pressure settings.

3. UL Listed, SPDT snap-acting, pilot duty rated (125 VA minimum).

4. NEMA 250 Type 1 enclosure.

5. Scale range and differential suitable for intended application.

D. Static Pressure Sensor:

1. Non-directional sensor with suitable range for expected input, and temperature compensated.

2. Accuracy: plus or minus 1 percent of full scale with repeatability of 0.5 percent.

3. Output: 0-5 VDC, 0-10 VDC.

4. Building Static Pressure Range: minus 0.1 to 0.1 inches water column, minus 0.25 to 0.25 inches water column, minus 0.5 to 0.5 inches water column, minus 1.0 to 1.0 inches water column, jumper selectable.

5. Duct Static Pressure Range: 0 to 1 inches water column, 0 to 2.5 inches water column, 0 to 5 inches water column, 0 to 10 inches water column, jumper adjustable.

E. Static Pressure Sensors:

1. Differential pressure type.

2. Sensor range closely matched to system static pressure, minus 0.5 to 0.5 inches water column, minus 1 to 1 inches water column or 0 to 2.5 inches water column.

3. Accuracy: Plus or minus 5 percent of sensing range.

F. Carbon Dioxide Sensors:

1. Sensors designed for indoor carbon dioxide levels in accordance with ASHRAE Standard 62.

2. 0 to 10 mA output over range of 0 to 2000 ppm of carbon dioxide for interface to DDC control system.

3. For duct mounted sensors furnish airtight enclosure complete with sampling tube.

G. Air Flow Switches:

1. Paddle or differential pressure type, as indicated in sequences of operation.
2. UL Listed, SPDT snap-acting with pilot duty rating (125 VA minimum).
3. Appropriate scale range and differential adjustment.
4. Adjustable sensitivity.
5. NEMA 250 Type 1 enclosure.

H. Water Flow Switches:

1. Paddle type with stainless steel or bronze paddle.
2. UL Listed, SPDT snap-acting with pilot duty rating (125 VA minimum).
3. Appropriate scale range and differential adjustment.
4. Adjustable sensitivity.
5. NEMA 250 Type 1enclosure.
6. Furnish vapor proof type for chilled water applications.

I. Carbon Monoxide Detectors: Single or multi-channel, dual-level detectors, using solid-state sensors with 3 year minimum life, maximum 15 minute sensor replacement, suitable over a temperature range of 23 to 130 degrees F calibrated for 50 and 100 ppm with maximum 120 second response time to 100 ppm carbon monoxide.

J. Carbon Dioxide Sensor and Transmitter: Single detectors, using solid-state infrared sensors, suitable over a temperature range of 23 to 130 degrees F calibrated for 0 to 2000 ppm, with continuous or averaged reading, 0 to 10 mA output, and wall mounted.

K. Oxygen Sensor and Transmitter: Single detectors, using solid-state zircon cell sensing, suitable over temperature range of minus 32 to 1100 degrees F, calibrated for 0 to 5 percent, with continuous or averaged reading, 0 to 10 mA output, wall mounted.

L. Refrigerant Detectors: Dual-level detectors, using solid-state sensors, with alarm preset for 300 ppm, alarm indicator light, alarm silence light and button, alarm test light and button, and trouble light. Provide auxiliary relay preset for 150 ppm.

M. Occupancy Sensor: Passive infrared (PIR) and/or ultrasonic (Dual-technology) , with time delay, daylight sensor lockout, sensitivity control, and 180 degree field of view with vertical sensing adjustment, for flush mounting.

2.14 DUCT-MOUNTED SMOKE DETECTOR

****

Coordinate specifying of smoke detectors with Fire Detection and alarm system located in Division 28. Duct mounted smoke detectors need to be compatible with Fire Detection and Alarm System.

****

A. Product Description: NFPA 72, [ionization type] [photoelectric type] with the following features:

1. Auxiliary SPDT relay contact.
2. Key-operated normal-reset-test switch.
3. Duct sampling tubes extending width of duct.
4. Visual indication of detector actuation.
5. Duct-mounted housing.

B. Furnish [two-wire detector with common] [four-wire detector with separate] power supply and signal circuits.

2.15 DIFFERENTIAL PRESSURE MONITOR

A. Through-the-wall measurement for differential pressure.

B. Digital Display:

1. Differential pressure in inches or Pascal.
2. State of pressure mode.
3. High pressure alarm.
4. Low pressure alarm.
5. General failure.
6. Status of door switch.
7. Anteroom status.

C. Keyed switch to change mode from positive to negative to neutral.

D. LED indicator for normal and alarm status.

E. Audible horn indicating alarm condition with silencing button.

F. Communications port.

G. [One remote pressure transmitter] [Two remote pressure transmitters].

H. Auxiliary alarm relay output.

I. Door switch contact.

J. Calibration tool.

2.16 ELECTRICAL CHARACTERISTICS AND COMPONENTS

A. Electrical Characteristics: In accordance with division 16 and the following:

B. Furnish voltages and horsepower as indicated in schedules on the plans

C. Disconnect Switch: Factory mount disconnect switch in control panel or surface mount on equipment.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify air handling units and ductwork installation is complete and air filters are in place before installing sensors in air streams.

B. Verify location of thermostats and humidistats and other exposed control sensors with drawings before installation.

C. Verify building systems to be controlled are ready to operate.

3.02 INSTALLATION

A. Install copper tubing in mechanical rooms at the following locations:

1. Where subject to damage or temperatures in excess of 200 degrees F.

2. Where adjacent to heating pipes passing through common sleeve.

3. Where not readily accessible.

B. In mechanical rooms, at installer's option, install bundled plastic tubing with junction boxes or single plastic tubing with tray or raceway.

C. Solder or Braze copper tubing joints except at instruments or equipment. Install compression fittings at instruments or equipment.

D. Install tubing concealed from view in finished occupied spaces.

E. Install tubing exposed only in mechanical rooms, storage rooms, and other unfinished spaces.

F. Install tubing mechanically attached to supporting surfaces.

G. Install sleeves through concrete surfaces in minimum one inch sleeves, extended 6 inches above floors and one inch below bottom surface of slabs.

H. Install thermostats, humidistats, space temperature sensors, and other exposed control sensors after locations are coordinated with other Work. Install sensors 48" above floor and align with light switches.

I. Install freeze protection thermostats using flanges and element holders.

J. Install outdoor reset thermostats and outdoor sensors indoors, with sensing elements outdoors with sun shield.

K. Provide separable sockets for liquids and flanges for air bulb elements.

L. Install thermostats in aspirating boxes in public areas where subject to physical abuse, such as handball courts, gymnasiums, high security areas and locations as indicated on drawings.

M. Install control panels adjacent to associated equipment on vibration free walls or freestanding supports. Use one cabinet for each system. Install engraved plastic nameplates for instruments and controls inside cabinet and engraved plastic nameplates on cabinet face. Label with appropriate equipment or system designation.

N. Install "hand/off/auto" selector switches to override automatic interlock controls when switch is in "hand" position.

O. Install conduit and electrical wiring in accordance with Division 26 requirements.

3.03 FIELD QUALITY CONTROL

A. After completion of installation, test and adjust control equipment. Submit data showing set points and final adjustments of controls.

B. Check calibration of instruments. Recalibrate instruments out of calibration. Replace defective instruments.

3.04 DEMONSTRATION AND TRAINING

A. Demonstrate complete operation of systems, including sequence of operation prior to date of Substantial Completion.

B. Demonstrate complete and operating system to Owner. Owner shall sign off on all demonstrated sequence of operations and where not satisfactory or cannot be demonstrated due to seasonal constraints (for example, heating system capacity and boiler controls cannot be demonstrated until cold weather arrives in the winter), the contractor and owner will agree to future sequence of operations demonstration.

END OF SECTION

SECTION 23 11 23

NATURAL GAS PIPING

PART 1 GENERAL

1.01 SCOPE

A. Provide natural gas piping including fittings, couplings, connected equipment and work as specified herein including compliance with references.

B. Natural gas piping includes:

1. Natural gas piping above grade.

2. Flanges, unions, and couplings.

3. Pipe hangers and supports.

4. Valves.

5. Underground pipe markers.

1.02 RELATED SPECIFICATION SECTIONS

A. Section 23 55 00 Fuel Fired Heaters.

1.03 REFERENCES

A. ASME B16.3, Malleable Iron Threaded Fittings.

B. ASME B16.26, Cast Copper Alloy Fittings for Flared Copper Tubes.

C. ASME B31.9, Building Services Piping.

D. ASME Section IX, Boiler and Pressure Vessel Code - Welding and Brazing Qualifications.

E. ASTM D3350/D2513, Standard Specification for Polyethylene Pipe.

F. ASTM A53, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

G. ASTM A234, Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.

H. ASTM B68, Standard Specification for Seamless Copper Tube, Bright Annealed.

I. ASTM B75, Standard Specification for Seamless Copper Tube.

J. ASTM B88, Standard Specification for Seamless Copper Water Tube.

K. ASTM B280, Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.

L. ASTM B749, Standard Specification for Lead and Lead Alloy Strip, Sheet, and Plate Products.

M. ASTM F708, Standard Practice for Design and Installation of Rigid Pipe Hangers.

N. AWS D1.1, Structural Welding Code - Steel.

O. AWWA C105, American National Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems.

P. MSS SP 58, Pipe Hangers and Supports - Materials, Design and Manufacturer.

Q. MSS SP 67, Butterfly Valves.

R. MSS SP 69, Pipe Hangers and Supports - Selection and Application.

S. MSS SP 78, Cast Iron Plug Valves, Flanged and Threaded Ends.

T. MSS SP 89, Pipe Hangers and Supports - Fabrication and Installation Practices.

U. MSS SP 110, Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

V. NFPA 54, National Fuel Gas Code.

W. NFPA 58, Liquefied Petroleum Gas Code.

X. UL 842, Valves for Flammable Fluids.

PART 2 PRODUCTS

2.01 GENERAL

A. Provide products to meet requirements as specified herein and in compliance with referenced standards.

B. All products of the same type must be from the same manufacturer.

2.02 NATURAL GAS PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53 Schedule 40 black.

1. Screwed joints up to 2 1/2". All joint over 2 1/2" to be welded.

2. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M forged steel welding type.

3. Joints: NFPA 54, Threaded or welded to ASME B31.9.

2.03 FLANGES, UNIONS, AND COUPLINGS

A. Ferrous pipe: 150 psi malleable iron threads: Malleable iron, Carbon steel, adjustable swivel, split ring.

B. Hangers for Pipe Sizes 2 inches and Larger: Carbon steel, adjustable, clevis.

C. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

D. Wall Support for Pipe 3 inches and Smaller: Cast iron hook.

E. Vertical Support: Steel riser clamp or Angle ring.

F. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

2.04 VALVES

A. Ball Valves:

1. Furnish materials in accordance with applicable codes

B. Plug Valves:

1. Furnish materials in accordance with applicable codes.

2.05 NATURAL GAS PRESSURE RELIEF VALVES:

A. All materials to be in accordance with applicable codes.

B. Product Description: Spring loaded type relief valve.

1. Body: Aluminum.

2. Diaphragm: nitrile.

3. Orifice: Aluminum, Brass or Stainless Steel

4. Maximum operating temperature: 150 degrees Fahrenheit

5. Inlet Connections: Threaded.

6. Outlet or Vent Connection: Same size as inlet connection.

PART 2 PRODUCTS – NOT USED.

PART 3 EXECUTION

3.01 GENERAL

A. Perform all natural gas work and installation in compliance with NFPA 54 and EM 385-1-1.

B. Perform all work in compliance with ASME B31.9 code for installation of piping systems and ASME Section IX for welding materials and procedures.

C. Perform all work in compliance with references specified herein, applicable codes and to meet utility standards and requirements.

D. Protect piping and fittings from soil and debris with temporary end caps and closures. Maintain in place until installation. Furnish temporary protective coating on cast iron and steel valves.

E. Verify field measurements prior to fabrication or installation.

F. Where more than one piping system material is specified, provide compatible system components and joints. Use non-conducting dielectric connections when joining dissimilar metals in systems.

G. Provide flanges, unions, or couplings at locations requiring servicing. Use unions, flanges, or couplings downstream of valves and at equipment connections. Do not use direct welded or threaded connections to valves, equipment.

H. Provide pipe hangers and supports in accordance with all applicable codes.

I. Use plug, ball, or butterfly valves for shut-off and to isolate equipment, part of systems, or vertical risers.

3.02 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.03 INSTALLATION

A. Installation - Pipe Hangers and Supports.

1. Install hangers and supports in accordance with ASME B31.9, ASTM F708 and/or MSS SP 89. Size hangers and supports to pipe size.
2. Support horizontal piping hangers as scheduled.
3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
4. Place hangers within 12 inches of each horizontal elbow.
5. Install hangers to allow 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
6. Support riser piping independently of connected horizontal piping.
7. Where installing several pipes in parallel and at same elevation, provide multiple pipe hangers or trapeze hangers.
8. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

B. Installation - Above Ground Piping Systems.

1. Install natural gas piping in accordance with NFPA 54.
2. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
3. Route piping in orderly manner and maintain gradient.
4. Install piping to conserve building space and not interfere with use of space.
5. Group piping whenever practical at common elevations.
6. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
7. Provide clearance for installation of insulation and access to valves and fittings.
8. Provide access where valves and fittings are not exposed.
9. Prepare pipe, fittings, supports, and accessories not pre-finished, ready for finish painting.
10. Install identification on piping systems including underground piping.
11. Install valves with stems upright or horizontal, not inverted.
12. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.
13. Install Work in accordance with all applicable codes.

C. Field Quality Control.

1. Pressure test natural gas piping in accordance with NFPA 54.

3.04 PIPE HANGER SPACING: USE WHEN PIPE SPACING AND SIZE IS NOT DEFINED BY CODE.

A. Hanger Rod.

PIPE SIZE Inches	MAX. HANGER SPACING Feet	DIAMETER Inches
1/2	7	3/8
3/4	7	3/8
1	7	3/8
1-1/4	7	3/8
1-1/2	9	3/8
2	10	3/8
2-1/2	11	1/2

B. Perform all work in compliance with references and all federal, state, and local laws, regulations, ordnances, and codes.

END OF SECTION

SECTION 23 31 13

DUCTWORK

PART 1 GENERAL

1.01 SCOPE

A. Low pressure ductwork.

1.02 REFERENCES

A. ASHRAE Fundamentals Handbook 2005 Chapter 35 - Duct Design.

B. ASHRAE Fundamentals Handbook 2004 Chapter 16 - Duct Construction.

C. ASTM A 90 - Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles.

D. ASTM A 167 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

E. ASTM A 123 - General Requirements for Steel Sheet, Zinc- Coated (Galvanized) by the Hot-Dip Process.

F. ASTM A 653 - Steel Sheet, Zinc-Coated (Galvanized) by Hot- Dip Process, Lock Forming Quality.

G. NFPA 90B - Installation of Warm Air Heating and Ventilating Systems.

H. SMACNA 006 - Low Pressure Duct Construction Standards.

I. UL 181 - Factory-Made Air Ducts and Connectors.

J. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.

1.03 SUBMITTALS:

A. Provide a ductwork schedule for each service intended for the actual project that indicates duct material, longitudinal and seam joint construction method, gauges, reinforcing, and sealing.

PART 2 PRODUCTS

2.01 MATERIALS

A. General: Non-combustible or conforming to requirements for Class 1 air duct materials or UL 181.

B. Steel Ducts: ASTM A653 galvanized steel sheet, lock-forming quality, having zinc coating of 1.25 oz per sq ft for each side in conformance with ASTM A90.

C. Flexible Ducts: Fabric supported by helically wound spring steel wire or flat steel bands rated to 2" WG positive and 1.5" WG negative for low pressure ducts.

D. Fasteners: Rivets, bolts, or sheet metal screws.

E. Sealant: Non-hardening, water resistant, fire resistive, compatible with mating materials; liquid used alone or with tape, or heavy mastic.

F. Hanger Rod: Steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

2.02 LOW PRESSURE DUCTWORK

A. Fabricate and support in accordance with SMACNA Low Pressure Duct Construction Standards and ASHRAE handbooks, except as indicated. Provide duct material, gauges, reinforcing, and sealing for operating pressures indicated.

B. Construct tees, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows are used, provide air turning vanes. Where acoustical lining is indicated, provide turning vanes of perforated metal with glass fiber insulation.

C. Increase duct sizes gradually, not exceeding 15 degrees divergence.

D. Provide easements where low pressure ductwork conflicts with piping and structure. Where easements exceed 10 percent duct area, split into two ducts maintaining original duct area.

E. Use double nuts and lock washers on threaded rod supports.

F. Flexible ductwork shall be no more than 5 feet in length.

PART 3 EXECUTION

3.01 INSTALLATION

A. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pilot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.

B. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

C. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

3.02 ADJUSTING AND CLEANING

A. Clean duct system and remove accumulated dust. Protect equipment which may be harmed by excessive dirt with temporary filters, or bypass during cleaning.

B. Adjust duct system dampers to balance overall air flow, keep system noise level below 27 decibels and create necessary air pressure drops to deliver required airflow quantities.

END OF SECTION

SECTION 23 33 00

DUCTWORK ACCESSORIES

PART 1 GENERAL

1.01 SCOPE

A. Volume control dampers.

B. Backdraft dampers.

C. Duct access doors.

D. Duct test holes.

E. Pressure relief doors.

1.02 REFERENCES

A. NFPA 90B - Installation of Warm Air Heating and Ventilating Systems.

B. SMACNA 006 - HVAC Duct Construction Standards - Metal and Flexible.

1.03 SUBMITTALS:

A. Provide the product data, shop drawings, work sheets, qualifications, system documentation, and extra materials per Section 01 33 00 for the following:

B. Product Data:

1. Volume control dampers.

2. Backdraft dampers.

3. Duct access doors.

4. Pressure relief doors.

PART 2 PRODUCTS

2.01 VOLUME CONTROL DAMPER

A. Fabricate in accordance with SMACNA Low Pressure Duct Construction Standards at each branch take off.

B. Fabricate multi-blade damper of opposed blade pattern with maximum blade sized 12 x 72 inch. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.

C. Except in round ductwork 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon or sintered bronze bearings.

D. Provide locking, indicating quadrant regulators on single and multi-blade dampers. Where rod lengths exceed 30 inches provide regulator at both ends.

E. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adaptors.

2.02 BACKDRAFT DAMPER

A. Product Description: Multi-Blade, back-draft dampers: Parallel-action, gravity-balanced, Galvanized 16 gage thick steel, or extruded aluminum. Blades,

maximum 6 inch width, center pivoted, with felt or flexible vinyl sealed edges. Blades linked together in rattle-free manner with 90-degree stop, steel ball bearings, and plated steel pivot pin. Furnish dampers with adjustment device to permit setting for varying differential static pressure.

2.03 DUCT TEST HOLES

A. Cut or drill temporary test holes in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

B. Permanent test holes shall be factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

2.04 FLEXIBLE DUCT CONNECTIONS

A. Cut Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.

B. Connector: Fabric crimped into metal edging strip.

1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric conforming to NFPA 90A, minimum density 30 oz per sq yd.

2. Net Fabric Width: Approximately 6 inches wide.

3. Metal: 3 inch wide, 24 gage galvanized steel.

2.05 DUCT ACCESS DOORS

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.

B. Fabrication: Rigid and close fitting of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ductwork, furnish minimum 1 inch thick insulation with sheet metal cover.

1. Less than 12 inches square, secure with sash locks.

2. Up to 18 inches Square: Furnish two hinges and two sash locks.

3. Up to 24 x 48 inches: Three hinges and two compression latches.

4. Larger Sizes: Furnish additional hinge.

5. Sash Lock: In manufacturer's standard options.

6. Compression Latch: In manufacturer's standard options.

7. Access panels with sheet metal screw fasteners are not acceptable.

2.06 PRESSURE RELIEF DOORS

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.

B. Furnish in either positive or negative pressure rating for intended duct service and pressure classification for the project. Furnish factory adjusted pressure range of 2" to 8" wc in 1" increments. Damper to open automatically at 1" above normal working pressure of the ductwork

C. Fabrication: Rigid and close fitting of aluminum with sealing gaskets and adjustable magnet locking devices. Furnish minimum 1 inch thick insulated solid

core metal cover. Door shall be minimum size of 18” x 18”, unless noted otherwise on the plans.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install accessories in accordance with manufacturer’s instructions and follow SMACNA Low Pressure Standards.

B. Provide balancing dampers at points on low pressure supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Use splitter dampers only where indicated.

C. Provide fire dampers at locations indicated, where ducts and outlets pass through fire rated components. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings, and hinges.

D. Demonstrate re-setting of fire dampers to authorities having jurisdiction and COR.

E. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, smoke detectors, at fire dampers and elsewhere as indicated. Provide minimum 8 x 8 inch size for hand access, 18 x 18 inch size for shoulder access, and as indicated.

F. Provide duct test holes where indicated and required for testing and balancing purposes.

3.02 DUCTWORK CLEANING

A. After completion of project, ensure all ductwork (warm and cold) and diffusers have been thoroughly cleaned.

END OF SECTION

SECTION 23 34 24

ENERGY RECOVERY VENTILATOR

PART 1 GENERAL

1.01 SCOPE

A. Provide indoor outdoor installed Energy Recovery Ventilator

B. Coordinate requirements with Section 23 54 10 - Forced Air Furnaces

1.02 REFERENCES

A. ARI 210/240 Unitary Air-Conditioning and Air-Source Heat Pump Equipment

B. CSA 439 certified by the (HVI) Home Ventilating Institute

C. NFPA 90A and 90B maximum flame/smoke rating index of 25/50 for materials of construction.

D. UL 1812 for ducted air to air heat exchangers

1.03 SUBMITTALS

A. Product Data: Submit product data for the energy recovery system. Submittal shall provide the following information:

1. Manufacturer's standard catalog data in sufficient detail to demonstrate compliance with contract requirements.

2. Data shall be submitted for each specified component.

3. Data shall include manufacturer's recommended installation instructions and procedures.

B. Operation and Maintenance Manuals: Submit in accordance with Section 01 10 10.

PART 2 PRODUCTS

2.01 ENERGY RECOVERY VENTILATOR

A. Materials and equipment shall be standard products of a manufacturer regularly engaged in the manufacturing of such products.

B. Manufacturers:

1. RenewAire

2. Greenheck

3. Aprilaire

4. Or approved Equal

C. Air to Air energy recovery plate core

1. Unit shall be commercial grade, factory assembled unit sized to meet scheduled airflows. The energy recovery plate shall be a fixed plate cross-flow construction arrangement. Static plate core for both sensible and latent energy recovery.

2. Passive frost control, core shall function with outdoor temperatures down to -10°F without frosting or condensing at the core. System shall be capable of furnishing ventilation air continuously without a bypass, recirculation, or electric heaters.

3. Provide positive airstream separation with no bypass or mixing of airstreams.

D. Cabinet:

1. Galvanized steel with baked enamel finish or powder paint finish.

2. Access doors to be fully insulated and provide access to all internal blowers, ERV cores, and filters.

3. Casing walls shall be fully insulated internally with minimum 1" thick foil faced insulation.

4. Unit framing shall be suitable for indoor ceiling hung installations.

E. Fan:

1. Provide supply and exhaust fans in capacities as indicated on the plans and schedules.

2. Blowers are to be direct drive, single motor arrangement.

3. Fans shall be internally vibration isolated. Duct connections at unit duct flanges shall be made with flexible duct connectors.

F. Control:

1. Provide proportional run time controller with furnace interlock.

G. Electrical

1. Unit shall be factory wired for single point power connection in voltage as indicated in schedules on the plan.

2. Furnish with factory installed 24v transformer and relay for controls

PART 3 EXECUTION

3.01 PREPARATION

A. Delivery, Storage, And Handling

1. Deliver, store, and handle equipment in accordance with Section 01 10 10.

2. Stored items shall be protected from the weather and contamination.

3. Proper protection and care of all material before, during, and after installation shall be the Contractor's responsibility. Any materials found to be damaged shall be replaced at the Contractor's expense. During installation, piping and similar openings shall be capped to keep out dirt and other foreign matter.

B. Project/Site Conditions

1. The Contractor shall verify dimensions in the field.

3.02 INSTALLATION

A. Work shall be performed in accordance with the manufacturer's published diagrams, recommendations, and equipment warranty requirements.

B. Operating Tests

1. Tests shall be conducted in the presence of the Contracting Officer or COR. Any material, equipment, instruments, and personnel required for the test shall be provided by the Contractor.

C. System Performance Tests: Prior to final inspection, test units to verify that heating and cooling energy recovery components are working properly. Tests shall be performed in the presence of the Construction Inspector or COR.

D. Cleaning And Adjusting

1. Equipment shall be wiped clean before final acceptance.

END OF SECTION

SECTION 23 37 13

DIFFUSERS, REGISTERS AND GRILLES

PART 1 GENERAL

1.01 SUMMARY

A. Diffusers, Registers and Grilles.

1.02 REFERENCES

A. ADC 1062 - Certification, Rating and Test Manual.

B. AMCA 500 - Test Method for Louvers, Dampers and Shutters.

C. ANSI/NFPA 90B - Installation of Warm Air Heating and Ventilating Systems.

D. ARI 650 - Air Outlets and Inlets.

E. ASHRAE 70 - Method of Testing for Rating the Air Flow Performance of Outlets and Inlets.

F. SMACNA - Low Pressure Duct Construction Standard.

1.03 QUALITY ASSURANCE

A. Test and rate performance of air outlets and inlets in accordance with ADC Equipment Test Code 1062 and ASHRAE 70.

B. Test and rate performance of louvers in accordance with AMCA 500.

C. Agency shall be company specializing in the adjusting and balancing of systems specified in this project with minimum three years documented experience or certified by AABC. Perform work under supervision of AABC Certified Test and Balance Engineer, or NEBB Certified Testing, Balancing and Adjusting Supervisor.

D. Total system balance shall be performed in accordance with AABC National Standards for Field Measurement and Instrumentation, Total System Balance, or NEBB Procedural Standards for Testing, Balancing and Adjusting of Environmental Systems. Balancing report shall be submitted for review and approval upon completion of the heating system.

1.04 REGULATORY REQUIREMENTS

A. Conform to ANSI/NFPA 90B.

1.05 SUBMITTALS

A. Product Data:

1. Return air grille.

2. Rectangular ceiling diffusers.

3. Supply air registers.

4. Louvers.

PART 2 PRODUCTS

2.01 RECTANGULAR CEILING DIFFUSERS (CD-1)

A. Rectangular, stamped, multicore type diffuser to discharge air in a 360 degree pattern with sectioning baffles and inverted T-bar type frame. Fabricate of steel with baked enamel finish (off white).

B. Volume control damper shall be furnished and installed separately from diffuser. Damper shall be located at duct takeoff fitting as far upstream from diffuser as possible for noise reduction considerations.

2.02 SQUARE CEILING DIFFUSER (CD-1)

A. Stamped louver diffuser with integral round neck suitable for flexible duct connection in a diameter as shown on the plans. Construction shall consists of 3 concentric cones and an adjustable vane controller for adjusting throw pattern from vertical-to-horizontal discharge pattern. All diffusers shall be 4-way throw pattern unless indicated otherwise on plans. Fabricate of steel with baked enamel finish (off white). Frame shall be for lay-in T-bar ceiling applications, frame size shall be as indicated on plans and schedules. Manufacturers; Titus model TMSA, Carnes model SJTB, or approved equal.

B. Volume control damper shall be furnished and installed separately from diffuser. Damper shall be located at duct takeoff fitting as far upstream from diffuser as possible for noise reduction considerations.

2.03 SUPPLY REGISTERS (SR-1)

A. Steel fabricated welded construction, factory baked enamel finish, and wide stamped border adjustable with 2-way deflection (45 degree).

B. Furnish with damper, adjustable from face of register.

2.04 RETURN OR TRANSFER GRILLES (RG-1 OR TG-1)

A. 24x 24 Ceiling mounted ½” x ½” x ½” egg-crate return grilles suitable for T-bar ceiling

B. Fabricate one inch margin frame with countersunk screw mounting.

C. In applications of transferring air from either private offices or conference rooms to adjoining corridors, a minimum of (2) 90° elbows with insulated flexible duct shall be used to reduce noise/voice transmission thru the transfer grilles.

2.05 RETURN REGISTERS (RR-1)

A. Fabricate of steel with 20 gauge minimum frames and 22 gauge minimum horizontal blades, steel and aluminum with 20 gauge minimum frame, or aluminum extrusions, with factory baked enamel finish.

B. Furnish with damper, adjustable from face of register.

C. Fabricate one inch margin frame with countersunk screw mounting.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install items in accordance with manufacturer's instructions.

B. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.

C. Install diffusers to ductwork with air tight connection.

D. Provide balancing dampers on duct take-off to diffusers, and grilles and registers. Provide dampers as part of the diffuser, grille or register assembly in gypsum ceiling applications or where only specified on the plans and/or schedules.

E. Paint ductwork visible behind air outlets and inlets matte black.

END OF SECTION

SECTION 23 54 10

FORCED AIR FURNACES

PART 1 GENERAL

1.01 SCOPE

A. Forced air furnaces.

B. Refrigerant cooling coils.

C. Controls.

D. Refer to Section 23 62 13 for air cooled condensing units.

1.02 REFERENCES

A. ARI 210/240 - Unitary Air-Conditioning and Air-Source Heat Pump Equipment.

B. ARI 520 - Positive Displacement Refrigerant Compressors, Compressor Units and Condensing Units.

C. ARI 610 - Central System Humidifiers for Residential Applications.

D. ASHRAE 14 - Methods of Testing for Rating Positive Displacement Condensing Units.

E. ASHRAE 15 - Safety Code for Mechanical Refrigeration.

F. ASHRAE 90A - Energy Conservation in New Building Design.

G. ASHRAE 103 - Heating Seasonal Efficiency of Central Furnaces and Boilers, Methods of Testing.

H. NEMA MG 1 - Motors and Generators.

I. NFPA 54 (AGA Z223.1) - National Fuel Gas Code.

J. NFPA 90A - Installation of Air Conditioning and Ventilating Systems.

K. NFPA 90B - Installation of Warm Air Heating and Air Conditioning Systems.

L. NFPA 211 - Chimneys, Fireplaces, Vents, and Solid Fuel Burning Appliances.

1.03 SUBMITTALS.

A. Product Data:

1. Furnace.

2. Evaporator cooling coil.

3. Thermostat.

B. Warranty:

1. Furnace.

2. Provide twenty-year manufacturer's warranty for heat exchangers.

C. Operations and Maintenance Data:

1. Furnace.

2. Evaporator cooling coil.

3. Thermostat.

1.04 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., or testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.01 GAS FIRED FURNACES

A. Manufacturers:

1. Carrier Corp.
2. Goodman Manufacturing.
3. The Trane Co.
4. McQuay.
5. Lennox.
6. Or approved equal.

B. Units F1 & F2: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, heating element, controls, air filter and accessories; wired for single power connection with control transformer.

1. Air Flow Configuration: Upflow.
2. Heating: Natural gas fired (unless propane is site-provided).
3. Sealed combustion: Min. 95% Efficiency.
4. Heating Capacity: As scheduled on plans.
5. Cooling Capacity: As scheduled on plans.
6. Airflow ratings: CFM and static pressure ratings as indicated on schedules.

C. Cabinet: Steel with baked enamel finish, easily removed and secured access doors with safety interlock switches, glass fiber insulation with reflective liner.

D. Supply Fan: Centrifugal type rubber mounted with direct drive. Blower shall be multi-speed, user adjustable, for airflow balancing to cfm as indicated on the plans. Blowers shall also be rated at airflows and pressure losses to accommodate cooling coil installation in ALL applications (present or future a/c). All a/c units shall match furnaces to be dual stage compressors.

E. Heat Exchanger: Stainless steel welded construction. Provide burner controls for a minimum of 2 stages of heat output.

F. Operating Controls:

1. Programmable Thermostat: Cycles burner to maintain temperature setting.
2. Supply Fan Control: Energize from bonnet temperature independent of burner controls, with adjustable timed off delay and fixed timed on delay, with manual switch for continuous fan operation. Programmable thermostat with night set back.

3. Furnace control board with self diagnostics and fault history to a flashing red LED or display.

G. Air Filters: 1-inch thick glass fiber, disposable type arranged for easy replacement.

H. Venting: Furnaces shall be rated for sealed combustion applications for direct venting to outside.

I. Outside Air Duct: Route an insulated 6" diameter fresh air duct (or in a size as indicated on plans) to each furnace's main return duct. Include intake louver or air intake fitting at a suitable location at the exterior wall or roof as shown on the plans. Also include a balancing/backdraft damper for balancing to 100 cfm, or unless indicated otherwise on the plans.

2.02 EVAPORATOR COIL:

A. Evaporator Coil: Furnish cased coils in a vertical "upflow" arrangement with aluminum fins and copper tube connections. Coils shall be factory installed in "A" frame type of configuration.

B. Casing: Coils shall be encased in an insulated housing constructed of a minimum 22 gauge galvanized steel cabinet. Provide a sloped drain pan with ¾" drain connection and piped to nearest floor drain or out onto grade.

C. Miscellaneous: Provide approximately 8" x 8" access panel for visual inspection and periodic cleaning of fins on coil.

2.03 REFRIGERANT PIPING:

A. Install lines from cooling coil piped to the outdoor condensing unit with thermal expansion valve, fittings and all associated accessories complete.

B. Refrigerant: Provide R-410A refrigerant.

C. Piping: Copper Tubing: ASTM B280, drawn.

1. Fittings: ASME B16.22 wrought copper.

2. Joints: Braze, AWS A5.8 BCuP silver/phosphorus/copper alloy with melting range 1190 to 1480 degrees F.

D. D. Specialties:

1. Thermal expansion valve

2. Filter dryers

3. Liquid indicators

2.04 THERMOSTATS

A. Programmable, Electronic solid-state microcomputer based room thermostat with remote sensor and outdoor air temperature sensor input and up to 2 binary inputs to monitor filter status and one other input status

1. Automatic switching from heating to cooling.

a. Capable of at least 2-stages of heating and 2-stages of cooling

b. Designed for heat pump or stand configuration (application dependent)

2. Preferential rate control to minimize overshoot and deviation from set point.

3. Set-up four separate temperatures per day.

4. Instant override of set point for continuous or timed period from one hour to 31 days.

5. Short cycle protection.

6. Programming based on weekdays, Saturday and Sunday.

7. Selection features including degree F or degree C display, 12 or 24-hour clock, keyboard disable, remote sensor, fan on-auto.

8. Battery replacement without program loss.

9. Thermostat display:

   a. Time of day.

   b. Actual room temperature.

   c. Programmed temperature.

   d. Programmed time.

   e. Duration of timed override.

   f. Day of week.

   g. System mode indication: heating, cooling, auto, fan, off, fan on.

10. Remote access via web or via central BAS for remote scheduling adjustment and remote set point adjustment

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with NFPA 90A and NFPA 90B.

B. Install gas fired furnaces in accordance with AGA Z223.1 (NFPA 54).

C. Provide vent connections in accordance with NFPA 211 and NFPA 54.

D. Install refrigeration systems in accordance with ASHRAE 15.

E. Mount counterflow furnaces installed on combustible floors on additive base.

END OF SECTION

SECTION 23 62 13

AIR COOLED CONDENSING UNITS

PART 1 GENERAL

1.01 SUMMARY

A. Section includes refrigerant condenser package, charge of refrigerant and oil, controls and control connections, refrigerant piping and connections, motor starters, electrical power connections.

1.02 REFERENCES

A. Air-Conditioning and Refrigeration Institute:

1. ARI 210/240 - Unitary Air-Conditioning and Air-Source Heat Pump Equipment.

2. ARI 365 - Commercial and Industrial Unitary Air-Conditioning Condensing Units.

3. ARI 460 - Remote Mechanical-Draft Air-Cooled Refrigerant Condensers.

B. American Society of Heating, Refrigerating and Air-Conditioning Engineers:

1. ASHRAE 15 - Safety Code for Mechanical Refrigeration.

2. ASHRAE 20 - Method of Testing for Rating Remote Mechanical-Draft Air-Cooled Refrigerant Condensers.

3. ASHRAE 90.1 - Energy Standard for Buildings Except Low-Rise Residential Buildings.

C. National Electrical Manufacturers Association:

1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

D. Underwriters Laboratories Inc.:

1. UL 207 - Refrigerant-Containing Components and Accessories, Nonelectrical.

1.03 SUBMITTALS

A. Section 01 33 00 - Submittals: Submittal procedures.

B. Shop Drawings: Indicate components, assembly, dimensions, weights and loading, required clearances, and location and size of field connections. Include schematic layouts showing condenser, refrigeration compressors, cooling coils, refrigerant piping and accessories required for complete system.

C. Product Data: Submit rated capacities, weights, accessories, electrical requirements, and wiring diagrams.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.04 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Submit start-up instructions, maintenance instructions, parts lists, controls, and accessories.

1.05 QUALITY ASSURANCE

A. Construction and Ratings: In accordance with ARI 210/240 Testing in accordance with ASHRAE 20.

B. Performance Ratings: Energy Efficiency Ratio (EER) not less than prescribed by ASHRAE 90.1when tested in accordance with ARI 210/240.

1.06 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

B. Installer: Company specializing in performing work of this section with minimum three years experience.

1.07 PRE-INSTALLATION MEETINGS

A. Section 01 10 10 - General Requirements: Pre-installation meeting.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Section 01 10 10 - General Requirements: Product storage and handling requirements.

B. Comply with manufacturer's installation instruction for rigging, unloading and transporting units.

C. Protect units on site from physical damage.

1.09 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.10 WARRANTY

A. Section 01 10 10 - General Requirements: Product warranties and product bonds.

B. Furnish (5) five year manufacturer warranty for compressors.

1.11 EXTRA MATERIALS

A. Section 01 10 10 - General Requirements: Spare parts and maintenance products.

B. Furnish (1) one sets of fan belts.

PART 2 PRODUCTS

2.01 CONDENSING UNITS

A. Manufacturers:

1. Baltimore Aircoil Company.
2. Carrier Corp.
3. Frick Co.
4. The Trane Co.
5. McQuay.
6. Or approved equal.

B. Product Description:

1. Packaged, factory assembled, pre-wired unit, suitable for outdoor use consisting of casing, condensing coil and fans, integral sub-cooling coil, screens, and controls.

2.02 HOUSING

A. House components in welded steel frame with galvanized steel panels with weather resistant, baked enamel finish.

A. Mount starters, disconnects, and controls in weatherproof panel with full opening access doors. Furnish mechanical interlock to disconnect power when door is opened.

B. Furnish removable access doors or panels with quick fasteners.

2.03 COMPRESSORS

A. Furnish scroll compressor with direct drive 3600 rpm suction gas-cooled hermetic motors. Each compressor shall have crankcase heaters installed, properly sized to minimize the amount of liquid refrigerant present in the oil sump during off cycles.

B. Include centrifugal oil pump, oil level sight glass and oil charging valve.

C. Quantity and sizes of each compressor shall be in factory standard sizes that satisfies total cooling load as scheduled. Provide a minimum of 2 stages of cooling. The staging on/off of compressors shall result in a suitable temperature control sequencing from part load to full load conditions.

2.04 CONDENSER COILS

A. Coils: Aluminum fins mechanically bonded to seamless copper tubing. Furnish sub-cooling circuits as applicable. Air test under water to 425 psig, and vacuum dehydrate. Seal with holding charge of refrigerant.

B. Coil Guard: Expanded metal or louvered with screens.

C. Configuration: Single refrigeration circuit (or two refrigeration circuits) each with receiver.

2.05 FANS AND MOTORS

A. Vertical discharge, direct driven propeller type condenser fans with fan guard on discharge , equipped with roller or ball bearings with grease fittings extended to outside of casing.

B. Weatherproof motors suitable for outdoor use, single phase permanent split capacitor or 3 phase, with permanent lubricated ball bearings and built-in current and thermal overload protection.

2.06 CONTROLS

A. Factory wired and mounted control panel, NEMA 250 Type 4 enclosure, containing fan motor starters, fan cycling thermostats, head pressure controls, compressor interlock and control transformer.

B. Furnish controls to permit operation down to 40 degrees F ambient temperature.

C. Furnish thermostat to cycle fan motors in response to outdoor temperature.

D. Furnish head pressure switch to cycle fan motors in response to refrigerant condensing pressure.

E. Furnish solid state control to vary speed of one condenser fan motor in response to refrigerant condensing pressure.

2.07 CONDENSING UNIT PERFORMANCE

A. Furnish in sizes and performances in accordance to schedules on the plans.

2.08 ELECTRICAL CHARACTERISTICS AND COMPONENTS

A. Electrical Characteristics: In accordance as indicated in schedules on the plans

B. Disconnect Switch: Factory mount disconnect switch in control panel or mounted on equipment.

PART 3 EXECUTION

3.01 3.01 INSTALLATION

A. Install in accordance with ASHRAE 15.

B. Install refrigerant piping from unit to condensing unit. Install refrigerant specialties furnished with unit.

C. Install connection to electrical power wiring.

3.02 INTERFACE WITH OTHER PRODUCTS

A. Install units on vibration isolators on concrete foundations.

B. Confirm operation of condensing unit is interfaced with associated air conditioning coil, air handling unit, or other cooling device.

3.03 DEMONSTRATION AND TRAINING

A. Demonstrate starting, maintenance, and operation of unit.

END OF SECTION

SECTION 23 81 26

DUCTLESS SPLIT SYSTEM AIR CONDITIONER

PART 1 GENERAL

1.01 SCOPE

A. Provide new ductless split air conditioners as shown on the plans and specified.

1.02 REFERENCES

A. ARI 210/240 - Unitary Air-Conditioning and Air-Source Heat Pump Equipment

B. ARI 410 - Forced-Circulation Air-Cooling and Air-Heating Coils

C. ARI 700 - Specifications for Fluorocarbon and Other Refrigerants

D. ASHRAE 15 - Safety Code for Mechanical Refrigeration

E. UL 1995 - Heating and Cooling Equipment

1.03 SUBMITTALS

A. Product Data: Submit product data for the Air-Conditioning System. Submittal shall provide the following information:

1. Manufacturer's standard catalog data in sufficient detail to demonstrate compliance with contract requirements.

2. Data shall be submitted for each specified component.

3. Data shall include manufacturer's recommended installation instructions and procedures.

B. Operation and Maintenance Manuals: Submit in accordance with Section 01 10 10.

PART 2 PRODUCTS

2.01 STANDARD PRODUCTS

A. Materials and equipment shall be standard products of a manufacturer regularly engaged in the manufacturing of such products.

B. Energy Star

1. https://www.energystar.gov/index.cfm?c=most_efficient.me_cac_ashp

C. DOE EERE

1. http://energy.gov/energysaver/articles/ductless-mini-split-heat-pumps

D. Manufacturers:

1. Carrier Corp.

2. Mitsubishi Electric

3. Samsung

4. Or approved Equal

2.02 NAMEPLATES

A. Mini-Split units shall have the manufacturer's name, address, type or style, model or serial number, and catalog number on a plate secured to the item of equipment.

B. Plates shall be durable and legible throughout equipment life.

2.03 DUCTLESS SPLIT AIR CONDITIONER

A. Mini-Split Unit

1. Unit shall be min. 13 SEER, heavy-duty commercial grade, factory assembled pre-charged unit. Compressor shall have over current and thermal protection. Filters shall be of the removable and washable type. Unit shall conform to UL 1995.

2. Unit shall be controller by separate wall thermostats with night setback features for each zone installed. Digital display, multi-function remotes with programmable night setbacks can be utilized in place of wall thermostat.

B. Compressor:

1. Furnish inverter type compressor technology for 4:1 turndown capability. The number of indoor fan coil installed and connected shall be as indicated in the schedules on the plans with provisions for future fan coil units.

C. Refrigerant:

1. Provide 410a refrigerant or equivalent ecological safe and approved type. Furnish refrigerant line sets in sizes and lengths as necessary meeting the manufacturers requirements for each installation.

D. Cabinet:

1. Galvanized steel with baked enamel finish easily removed and secured access doors, glass fiber insulation and reflective liner.

E. Fan Coil:

1. Provide in numbers and capacities as indicated on the plans and schedules.

2. Provide with a minimum of 3 fan speeds for multiple airflow settings. Minimum airflow shall be 200 cfm per unit

3. Where applicable, include manufacturers wall mounting bracket for attachment to gypsum/wood stud framed walls.

4. Provide condensate pump, where necessary, to lift condensate for piping to nearest floor drain.

PART 3 EXECUTION

3.01 PREPARATION

A. Delivery, Storage, And Handling

1. Deliver, store, and handle equipment in accordance with Section 01 10 10.

2. Stored items shall be protected from the weather and contamination.

3. Proper protection and care of all material before, during, and after installation shall be the Contractor's responsibility. Any materials found to be damaged shall be replaced at the Contractor's expense. During installation, piping and similar openings shall be capped to keep out dirt and other foreign matter.

B. Project/Site Conditions

1. The Contractor shall verify dimensions in the field.

3.02 INSTALLATION

A. Work shall be performed in accordance with the manufacturer's published diagrams, recommendations, and equipment warranty requirements.

B. Operating Tests

1. Tests shall be conducted in the presence of the Contracting Officer or COR. Any material, equipment, instruments, and personnel required for the test shall be provided by the Contractor.

2. The Contractor shall at all times during the installation and testing of the refrigeration system, take steps to prevent the release of refrigerants into the atmosphere. The steps shall include but not be limited to, procedures which will minimize the release of refrigerants to the atmosphere and the use of refrigerant recovery devices to remove refrigerant from the system and store the refrigerant for reuse or reclaim.

3. At no time shall more than 3 ounces of refrigerant be released to the atmosphere in any one occurrence. Any system leaks within the first year shall be repaired in accordance with the requirements herein at no cost to the Government including material, labor, and refrigerant if the leak is the result of defective equipment, material, or installation.

C. System Performance Tests: Prior to final inspection, test units to verify that heating and cooling systems are working properly. Tests shall be performed in the presence of the Construction Inspector or COR.

D. Cleaning And Adjusting

1. Equipment shall be wiped clean before final acceptance.

END OF SECTION

SECTION 26 05 00

BASIC ELECTRICAL REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electrical requirements for this project.

1.02 APPLICABLE PUBLICATIONS

A. NFPA 70 - National Electrical Code.

B. ANSI C2-2002, National Electrical Safety Code.

C. TIA/EIA-568-A Commercial Building Telecommunications Cabling Standard.

D. TIA/EIA-569-A Commercial Building Standard for Telecommunications Pathways and Spaces.

E. NECA 101-2006 Standard for Installing Steel Conduit (Rigid, IMC, EMT).

1.03 REGULATORY REQUIREMENTS

A. Furnish products listed and classified by UL or other independent testing firm as suitable for purpose specified and shown.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 DIMENSIONS AND DEFINITE LOCATIONS

A. Refer to the Architectural and/or Electrical drawings for locations of electrical equipment.

B. All conductors shall be copper unless otherwise indicated on drawings.

C. The COR reserves the right to make reasonable changes in the location of outlets, apparatus, or equipment up to the time of rough-in.

3.02 SPECIAL CLEANING AND PAINTING

A. Clean work area and equipment surfaces, interior and exterior.

B. Any painted metal found chipped and/or scratched on the newly installed equipment shall be painted with touch up paint obtained from the equipment manufacturer.

3.03 INSTALLATION

A. All electrical work shall be overseen by a state certified Master electrician. Proof of certification required.

B. All electrical work shall be supervised on site by a state certified journeyman electrician. Proof of certification required.

C. All work shall meet the requirements of the NEC, latest edition.

D. Coordinate all electrical connections with the general contractor, and the fire alarm contractor for all electrical requirements associated with the fire alarm systems.

E. Conductors and breakers shall be properly sized for devices or equipment to be installed.

F. Use conductor not smaller than 12 AWG for power and lighting circuits.

G. Use conductor not smaller than 16 AWG for control circuits.

H. Use 10 AWG conductors for 20 Ampere, 120 volt branch circuits longer than 75 feet.

I. Pull all conductors into the raceway at the same time.

J. Run all exposed power and lighting wiring or wiring above a drop ceiling in Electrical Metallic Tubing (EMT) conduit unless specified differently in the Section 01 10 10 - General Requirements or in one of the Division 16 Specifications.

K. Use steel set screw or compression fittings for EMT conduit.

L. Boxes for exposed conduit shall be rolled steel made for surface mounting.

M. Run telecommunications wire according to ANSI/TIA/EIA standards, particularly in reference to clearance requirements.

N. providing a new main electric service panel is part of the scope of work, install a grounding electrode system, if one does not already exist. This includes at least two grounding electrodes not less than 8 feet apart and must not exceed a measurement of 25 ohms resistance from earth to the grounding electrode system.

O. All grounding electrodes (ground rods) shall be 5/8” minimum diameter, 8 feet long and copper clad.

P. Use Square D panelboards, or Government approved equal.

Q. Install conduit according to the NECA “Standard of Installation” for each type of conduit.

3.04 FURNISH AND INSTALL A FREEZE ALARM.

A. The freeze alarm shall consist of a remote bulb commercial temperature controller and a freeze alarm signal manual controller.

1. Locate the remote bulb commercial temperature controller in any room with water. The remote bulb commercial temperature controller shall have a set point range of 0 F to 100 F, minimum 5 ft. capillary, copper bulb sensing element, contact rating of 125 VA.

2. Locate the freeze alarm signal manual controller.

3. The controller shall be a NEMA F small hinged wall mount enclosure, minimum 4” x 4” x 2”, and minimum 16 gauge steel with mounting holes on back of the cabinet.

4. The controller shall have a toggle switch labeled as Activate/Deactivate. The activate/deactivate switch will interrupt the signal form the remote bulb temperature controller to the SigComm transceiver panel.

5. The temperature controller(s) shall be connected in series with the freeze alarm signal manual controller and this controller shall be wired to the

government supplied SigComm transceiver panel. All wiring shall be in conduit.

3.05 TESTS AND DEMONSTRATIONS

A. The Contractor shall check and test the electrical systems to verify proper continuity and proper connections to equipment have been made, that no shorts or improper grounds exist, to ensure a safe, sound, functional, NEC compliant installation.

B. Upon completion of the work, the Contractor shall demonstrate to the Fort McCoy Construction Inspector that the systems are properly wired and that all systems and equipment perform and operate as specified.

END OF SECTION

SECTION 26 05 19

BUILDING WIRE AND CABLE

PART 1 GENERAL

1.01 SCOPE

A. Building wire and cable.

B. Metal clad cable.

C. Wiring connectors and connections.

D. Project conditions.

1. Contractor shall properly size wire and cable for indicated circuits.

2. Route wire and cable as required to meet project conditions.

1.02 REFERENCES

A. NFPA 70 - National Electrical Code.

1.03 SUBMITTALS - NOT USED

PART 2 PRODUCTS

2.01 BUILDING WIRE AND CABLE

A. Description: Single conductor insulated wire.

B. Conductor: Copper unless shown otherwise on drawings.

C. Insulation Voltage Rating: 600 volts.

2.02 METAL CLAD CABLE

A. Description: ANSI/NFPA 70, Type MC.

B. Conductor: Copper.

C. Insulation Voltage Rating: 600 volts.

D. Insulation Temperature Rating: 140 degrees Fahrenheit.

E. Insulation Material: Thermoplastic.

F. Armor Material: Steel.

G. Armor Design: Interlocked metal tape.

H. Jacket: None.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that interior of building has been protected from weather.

B. Verify that mechanical work likely to damage wire and cable has been completed.

3.02 PREPARATION

A. Completely and thoroughly swab raceway before installing wire.

3.03 INSTALLATION

A. Install products in accordance with manufacturer's instructions and NEC requirements.

B. Use conductor not smaller than 12 AWG for power and lighting circuits.

C. Use solid copper conductor not smaller than 16 AWG for control and fire alarm circuits.

D. Use 10 AWG conductors for 20 ampere, 120 volt branch circuits longer than 75 feet.

E. Pull all conductors into raceway at the same time.

F. Protect exposed cable from damage.

G. Support cables above accessible ceilings using spring metal clips or plastic cable ties to support cables from structure or ceiling suspension system. Do not rest cable on ceiling panels.

H. Use suitable cable fittings and connectors.

I. Neatly train and lace wiring inside boxes, equipment, and panelboards.

J. Clean conductor surfaces before installing lugs and connectors.

K. Make splices, taps, and terminations to carry full capacity of conductors with no perceptible temperature rise.

L. Use suitable reducing connectors or mechanical connector adapters for connecting aluminum conductors to copper conductors.

M. Use solder less pressure connectors with insulating covers for copper conductor splices and taps 8 AWG and larger.

N. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps 10 AWG and smaller.

O. For all Fire Alarm circuits, splices will be made using terminal blocks securely fastened in junction boxes. T Taps are not allowed on Fire Alarm Circuits.

P. Dry Interior Locations: Use only building wire, Type THHN/THWN , in raceway, metal clad cable.

Q. Mechanical Room Circuits.: Use only building wire Type THWN in metal raceway or metal clad cable.

3.04 FIELD QUALITY CONTROL

A. Inspect wire and cable for physical damage and proper connection.

B. Verify continuity of each branch circuit conductor.

END OF SECTION

SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes grounding and bonding systems and equipment.

PART 2 - PRODUCTS

2.01 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.02 STANDARDS

A. Comply with UL 467 for grounding and bonding materials and equipment manufacturer.

2.03 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
4. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
5. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

C. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 6 inches (6.3 by 100 mm) in cross section, with 9/32-inch (7.14-mm) holes spaced 1-1/8 inches (28 mm) apart, unless identified otherwise. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V and shall be Lexan or PVC, impulse tested at 5000 V.

2.04 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

C. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

D. Bus-Bar Connectors: Compression type, copper or copper alloy, with two wire terminals.

E. Beam Clamps: Mechanical type, terminal, ground wire access from four directions, with dual, tin-plated or silicon bronze bolts.

F. Cable-to-Cable Connectors: Compression type, copper or copper alloy.

G. Cable Tray Ground Clamp: Mechanical type, zinc-plated malleable iron.

H. Conduit Hubs: Mechanical type, terminal with threaded hub.

I. Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with hex head bolt.

J. Lay-in Lug Connector: Mechanical type, copper rated for direct burial terminal with set screw.

K. Service Post Connectors: Mechanical type, bronze alloy terminal, in short- and long-stud lengths, capable of single and double conductor connections.

L. Signal Reference Grid Clamp: Mechanical type, stamped-steel terminal with hex head screw.

M. Straps: Solid copper, copper lugs. Rated for 600 A.

N. U-Bolt Clamps: Mechanical type, copper or copper alloy, terminal listed for direct burial.

O. Water Pipe Clamps:

1. Mechanical type, two pieces with stainless-steel bolts.

a) Material: Die-cast zinc alloy.

b) Listed for direct burial.

2. U-bolt type with malleable-iron clamp and copper ground connector rated for direct burial.

2.05 GROUNDING ELECTRODES

A. Copper-clad steel ground rods are the most common grounding electrode. See the Evaluations for discussion on alternative materials. Sectional rods are used when electrodes longer than 10 feet (3 m) are required.

B. Ground Rods: Copper-clad steel; 3/4 inch by 10 feet (19 mm by 3 m) (16 by 2400 mm).

PART 3 - EXECUTION

3.01 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Grounding Bus: Install in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Install bus horizontally, on insulated spacers 2 inches (50 mm) minimum from wall, 6 inches (150 mm) above finished floor unless otherwise indicated.
2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.

C. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.

4. Connections to Structural Steel: Welded connectors.

3.02 GROUNDING AT THE SERVICE

A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

3.03 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

1. Feeders and branch circuits.
2. Lighting circuits.
3. Receptacle circuits.
4. Single-phase motor and appliance branch circuits.
5. Three-phase motor and appliance branch circuits.
6. Flexible raceway runs.
7. Armored and metal-clad cable runs.

C. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

D. Water Heater: Install a separate insulated equipment grounding conductor to each electric water heater. Bond conductor to heater units, piping, connected equipment, and components.

3.04 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

C. Grounding and Bonding for Piping

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.

2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve

D. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install bonding jumper to bond across flexible duct connections to achieve continuity.

E. Connections: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact are galvanically compatible.

1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer in order of galvanic series.
2. Make connections with clean, bare metal at points of contact.
3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
4. Make aluminum-to-galvanized-steel connections with tin-plated copper jumpers and mechanical clamps.
5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

3.05 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal. Make tests at ground rods before any conductors are connected.

a) Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.

b) Perform tests by fall-of-potential method according to IEEE 81.

C. Grounding system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

E. Report measured ground resistances that exceed the following values:

1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: **5** ohms.
3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.

F. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION

SECTION 26 05 33

CONDUIT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal conduit.

B. Flexible metal conduit.

C. Liquid tight flexible metal conduit.

D. Electrical metallic tubing.

E. Nonmetal conduit.

F. Fittings and conduit bodies.

1.02 REFERENCES

A. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.

B. ANSI C80.3 - Electrical Metallic Tubing, Zinc Coated.

C. ANSI C80.6 - Electrical Intermediate Metal Conduit

D. ANSI/NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing and Cable Assemblies.

E. ANSI/NFPA 70 - National Electrical Code, latest edition.

F. NECA "Standard of Installation".

G. NEMA RN 1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.

1.03 NEMA TC 3 - PVC FITTINGS FOR USE WITH RIGID PVC CONDUIT DESIGN REQUIREMENTS

A. Conduit Size: ANSI/NFPA 70.

1.04 REGULATORY REQUIREMENTS

A. Furnish products listed and classified by an independent testing firm as suitable for purpose specified and shown.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

B. Protect PVC conduit from sunlight.

PART 2 PRODUCTS

2.01 CONDUIT REQUIREMENTS

A. Minimum Size: 1/2 inch unless otherwise specified.

2.02 METAL CONDUIT

A. Rigid Steel Conduit: ANSI C80.1.

B. Electrical Intermediate Metal Conduit (EIMC): ANSI C80.6.

C. Fittings and Conduit Bodies: ANSI/NEMA FB 1; material to match conduit.

2.03 PVC COATED METAL CONDUIT

A. Description: NEMA RN 1; rigid steel conduit with external PVC coating, 20 mil thick.

B. Fittings and Conduit Bodies: ANSI/NEMA FB 1; steel fittings with external PVC coating to match conduit.

2.04 FLEXIBLE METAL CONDUIT

A. Description: Interlocked steel construction.

B. Fittings: ANSI/NEMA FB 1.

2.05 LIQUIDTIGHT FLEXIBLE METAL CONDUIT

A. Description: Interlocked steel construction with PVC jacket.

B. Fittings: ANSI/NEMA FB 1.

2.06 ELECTRICAL METALLIC TUBING (EMT)

A. Description: ANSI C80.3; galvanized tubing.

B. Fittings and Conduit Bodies: ANSI/NEMA FB 1; steel or malleable iron, compression type.

2.07 NONMETALLIC CONDUIT

A. Description: NEMA TC 2; Schedule 40 PVC.

B. Fittings and Conduit Bodies: NEMA TC 3.

PART 3 EXECUTION

3.01 STORAGE

A. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

B. Protect PVC conduit from sunlight.

3.02 INSTALLATION

A. Install conduit in accordance with NECA "Standard of Installation."

B. Install nonmetallic conduit in accordance with manufacturer's instructions.

C. Arrange supports to prevent misalignment during wiring installation.

D. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.

E. Group related conduits; support using conduit rack. Construct rack using steel channel.

F. Fasten conduit supports per NEC requirements.

G. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports.

H. Do not attach conduit to ceiling support wires.

I. Arrange conduit to maintain headroom and present neat appearance.

J. Route exposed conduit parallel and perpendicular to walls.

K. Route conduit installed above accessible ceilings parallel and perpendicular to walls.

L. Route conduit in and under slab from point-to-point.

M. Do not cross conduits in slab.

N. Maintain clearance between conduit and piping to prevent conduit from coming in contact with piping.

O. Maintain 12 inch clearance between conduit and surfaces with temperatures exceeding 104 degrees F.

P. Cut conduit square using saw or pipe cutter; de-burr cut ends.

Q. Bring conduit to shoulder of fittings; fasten securely.

R. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.

S. Use conduit hubs or sealing locknuts to fasten conduit to sheet metal boxes in damp and wet locations and to cast boxes.

T. Install no more than equivalent of three 90-degree bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Use factory elbows for bends in metal conduit larger than 2 inch size.

U. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.

V. Provide suitable fittings to accommodate expansion and deflection where conduit crosses control and expansion joints.

W. Provide pull string in each empty conduit, except sleeves and nipples.

X. Use caps to protect installed conduit against entrance of dirt and moisture.

Y. Ground and bond metallic conduit.

Z. Run all exposed power and lighting wiring or wiring above a drop ceiling in Electrical Metallic Tubing (EMT) conduit unless specified differently in the Section 01 10 10 - General Requirements or in one of the Division 26 Specifications.

AA. Use PVC Coated Metal conduit when entering building under ground up to 5 feet outside building.

3.03 INTERFACE WITH OTHER PRODUCTS

A. Install conduit to preserve fire resistance rating of partitions and other elements. Caulk and seal all penetrations with fire rated sealant.

END OF SECTION

SECTION 26 05 34

BOXES

PART 1 GENERAL

1.01 SCOPE

A. Wall and ceiling outlet boxes.

B. Pull and junction boxes.

1.02 REFERENCES

A. ANSI/MENA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing and Cable.

B. ANSI/NEMA OS 1 - Sheet-steel Outlet Boxes, Device Boxes, Covers, and Box Supports.

C. ANSI/NFPA 70 - National Electrical Code, current edition.

D. NEMA/250 - Enclosures for Electrical Equipment (1000 volts Maximum).

1.03 SUBMITTALS - NOT USED

PART 2 PRODUCTS

2.01 OUTLET BOXES

A. Sheet Metal Outlet Boxes: ANSI/NEMA OS 1, galvanized steel.

1. Luminaries and Equipment Supporting Boxes: Rate for weight of equipment supported; include 1/2 inch male fixture studs where required.

B. Cast Boxes: NEMA FB 1, Type FD, aluminum. Provide gasketed cover by box manufacturer. Provide threaded hubs.

2.02 PULL AND JUNCTION BOXES

A. Sheet Metal Boxes: NEMA 051, galvanized steel.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install electrical boxes as required for splices, taps, wire pulling, equipment connections, and compliance with regulatory requirements.

B. Install electrical boxes to maintain headroom and to present neat mechanical appearance.

C. Install pull boxes and junction boxes above accessible ceilings and in unfinished area only. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaries.

D. Boxes shall not be less than 1-1/2 inches deep unless approved by the COR for unusual structural conditions.

E. Install boxes to preserve fire resistance rating of partitions and other elements.

F. Use flush mounting outlet boxes in finished areas.

G. Boxes for exposed conduit shall be rolled steel made for surface mounting.

H. Do not install flush mounting boxes back-to-back in walls; provide minimum 6 inch separation. Provide minimum 24 inches separation in acoustic rated walls.

I. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.

J. Use stamped steel bridges to fasten flush mounting outlet box between studs.

K. Install flush mounting box without damaging wall insulation or reducing its effectiveness.

L. Use adjustable steel channel fasteners for hung ceiling outlet box.

M. Do not fasten boxes to ceiling support wires.

N. Support boxes independently of conduit, except cast box that is connected to two rigid metal conduits both supported within 12 inches of box.

O. Use gang box where more than one device is mounted together. Do not use sectional box. Use gang box with plaster ring for single device outlets.

P. Use gasketed, water tight cast boxes in exterior locations exposed to the weather and wet locations.

3.02 INTERFACE WITH OTHER PRODUCTS

A. Coordinate mounting heights and locations of outlets mounted above counters, benches and backsplashes.

B. Position outlet boxes to locate luminaries.

3.03 ADJUSTING

A. Adjust flush-mounting outlets to make front flush with finished wall or floor material.

B. Install knockout closure in unused box opening.

END OF SECTION

SECTION 26 05 44

SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
2. Sleeve-seal systems.
3. Sleeve-seal fittings.
4. Grout.
5. Silicone sealants.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.01 SLEEVES

A. Wall Sleeves:

1. Retain "Steel Pipe Sleeves" or "Cast-Iron Pipe Sleeves" Subparagraph below for penetrations through exterior walls above and below grade.
2. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
3. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

C. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

D. Sleeves for Rectangular Openings:

1. Material: Galvanized sheet steel.

2. Minimum Metal Thickness:

a. For sleeve cross-section rectangle perimeter less than 50 inches and with no side larger than 16 inches, thickness shall be 0.052 inch.

b. For sleeve cross-section rectangle perimeter 50 inches or more and one or more sides larger than 16 inches, thickness shall be 0.138 inch.

2.02 SLEEVE-SEAL SYSTEMS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

1. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.

2. Pressure Plates: Carbon steel.

3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating of length required to secure pressure plates to sealing elements.

2.03 SLEEVE-SEAL FITTINGS

A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.

2.04 GROUT

A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

2.05 SILICONE SEALANTS

A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.

B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

PART 3 - EXECUTION

3.01 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

A. Comply with NECA 1.

B. Comply with NEMA VE 2 for cable tray and cable penetrations.

C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:

1. Interior Penetrations of Non-Fire-Rated Walls and Floors:

a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 07 92 00 "Joint Sealants."

b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.

2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

3. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed

4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.

5. Install sleeves for floor penetrations. Extend sleeves installed in floors 6 inches finished floor level. Install sleeves during erection of floors.

D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:

1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.

2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.

E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel or cast-iron pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

G. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

3.02 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.

B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.03 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout, seal the space around outside of sleeve-seal fittings.

END OF SECTION

SECTION 26 05 53

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Color and legend requirements for raceways, conductors, and warning labels and signs.
2. Labels.
3. Bands and tubes.
4. Tapes and stencils.
5. Tags.
6. Signs.
7. Cable ties.
8. Paint for identification.
9. Fasteners for labels and signs.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Comply with ASME A13.1.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

D. Comply with ANSI Z535.4 for safety signs and labels.

E. Comply with NFPA 70E requirements for arc-flash warning labels.

F. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

G. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.02 COLOR AND LEGEND REQUIREMENTS

A. Raceways, Direct Buried and Aerial Cables Carrying Circuits at 600 V or Less:

1. Black letters on an orange field.
2. Legend: Indicate voltage.

B. Color-Coding for Phase-and Voltage-Level Identification, 600 V or Less: Use colors listed below for ungrounded conductors.

1. Color shall be factory applied for #8AWG or smaller, or where applicable.
2. Colors for 208/120-V Circuits. Use existing scheme if it exists. If not use the following:

a) Phase A: Black.

b) Phase B: Red.
c) Phase C: Blue.

3. Color for Neutral: White for 240V or less.
4. Color for Equipment Grounds: Green

C. Warning Label Colors:

1. Identify system voltage with black letters on an orange background.

D. Warning labels and signs shall include, but are not limited to, the following legends:

1. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."

E. Equipment Identification Labels:

1. Black letters on a white field for non-emergency equipment
2. 3 lines

a) Line 1: Equipment Name
b) Line 2: Voltage System and Wires
c) Line 3: Fed From

2.03 LABELS

A. Vinyl Wraparound Labels: Preprinted, flexible labels laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.

B. Snap-around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameters sized to suit diameters and that stay in place by gripping action.

C. Self-Adhesive Wraparound Labels: Preprinted, 3-mil- thick, vinyl flexible label with acrylic pressure-sensitive adhesive.

1. Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating, protective shield over the legend. Labels sized such that the clear shield overlaps the entire printed legend.

2. Marker for Labels: Permanent, waterproof, black ink marker recommended by tag manufacturer.
3. Marker for Labels: Machine-printed, permanent, waterproof, black ink recommended by printer manufacturer.

D. Self-Adhesive Labels: Vinyl, thermal, transfer-printed, 3-mil- thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.

1. Minimum Nominal Size:

a) 1-1/2 by 6 inches for raceway and conductors
b) 3-1/2 by 5 inches for equipment.
c) As required by authorities having jurisdiction.

2.04 BANDS AND TUBES

A. Snap-around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeves, 2 inches long, with diameters sized to suit diameters and that stay in place by gripping action.

B. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tubes with machine-printed identification labels, sized to suit diameter and shrunk to fit firmly. Full shrink recovery occurs at a maximum of 200 deg F. Comply with UL 224.

2.05 TAPES AND STENCILS

A. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

B. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; not less than 3 mils thick by 1 to 2 inches wide; compounded for outdoor use.

C. Tape and Stencil: 4-inch- wide black stripes on 10-inch centers placed diagonally over orange background and is 12 inches wide. Stop stripes at legends.

D. Floor Marking Tape: 2-inch- wide, 5-mil pressure-sensitive vinyl tape, with yellow and black stripes and clear vinyl overlay.

E. Underground-Line Warning Tape:

1. Tape:

a) Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications lines.
b) Printing on tape shall be permanent and shall not be damaged by burial operations.
c) Tape material and ink shall be chemically inert and not subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.

2. Color and Printing:

a) Comply with ANSI Z535.1, ANSI Z535.2, ANSI Z535.3, ANSI Z535.4, and ANSI Z535.5.
b) Inscriptions for Red-Colored Tapes: "ELECTRIC LINE, HIGH VOLTAGE"
c) Inscriptions for Orange-Colored Tapes: "TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE"

2.06 TAGS

A. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking cable tie fastener.

B. Nonmetallic Preprinted Tags: Polyethylene tags, 0.023 inch thick, color-coded for phase and voltage level, with factory printed permanent designations; punched for use with self-locking cable tie fastener.

2.07 SIGNS

A. Baked-Enamel Signs:

1. Preprinted aluminum signs punched or drilled for fasteners, with colors, legend, and size required for application.
2. 1/4-inch grommets in corners for mounting.
3. Nominal Size: 7 by 10 inches.

B. Laminated Acrylic or Melamine Plastic Signs:

1. Engraved legend.
2. Thickness:

a) For signs up to 20 sq. in., minimum 1/16 inch thick.
b) For signs larger than 20 sq. in., 1/8 inch thick.

c) Engraved legend with black letters on white face for non-emergency devices, white letters on red background for emergency devices.
d) Punched or drilled for stainless steel mechanical fasteners with 1/4-inch grommets in corners for mounting.
e) Framed with mitered acrylic molding and arranged for attachment at applicable equipment.
f) Self Adhesive equipment labels are not allowed.

2.08 CABLE TIES

A. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 Deg F according to ASTM D 638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black, except where used for color-coding.

B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 Deg F according to ASTM D 638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black.

C. Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, and self-locking.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 Deg F according to ASTM D 638: 7000 psi.
3. UL 94 Flame Rating: 94V-0.
4. Temperature Range: Minus 50 to plus 284 deg F.
5. Color: Black.

2.09 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.01 PREPARATION

A. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

3.02 INSTALLATION

A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.

B. Install identifying devices before installing acoustical ceilings and similar concealment.

C. Verify identity of each item before installing identification products.

D. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.

E. Apply identification devices to surfaces that require finish after completing finish work.

F. Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.

G. System Identification for Raceways and Cables under 600 V: Identification shall completely encircle cable or conduit. Place identification of two-color markings in contact, side by side.

1. Secure tight to surface of conductor, cable, or raceway.

H. System Identification for Raceways and Cables over 600 V: Identification shall completely encircle cable or conduit. Place adjacent identification of two-color markings in contact, side by side.

1. Secure tight to surface of conductor, cable, or raceway.

I. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.

J. Vinyl Wraparound Labels:

1. Secure tight to surface of raceway or cable at a location with high visibility and accessibility.
2. Attach labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to the location and substrate.

K. Snap-around Labels: Secure tight to surface at a location with high visibility and accessibility.

L. Self-Adhesive Wraparound Labels: Secure tight to surface at a location with high visibility and accessibility.

M. Self-Adhesive Labels:

1. On each item, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch- high letters on 1-1/2-inch- high label; where two lines of text are required, use labels 2 inches high.

N. Snap-around Color-Coding Bands: Secure tight to surface at a location with high visibility and accessibility.

O. Heat-Shrink, Preprinted Tubes: Secure tight to surface at a location with high visibility and accessibility.

P. Marker Tapes: Secure tight to surface at a location with high visibility and accessibility.

Q. Self-Adhesive Vinyl Tape: Secure tight to surface at a location with high visibility and accessibility.

1. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding.

R. Tape and Stencil: Comply with requirements in painting Sections for surface preparation and paint application.

S. Floor Marking Tape: Apply stripes to finished surfaces following manufacturer's written instructions.

T. Underground Line Warning Tape:

1. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 6 to 12 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench exceeds 16 inches overall.
2. Limit use of underground-line warning tape to direct-buried cables.
3. Install underground-line warning tape for direct-buried cables and cables in raceways.

U. Nonmetallic Preprinted Tags:

1. Place in a location with high visibility and accessibility.
2. Secure using plenum-rated cable ties.

V. Laminated Acrylic or Melamine Plastic Signs:

1. Attach signs that are not self-adhesive type with stainless steel mechanical fasteners appropriate to the location and substrate.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch- high letters on 1-1/2-inch- high sign; where two lines of text are required, use labels 2 inches high.

W. Cable Ties: General purpose, for attaching tags, except as listed below:

1. Outdoors: UV-stabilized nylon.
2. In Spaces Handling Environmental Air: Plenum rated.

3.03 IDENTIFICATION SCHEDULE

A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.

B. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.

C. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits, More Than 30 A and 120 V to Ground: Identify with self-adhesive vinyl tape applied in bands.

1. Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

D. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use vinyl wraparound labels to identify the phase.

1. Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

E. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use self-adhesive labels with the conductor or cable designation, origin, and destination.

F. Control-Circuit Conductor Termination Identification: For identification at terminations, provide heat-shrink preprinted tubes with the conductor designation.

G. Conductors to Be Extended in the Future: Attach marker tape to conductors and list source.

H. Auxiliary Electrical Systems Conductor Identification: Self-adhesive vinyl tape that is uniform and consistent with system used by manufacturer for factory-installed connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.

I. Locations of Underground Lines: Underground-line warning tape for power, lighting, communication, and control wiring and optical-fiber cable.

J. Workspace Indication: Apply floor marking tape to finished surfaces. Show working clearances in the direction of access to live parts. Workspace shall comply with NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

K. Instructional Signs: Self-adhesive labels, including the color code for grounded and ungrounded conductors.

L. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive labels.

1. Apply to exterior of door, cover, or other access.
2. For equipment with multiple power or control sources, apply to door or cover of equipment, including, but not limited to, the following:

a) Controls with external control power connections.
b) Power-transfer switches.

M. Arc Flash Warning Labeling: Self-adhesive labels.

N. Equipment Identification Labels:

1. Indoor Equipment: Laminated acrylic or melamine plastic sign.
2. Outdoor Equipment: Laminated acrylic or melamine sign.
3. Equipment to Be Labeled:
    a) Enclosures and electrical cabinets.
    b) Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be in the form of an engraved, laminated acrylic or melamine label.
    c) Enclosures and electrical cabinets.
    d) Emergency system boxes and enclosures.
    e) Access doors and panels for concealed electrical items.
    f) Enclosed switches.
    g) Enclosed circuit breakers.
    h) Enclosed controllers.
    i) Variable-speed controllers.
    j) Power-transfer equipment.
    k) Power-generating units.
    l) Monitoring and control equipment.

END OF SECTION

SECTION 26 05 73

OVERCURRENT PROTECTIVE DEVICE COORDINATION, SHORT CIRCUIT AND ARC-FLASH STUDY

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes computer-based, overcurrent protective device coordination studies to determine overcurrent protective devices and to determine overcurrent protective device settings for selective tripping. Fault-current study to determine the minimum interrupting capacity of circuit protective devices. Arc-flash study to determine the arc-flash hazard distance and the incident energy to which personnel could be exposed during work on or near electrical equipment.

1. Study results shall be used to determine coordination of series-rated devices.

1.02 DEFINITIONS

A. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

B. One-Line Diagram: A diagram which shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.

C. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion from the system.

D. SCCR: Short-circuit current rating.

E. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

1.03 ACTION SUBMITTALS

A. Product Data: For computer software program to be used for studies.

B. Other Action Submittals: Submit the following after the approval of system protective devices submittals. Submittals shall be in digital form.

1. Coordination-study Short-circuit study Arc-flash study input data, including completed computer program input data sheets.

2. Study and equipment evaluation reports.

3. Overcurrent protective device coordination study report; Short-circuit study and equipment evaluation; Arc-flash study report; signed, dated, and sealed by a qualified professional engineer.

a) Submit study report for action prior to receiving final approval of the distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Architect for preliminary submittal of sufficient study data to ensure that the selection of devices and associated characteristics is satisfactory.

1.04 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Coordination Study Software Developer, Coordination Study Specialist and Field Adjusting Agency.

B. Product Certificates: For overcurrent protective device coordination and short-circuit study software, certifying compliance with IEEE 399. For arc-flash hazard analysis software, certifying compliance with IEEE 1584 and NFPA 70E.

1.05 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For the overcurrent protective devices to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 03300 "Submittals," include the following:

a) The following parts from the Protective Device Coordination Study Report:

1) One-line diagram.

2) Protective device coordination study.

3) Time-current coordination curves.

b) Power system data.

2. Maintenance procedures according to requirements in NFPA 70E shall be provided in the equipment manuals.

3. Provide maintenance procedures for use by Owner's personnel that comply with requirements in NFPA 70E.

1.06 QUALITY ASSURANCE

A. Studies shall use computer programs that are distributed nationally and are in wide use. Software algorithms shall comply with requirements of standards and guides specified in this Section. Manual calculations are unacceptable.

B. Coordination Study Short-Circuit Study and Arc-Flash Study Software Developer Qualifications: An entity that owns and markets computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.

1. The computer program shall be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.

C. Coordination Study Short-Circuit Study and Arc-Flash Study Specialist Qualifications: Professional engineer in charge of performing the study and documenting recommendations, licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer.

D. Field Adjusting Agency Qualifications: An independent agency, with the experience and capability to adjust overcurrent devices and to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

E. Comply with IEEE 242 for protection and coordination time intervals.

F. Comply with IEEE 399 for general study procedures.

G. Comply with IEEE 551 for short-circuit currents.

H. Comply with IEEE 1584 for arc-flash hazard and NFPA 70E for electrical safety in the workplace.

PART 2 - PRODUCTS

2.01 COMPUTER SOFTWARE DEVELOPERS

A. Software Developers:

1. CGI CYME.
2. ESA Inc.
3. Operation Technology, Inc.
4. Power Analytics, Corporation.
5. SKM Systems Analysis, Inc.

B. Comply with IEEE 242 and IEEE 399 IEEE 551 and IEEE 1584 and NFPA 70E.

C. Analytical features of device coordination study computer software program shall have the capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.

D. Computer software program shall be capable of plotting and diagramming time-current-characteristic curves as part of its output. Computer software program shall report device settings and ratings of all overcurrent protective devices and shall demonstrate selective coordination by computer-generated, time-current coordination plots.

1. Optional Features:

2. Arcing faults.

3. Simultaneous faults.

4. Explicit negative sequence.

5. Mutual coupling in zero sequence.

2.02 PROTECTIVE DEVICE COORDINATION STUDY REPORT CONTENTS

A. Executive summary.

B. Study descriptions, purpose, basis and scope. Include case descriptions, definition of terms and guide for interpretation of the computer printout.

C. One-line diagram, showing the following:

1. Protective device designations and ampere ratings.

2. Cable size and lengths.

3. Transformer kilovolt ampere (kVA) and voltage ratings.

4. Motor and generator designations and kVA ratings.

5. Motor-control equipment, Distribution panelboard, and branch circuit panelboard designations.

D. Study Input Data: As described in "Power System Data" Article.

E. Short-Circuit Study Output: As specified in "Short-Circuit Study Output" Paragraph in "Short-Circuit Study Report Contents."

F. Protective Device Coordination Study:

1. Report recommended settings of protective devices, ready to be applied in the field. Use manufacturer's data sheets for recording the recommended setting of overcurrent protective devices when available.

a) Phase and Ground Relays:

1) Device tag.

2) Relay current transformer ratio and tap, time dial, and instantaneous pickup value.

3) Recommendations on improved relaying systems, if applicable.

b) Circuit Breakers:

1) Adjustable pickups and time delays (long time, short time, ground).

2) Adjustable time-current characteristic.

3) Adjustable instantaneous pickup.

4) Recommendations on improved trip systems, if applicable.

c) Fuses: Show current rating, voltage, and class.

G. Time-Current Coordination Curves: Determine settings of overcurrent protective devices to achieve selective coordination. Graphically illustrate that adequate time separation exists between devices installed in series, including power utility company's upstream devices. Prepare separate sets of curves for the switching schemes and for emergency periods where the power source is local generation. Show the following information:

1. Device tag and title, one-line diagram with legend identifying the portion of the system covered.

2. Terminate device characteristic curves at a point reflecting maximum symmetrical or asymmetrical fault current to which the device is exposed.

3. Identify the device associated with each curve by manufacturer type, function, and, if applicable, tap, time delay, and instantaneous settings recommended.

4. Plot the following listed characteristic curves, as applicable:

a) Power utility's overcurrent protective device.

b) Low-voltage fuses including manufacturer's minimum melt, total clearing, tolerance, and damage bands.

c) Low-voltage equipment circuit-breaker trip devices, including manufacturer's tolerance bands.

d) Transformer full-load current, magnetizing inrush current, and ANSI through-fault protection curves.

e) Cables and conductors damage curves.

f) Ground-fault protective devices.

g) Motor-starting characteristics and motor damage points.

h) Generator short-circuit decrement curve and generator damage point.

i) The largest feeder circuit breaker in each motor-controller and panelboard.

5. Series rating on equipment allows the application of two series interrupting devices for a condition where the available fault current is greater than the interrupting rating of the downstream equipment. Both devices share in the interruption of the fault and selectivity is sacrificed at high fault levels. Maintain selectivity for tripping currents caused by overloads.

6. Provide adequate time margins between device characteristics such that selective operation is achieved.

H. Comments and recommendations for system improvements.

2.03 SHORT-CIRCUIT STUDY REPORT CONTENTS

A. Executive summary.

B. Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpretation of the computer printout.

C. One-line diagram, showing the following:

1. Protective device designations and ampere ratings.

2. Cable size and lengths.

3. Motor and generator designations and kVA ratings.

4. Motor-controllers, Distribution panelboard, and branch circuit panelboard designations.

D. Comments and recommendations for system improvements, where needed.

E. Protective Device Evaluation:

1. Evaluate equipment and protective devices and compare to short-circuit ratings.

2. Tabulations of circuit breaker, fuse, and other protective device ratings versus calculated short-circuit duties.

3. For 600-V overcurrent protective devices, ensure that interrupting ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.

4. For devices and equipment rated for asymmetrical fault current, apply multiplication factors listed in the standards to 1/2-cycle symmetrical fault current.

5. Verify adequacy of phase conductors at maximum three-phase bolted fault currents; verify adequacy of equipment grounding conductors and grounding electrode conductors at maximum ground-fault currents. Ensure that short-circuit withstand ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.

F. Short-Circuit Study Input Data: As described in "Power System Data" Article in the Evaluations.

G. Short-Circuit Study Output:

1. Low-Voltage Fault Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:

    a) Voltage.

    b) Calculated fault-current magnitude and angle.

    c) Fault-point X/R ratio.

    d) Equivalent impedance.

2. Momentary Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:

    a) Voltage.

    b) Calculated symmetrical fault-current magnitude and angle.

    c) Fault-point X/R ratio.

    d) Calculated asymmetrical fault currents:

        1) Based on fault-point X/R ratio.

        2) Based on calculated symmetrical value multiplied by 1.6.

        3) Based on calculated symmetrical value multiplied by 2.7.

3. Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:

    a) Voltage.

    b) Calculated symmetrical fault-current magnitude and angle.

    c) Fault-point X/R ratio.

    d) No AC Decrement (NACD) ratio.

    e) Equivalent impedance.

    f) Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a symmetrical basis.

H. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a total basis.

2.04 ARC-FLASH STUDY REPORT CONTENT

A. Executive summary.

B. Study descriptions, purpose, basis and scope.

C. One-line diagram, showing the following:

1. Protective device designations and ampere ratings.

2. Cable size and lengths.

3. Transformer kilovolt ampere (kVA) and voltage ratings.

4. Motor and generator designations and kVA ratings.

5. Motor-control center, Distribution panelboard and branch circuit panelboard designations.

D. Study Input Data: As described in "Power System Data" Article.

E. Short-Circuit Study Output: As specified in "Short Circuit Study Output" Paragraph in "Short-Circuit Study Report Contents."

F. Protective Device Coordination Study Report Contents: As specified in "Protective Device Coordination Study Report Contents."

G. Arc-Flash Study Output:

1. Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:

a) Voltage.

b) Calculated symmetrical fault-current magnitude and angle.

c) Fault-point X/R ratio.

d) No AC Decrement (NACD) ratio.

e) Equivalent impedance.

f) Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a symmetrical basis.

g) Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a total basis.

H. Incident Energy and Flash Protection Boundary Calculations:

1. Arcing fault magnitude.

2. Protective device clearing time.

3. Duration of arc.

4. Arc-flash boundary.

5. Working distance.

6. Incident energy.

7. Hazard risk category.

8. Recommendations for arc-flash energy reduction.

I. Fault study input data, case descriptions, and fault-current calculations including a definition of terms and guide for interpretation of the computer printout.

2.05 ARC-FLASH WARNING LABELS

A. Comply with requirements in Section 260553 "Identification for Electrical Systems" for self-adhesive equipment labels. Produce a 3.5-by-5-inch self-adhesive equipment label for each work location included in the analysis.

B. The label shall have an orange header with the wording, "WARNING, ARC-FLASH HAZARD," and shall include the following information taken directly from the arc-flash hazard analysis:

1. Location designation.

2. Nominal voltage.

3. Flash protection boundary.

4. Hazard risk category.

5. Incident energy.

6. PPE level

7. Working distance.

8. Engineering report number, revision number, and issue date.

9. Labels shall be machine printed, with no field-applied markings.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine Project overcurrent protective device submittals for compliance with electrical distribution system coordination requirements and other conditions affecting performance. Devices to be coordinated are indicated on Drawings.

1. Proceed with coordination, short-circuit and arc-flash study only after relevant equipment submittals have been assembled. Study shall be submitted concurrently with related equipment.

3.02 PROTECTIVE DEVICE COORDINATION, SHORT-CIRCUIT AND ARC-FLASH STUDY

A. Comply with IEEE 242 for calculating short-circuit currents and determining coordination time intervals.

B. Comply with IEEE 399 for general study procedures.

C. Calculate short-circuit currents according to IEEE 551

D. Comply with NFPA 70E and its Annex D for hazard analysis study.

E. Calculate maximum and minimum contributions of fault-current size.

1. The minimum calculation shall assume that the utility contribution is at a minimum and shall assume no motor load.

2. The maximum calculation shall assume a maximum contribution from the utility and shall assume motors to be operating under full-load conditions.

F. Calculate the arc-flash protection boundary and incident energy at locations in the electrical distribution system where personnel could perform work on energized parts.

G. Include medium- and low-voltage equipment locations, except equipment rated 240-V ac or less fed from transformers less than 125 kVA.

H. Safe working distances shall be specified for calculated fault locations based on the calculated arc-flash boundary, considering incident energy of 1.2 cal/sq.cm.

I. Incident energy calculations shall consider the accumulation of energy over time when performing arc-flash calculations on buses with multiple sources. Iterative calculations shall take into account the changing current contributions, as the sources are interrupted or decremented with time. Fault contribution from motors and generators shall be decremented as follows:

1. Fault contribution from induction motors should not be considered beyond three to five cycles.

2. Fault contribution from synchronous motors and generators should be decayed to match the actual decrement of each as closely as possible (e.g., contributions from permanent magnet generators will typically decay from 10 per unit to three per unit after 10 cycles).

J. Arc-flash computation shall include both line and load side of a circuit breaker as follows:

1. When the circuit breaker is in a separate enclosure.

2. When the line terminals of the circuit breaker are separate from the work location.

K. Base arc-flash calculations on actual overcurrent protective device clearing time. Cap maximum clearing time at two seconds based on IEEE 1584, Section B.1.2.

L. The study shall be based on the device characteristics supplied by device manufacturer.

M. The extent of the electrical power system to be studied is indicated on Drawings.

N. Begin coordination, short-circuit current, arc-flash hazard analysis at the service, extending down to the system overcurrent protective devices as follows:

1. To normal system low-voltage load buses where fault current is 10 kA or less.

2. Exclude equipment rated 240-V ac or less when supplied by a single transformer rated less than 125 kVA.

O. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Study all cases of system-switching configurations and alternate operations that could result in maximum fault conditions.

P. Transformer Primary Overcurrent Protective Devices:

1. Device shall not operate in response to the following:

a) Inrush current when first energized.

b) Self-cooled, full-load current or forced-air-cooled, full-load current, whichever is specified for that transformer.

c) Permissible transformer overloads according to IEEE C57.96 if required by unusual loading or emergency conditions.

2. Device settings shall protect transformers according to IEEE C57.12.00, for fault currents.

Q. Motor Protection:

1. Select protection for low-voltage motors according to IEEE 242 and NFPA 70.

2. Select protection for motors served at voltages more than 600 V according to IEEE 620.

R. Conductor Protection: Protect cables against damage from fault currents according to ICEA P-32-382, ICEA P-45-482, and protection recommendations in IEEE 242. Demonstrate that equipment withstands the maximum short-circuit current for a time equivalent to the tripping time of the primary relay protection or total clearing time of the fuse. To determine temperatures that damage insulation, use curves from cable manufacturers or from listed standards indicating conductor size and short-circuit current.

S. Generator Protection: Select protection according to manufacturer's written recommendations and to IEEE 242.

T. The calculations shall include the ac fault-current decay from induction motors, synchronous motors, and asynchronous generators and shall apply to low- and medium-voltage, three-phase ac systems. The calculations shall also account for the fault-current dc decrement, to address the asymmetrical requirements of the interrupting equipment.

1. For grounded systems, provide a bolted line-to-ground fault-current study for areas as defined for the three-phase bolted fault short-circuit study.

U. Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault and single line-to-ground fault at each of the following:

1. Electric utility's supply termination point.

2. Motor-controllers.

3. Control panels.

4. Standby generators and automatic transfer switches.

5. Distribution panelboards.

6. Disconnect switches.

7. Branch circuit panelboards.

V. Protective Device Evaluation:

1. Evaluate equipment and protective devices and compare to short-circuit ratings.

2. Adequacy of transfer switches, motor-controllers, distribution panelboard, branch circuit panelboard bus bars to withstand short-circuit stresses.

3. Any application of series-rated devices shall be recertified, complying with requirements in NFPA 70.

3.03 POWER SYSTEM DATA

A. Obtain all data necessary for the conduct of the overcurrent protective device study.

1. Verify completeness of data supplied in the one-line diagram on Drawings. Call discrepancies to the attention of Architect, COR, and Engineer Of Record.

2. For new equipment, use characteristics submitted under the provisions of action submittals and information submittals for this Project.

3. For existing equipment, whether or not relocated obtain required electrical distribution system data by field investigation and surveys, conducted by qualified technicians and engineers. The qualifications of technicians and engineers shall be qualified as defined by NFPA 70E.

B. Gather and tabulate the following input data to support coordination short-circuit, arc-flash, study. The list below is a guide. Comply with recommendations in IEEE 551 IEEE 1584 and NFPA 70E for the amount of detail required to be acquired in the field. Field data gathering shall be under the direct supervision and control of the engineer in charge of performing the study, and shall be by the engineer or its representative who holds NETA ETT Level III certification or NICET Electrical Power Testing Level III certification.

1. Product Data for overcurrent protective devices specified in other Sections and involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.

2. Electrical power utility impedance at the service.

3. Power sources and ties.

4. Short-circuit current at each system bus, three phase and line-to-ground.

5. Full-load current of all loads.

6. Voltage level at each bus.

7. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip and available range of settings, SCCR, current rating, and breaker settings.

8. Generator short-circuit current contribution data, including short-circuit reactance, rated kVA, rated voltage, and X/R ratio.

9. For relays, provide manufacturer and model designation, current transformer ratios, potential transformer ratios, and relay settings.

10. Maximum demands from service meters.

11. Motor horsepower and NEMA MG 1 code letter designation.

12. Low-voltage cable sizes, lengths, number, conductor material, and conduit material (magnetic or nonmagnetic).

13. Data sheets to supplement electrical distribution system diagram, cross-referenced with tag numbers on diagram, showing the following:

    a) Special load considerations, including starting inrush currents and frequent starting and stopping.

    b) Motor full-load current, locked rotor current, service factor, starting time, type of start, and thermal-damage curve.

    c) Generator thermal-damage curve.

    d) Ratings, types, and settings of utility company's overcurrent protective devices.

    e) Special overcurrent protective device settings or types stipulated by utility company.

    f) Time-current-characteristic curves of devices indicated to be coordinated.

    g) Manufacturer, frame size, interrupting rating in amperes rms symmetrical, ampere or current sensor rating, long-time adjustment range, short-time adjustment range, and instantaneous adjustment range for circuit breakers.

h) Manufacturer and type, ampere-tap adjustment range, time-delay adjustment range, instantaneous attachment adjustment range, and current transformer ratio for overcurrent relays.

i) Transfer Switch, motor-controllers, distribution panelboard and branch circuit panelboard and SCCR in amperes rms symmetrical.

14. Identify series-rated interrupting devices for a condition where the available fault current is greater than the interrupting rating of the downstream equipment. Obtain device data details to allow verification that series application of these devices complies with NFPA 70 and UL 489 requirements.

3.04 LABELING

A. Apply one arc-flash label for 600-V ac, 480-V ac, and applicable 208-V ac panelboards and disconnects and for each of the following locations:

1. Motor-controllers.

2. Control panel.

3. Transfer Switch.

3.05 APPLICATION OF WARNING LABELS

a) Install the arc-fault warning labels under the direct supervision and control of the Arc-Flash Study Specialist who has completed an 8-Hour instructor led Electrical Safety Training Course which includes NFPA 70E material including the selection of personal protective equipment.

3.06 FIELD ADJUSTING

A. Adjust relay and protective device settings according to the recommended settings provided by the coordination study. Field adjustments shall be completed by the engineering service division of the equipment manufacturer under the Startup and Acceptance Testing contract portion.

B. Make minor modifications to equipment as required to accomplish compliance with short-circuit and protective device coordination studies.

C. Testing and adjusting shall be by a full-time employee of the Field Adjusting Agency, who holds NETA ETT Level III certification or NICET Electrical Power Testing Level III certification.

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters. Perform NETA tests and inspections for all adjustable overcurrent protective devices.

3.07 DEMONSTRATION

A. Engage the Coordination Study Specialist to train Owner's maintenance personnel in the following:

1. Acquaint personnel in the fundamentals of operating the power system in normal and emergency modes.

2. Hand-out and explain the objectives of the coordination short-circuit, arc-flash study, study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpreting the time-current coordination curves.

3. Adjust, operate, and maintain overcurrent protective device settings.

B. Engage the Arc-Flash Study Specialist to train Owner's maintenance personnel in the potential arc-flash hazards associated with working on energized equipment and the significance of the arc-flash warning labels. (minimum of 4 hours)

END OF SECTION

SECTION 26 09 43
DIGITAL NETWORK LIGHTING CONTROLS

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes the following lighting control devices:
   1. Lighting load controllers.
   2. Daylight harvesting dimming controls.
   3. Indoor occupancy and vacancy sensors.
   4. Wall switches.
   5. Network Interface and/or control components.

1.02 DEFINITIONS

A. LED: Light-emitting diode.

B. Zone: A fixture or group of fixtures controlled simultaneously as a single entity. Also known as a "channel."

1.03 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.04 SUBMITTALS

A. Product Data: For each type of product indicated.
   1. Shop Drawings: Detailed assemblies of standard components, custom assembled for specific application on Project.
      a. Include composite wiring and/or schematic diagram of each control circuit as proposed to be installed.
      b. Lighting plan showing location of all devices, including at minimum sensors with orientation and coverage, load controllers, and switches/dimmers.
   2. Include room/area details including products and sequence of operation for each room or area. Illustrate typical acceptable room/area connection topologies.
   3. Include network riser diagram including floor and building level details. Include network cable specification. Illustrate points of connection to integrated systems. Coordinate integration with mechanical and/or other trades.
   4. Include example contractor startup/commissioning worksheet.

B. Field quality-control reports.

C. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals.

   1. In addition to items specified in Division 1 Section “Operation and Maintenance Data,” include the following:
      a. Sequence of Operation, identifying operation for each room or space.
      b. Adjustments of scene preset controls.
      c. As-built drawings identifying load controllers, sensors, wall switches, relay panels, network interface and/or control components and all control zones.
         1) Drawings shall show load controller addresses, show connected luminaires, and luminaire groups.
         2) Additional copy of as-built drawing shall be located near the main system controller.

2. Operation of adjustable zone controls.

1.05 PROJECT CONDITIONS

A. Only install equipment after the following site conditions are maintained:
1. Ambient Temperature: 14 to 105 degrees F (-10 to 40 degrees C)
2. Relative Humidity: less than 90% non-condensing

B. Equipment shall not be subjected to dust, debris, moisture, or temperature and humidity conditions exceeding the requirements indicated above, at any point prior to installation.

C. Only properly rated equipment and enclosures, installed per the manufacturer's instructions, may be subjected to dust and moisture following installation.

1.06 WARRANTY

A. Manufacturer shall provide a 5 year limited warranty on products within this installation, except where otherwise noted, and consisting of a one for one device replacement.

1.07 COORDINATION

A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

B. Coordinate lighting control components to form an integrated interconnection of compatible components.

C. Coordinate lighting controls with connected monitoring and control devices and systems specified in other Sections.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or a comparable product by one of the following:
1. Touche Controls
2. Acuity Brands, Inc.
3. Lutron Electronics Co., Inc.
4. Hubbell Control Solutions

2.02 GENERAL SYSTEM REQUIREMENTS

A. Controllability:
1. Dimming control components shall be compatible with lighting fixtures, drivers, and transformers.

B. Description: Individually-addressable intelligent controls capable of digital communication between devices.

C. Operation: Change variable dimmer settings of indicated number of zones simultaneously from one preset scene to another when a push button is operated.
1. Each zone shall be configurable.
2. Memory: Retain preset scenes through power failures

D. System Architecture:
1. Based on three components:
a. Intelligent lighting control devices
b. Standalone lighting control zones
1) Each lighting control zone shall be capable of automatically configuring itself for default operation without any start-up labor required.

E. System must interface such that only CAT-6 cabling or higher is required to interconnect digital control components such as sensors and switches via RJ45 style connectors. Devices shall be connected in any order.

F. System shall use devices that route communication and distribute power for up to 8 directly connected lighting zones together for decreasing system wiring requirements.

G. System shall be capable of operating a lighting control zone according to several sequences of operation.

H. Wired Networked Control Zone Characteristics

1. Connections to devices within a wired networked lighting control zone and to backbone components shall be with a single type of low voltage network cable, which shall be compliant with CAT6 specifications or higher. To prevent wiring errors and provide cost savings, the use of mixed types of low voltage network cables shall not be permitted.
2. Devices in an area shall be connected via a "daisy-chain" topology; requiring all individual networked devices to be connected back to a central component in a "hub-and-spoke" topology shall not be permitted, so as to reduce the total amount of network cable required for each control zone.
3. System shall provide the option of having pre-terminated plenum rated low voltage network cabling supplied with hardware so as to reduce the opportunity for improper wiring and communication errors during system installation.
4. Following proper installation and provision of power, all networked devices connected together with low voltage network cable shall automatically form a functional lighting control zone without requiring any type of programming, regardless of the programming mechanism (e.g., software application, handheld remote, pushbutton). The "out of box" default sequence of operation is intended to provide typical sequence of operation so as to minimize the system startup and programming requirements and to also have functional lighting control operation prior to system startup and programming.
5. All networked devices shall have the ability to detect improper communication wiring and blink its LED in a specific cadence as to alert installation/startup personnel.

I. Supported Sequence of Operations

1. Characteristics and performance requirements herein shall be supported by the networked lighting control system.
2. Control Zones
   a. Networked luminaires and intelligent lighting control devices installed in an area (also referred to as a group of devices) shall be capable of transmitting and tracking occupancy sensor, photocell sensor, and manual switch information within at least 48 unique control zones to support different and reconfigurable sequences of operation within the area. These shall also be referred to as local control zones.
   b. Networked luminaires and intelligent lighting control devices located in different areas shall be able to transmit and track information within at least 128 system-wide control zones to support required sequences of operation that may span across multiple areas. Occupancy and photocell commands shall be available across a single controller, and switch commands shall be available across single or multiple controllers. These shall also be referred to as global control zones.
3. System shall support automated demand response capabilities with automatic reduction of light level to at least three levels of demand response.
4. Third Party Interface shall allow non-system devices and controllers to digitally interface with the system zones to control On/Off, Raise/Lower/Scene control.

2.03 LIGHTING LOAD CONTROLLERS

A. Functions and Features:

1. Controllers (also known as power packs or relay packs) shall incorporate one Class 1 relay, a 0-10 VDC dimming output, and contribute low voltage power to the rest of the system.
2. Secondary Packs shall incorporate the relay and 0-10 VDC or line voltage dimming output, but shall not be required to contribute system power. Power Supplies shall provide system power only, but are not required to switch line voltage circuit.
3. Auxiliary Relay Packs shall switch low voltage circuits only.
4. Controllers shall accept 120 or 277 VAC, be plenum rated, and provide Class 2 power to the system.
5. Communication shall be delivered to each device via standard low voltage network cabling with RJ-45 connectors. Secondary packs shall receive low voltage power via standard low voltage network cable.
6. Power Pack programming parameters shall be available and configurable remotely from the software and locally via the device push-button.
7. All devices shall have at least two RJ-45 ports.
8. Every controller parameter shall be available and configurable remotely from the software if interconnected to the System Controller and locally via the device push-button or a programming remote control.
9. Controller shall securely mount to junction location through a threaded ½ inch chase nipple or manufacturer recommended means of connection. Or, controller shall be capable of being secured within a luminaire ballast channel. Plastic clips into junction box shall not be accepted. All Class 1 wiring shall pass through chase nipple, or manufacturer recommended means of connection, into adjacent junction box without any exposure of wire leads. Note: UL Listing under Energy Management or Industrial Control Equipment automatically meets this requirement, whereas Appliance Control Listing does not meet this safety requirement.
10. When required by local code, controller must install inside standard electrical enclosure and provide UL recognized support to junction box. All Class 1 wiring is to pass through chase nipple manufacturer recommended means of connection into adjacent junction box without any exposure of wire leads.
11. Controllers (secondary) shall be available that provide up to 16 Amp switching of all lighting load types.
12. Controllers shall be available that provide up to 5 Amps switching of all lighting load types as well as 0-10 VDC dimming for LED drivers.
13. Specific secondary controllers shall be available that provide up to 5 Amps of switching and can dim 120 VAC incandescent lighting loads or 120/277 VAC line voltage dimmable fluorescent ballasts (2-wire and 3-wire versions).
14. Specific secondary controllers shall be available that provide up to 4 Amps of switching and can dim 120 VAC electronic low voltage transformers.

2.04 DAYLIGHT HARVESTING DIMMING CONTROLS

A. Functions and Features:

1. Photocell shall provide for an on/off set-point, and a deadband to prevent the artificial light from cycling. Delay shall be incorporated into the photocell to prevent rapid response to passing clouds.
2. Photocell and dimming sensor's set-point and deadband shall be automatically calibrated through the sensor's microprocessor by initiating an "Automatic Set-point Programming" procedure. Min and max dim settings as well as set-point may be manually entered.

3. Deadband setting shall be verified and modified by the sensor automatically every time the lights cycle to accommodate physical changes in the space (i.e., furniture layouts, lamp depreciation, or lamp outages).
4. Photocell and dimming sensors shall be equipped with an automatic override for 100 hour burn-in of fluorescent lamps. This feature must be available at any time for lamp replacements. (Note: This function should be performed prior to any dimming of the lamps including the "auto set-point" setting.)
5. Combination units that have all features of on/off photocell and dimming sensors shall be acceptable.
6. A dual zone option shall be acceptable for automatic dimming control photocell and combination units. The second zone shall be capable of being controlled as an "offset" from the primary zone.

2.05 INDOOR OCCUPANCY AND VACANCY SENSORS

A. Functions and Features:
1. Occupancy sensors shall sense the presence of human activity within the desired space and fully control the on/off function of the lights.
2. Unless otherwise indicated, turn lights on when covered area is occupied and off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
3. Sensors shall utilize dual technology to detect occupancy by using a combination of PIR and ultrasonic detection methods in area of coverage. Particular technology or combination of technologies that controls on and off functions shall be selectable in the field by operating controls on unit.
4. PIR/Microphonics (also known as Passive Dual Technology or PDT) to detect occupancy by looking for occupant motion and listening for sounds indicating occupants shall also be acceptable.
5. Sensors shall be available with zero or one integrated dry contact switching relays, capable of switching 1 amp at 24 VAC/VDC (resistive only).
6. Sensors shall be available with one or two occupancy "poles", each of which provides a programmable time delay.
7. Communication and Class 2 low voltage power shall be delivered to each device via standard CAT-6 low voltage cabling with RJ-45 connectors.
8. All sensors shall have two RJ-45 ports or be capable of utilizing a splitter.
9. All sensors shall have the ability to detect when it is not receiving valid communication (via CAT-6 connections) and blink its LED in a pattern to visually indicate of a potential wiring issue.
10. Every sensor parameter shall be available and configurable remotely from the software when interconnected to the System Controller and locally via the device push-button or a programming remote control.
11. Sensors shall be able to function together with other sensors in order to provide expanded coverage areas by simply daisy-chain wiring together the units with CAT-6 cabling.
12. Switch-box occupancy sensors
    a. Sensors shall recess into single-gang switch box and fit a standard GFI opening.
    b. Sensors must meet NEC grounding requirements by providing a dedicated ground connection and grounding to mounting strap. Line and load wire connections shall be interchangeable. Sensor shall not allow current to pass to the load when sensor is in the unoccupied (Off) condition.
    c. Sensors shall have optional features for photocell/daylight override, and low temperature/high humidity operation.

d. Sensors shall be available with optional raise/lower dimming adjustment controls.

B. Color: White, unless otherwise indicated by Architect.

C. Mounting: Ceiling or wall-mounted as indicated on plans.

1. System shall have ceiling, fixture, recessed & corner mounted sensors available, with multiple lens options available customized for specific applications.

2.06 WALL SWITCHES

A. Wired Networked Wall Switches, Dimmers, Scene Controllers

1. Functions and Features:
   a. Devices shall recess into single-gang switch box and fit a standard GFI opening.
   b. Communication and low voltage power shall be delivered to each device via standard CAT-6 low voltage cabling with RJ-45 connectors.
   c. All devices shall have two RJ-45 ports.
   d. All switches shall have the ability to detect when it is not receiving valid communication and blink its LED in a pattern to visually indicate a potential wiring issue.
   e. All devices shall provide toggle switch control or dimming control as indicated on plans.
   f. Devices with mechanical push-buttons shall provide tactile and LED user feedback.
   g. Devices with mechanical push-buttons shall be made available with custom button labeling.
   h. Devices with a single “on” button shall be capable of selecting all possible lighting combinations for a bi-level lighting zone such that the user confusion as to which of two buttons (as is present in multi-button scenarios) controls which load is eliminated.
2. Wall Plates: Use multigang plates if more than one switch is indicated at a location.
3. Color: White unless otherwise indicated by Architect; red when associated with emergency circuits.
4. Legend: Engraved or permanently silk-screened on button when available or wall plate where indicated. Use designations as coordinated with Owner, Architect, and Engineer.

2.07 THIRD PARTY INTERFACE

A. Functions and Features:

1. Inline wired device to digitally interface network system zones with non-system devices.
2. The interface shall allow non-system touch panel to individually control all local switch channels in the system zone, on/off, Raise/Lower/Scene control.
3. Provide relay and dimming levels to touch panel.
4. Remotely configurable and upgradable.
5. All supporting devices shall be provided with the interface system.

2.08 CONDUCTORS AND CABLES

A. Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 14 AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

D. Unshielded, Twisted-Pair Data Cable: Category 6, or proprietary cabling as recommended or required by manufacturer. Comply with requirements in Division 27 Section "Communications Horizontal Cabling."

PART 3 EXECUTION

3.01 WIRING INSTALLATION

A. Comply with NECA 1.

B. Wiring Method

1. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."
2. Install unshielded, twisted-pair cable for control and signal transmission conductors.
3. Minimum conduit size shall be 1/2 inch.
4. Install system in accordance with the approved system shop drawings and manufacturer's instructions.

C. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.

D. Size conductors according to lighting control device manufacturer's written instructions unless otherwise indicated.

E. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

1. All Class II cabling shall enter enclosures from within low-voltage wiring areas and shall remain within those areas. No Class I conductors shall enter a low-voltage area.

F. Run separate neutrals for any phase dimmed branch load circuit. Different types of dimming loads shall have separate neutral.

G. Verify all non-panel-based lighting loads to be free from short circuits prior to connection to room controllers.

3.02 INSTALLATION

A. Install controllers for each zone.

1. Control devices (controllers, bridges, power packs, relays, etc) shall be mounted above accessible ceiling unless otherwise noted. All devices shall be labelled as “LIGHTING CONTROL DEVICE” and with the room and/or zones controlled.

B. Install all room/area devices using manufacturer's factory-tested Cat 6 cable with pre-terminated RJ-45 connectors.

C. Test all devices to ensure proper communication.

D. Calibrate all sensor time delays and sensitivity to guarantee proper detection of occupants and energy savings. Adjust time delay so that controlled area remains lighted while occupied.

E. Provide written or computer-generated documentation on the configuration of the system including room by room description including:

1. Sensor parameters, time delays, sensitivities, and daylighting setpoints.
2. Sequence of operation, (e.g. manual ON, Auto OFF. etc.)
3. Load Parameters (e.g. blink warning, etc.)

F. Post start-up tuning - Adjust sensor time delays and sensitivities to meet the Owner's requirements 30 days from beneficial occupancy. Provide a detailed report to the Architect / Owner of post start-up activity.

3.03 DOCUMENTATION

A. Document installed location of all networked devices, including networked luminaires. This includes responsibility to provide as-built plan drawing showing device address barcodes corresponding to locations of installed equipment.

3.04 IDENTIFICATION

A. Comply with requirements in Division 26 Section "Identification for Electrical Systems" for identifying components and power and control wiring.

1. All line voltage connections shall be tagged to indicate circuit and switched legs.

B. Label each dimmer module with a unique designation.

C. Label each scene control button with approved scene description as coordinated with Owner, Architect, and Engineer.

3.05 SYSTEM STARTUP

A. Upon completion of installation by the installer, including completion of all required verification and documentation required by the manufacturer, the system shall be started up and programmed by an authorized representative of the manufacturer.

1. Low voltage network cable testing shall be performed prior to system startup.

B. System start-up and programming shall include:

1. Verifying operational communication to all system devices.
2. Programming the network devices into functional control zones to meet the required sequence of operation.
3. Programming and verifying all sequence of operations.

C. Initial start-up and programming is to occur on-site. Additional programming may occur on-site or remotely over the Internet as necessary.

3.06 FIELD QUALITY CONTROL

A. Manufacturer’s Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

B. Perform the following tests and inspections:

1. Continuity tests of circuits.
2. Operational Test: Set and operate controls to demonstrate their functions and capabilities in a methodical sequence that cues and reproduces actual operating functions.
   a. Include testing of dimming control equipment under conditions that simulate actual operational conditions. Record control settings, operations, cues, and functional observations.

C. Remove and replace malfunctioning dimming control components and retest as specified above.

D. Test Labeling: After satisfactory completion of tests and inspections, apply a label to tested components indicating test results, date, and responsible agency and representative.

E. Reports: Written reports of tests and observations. Record defective materials and workmanship and unsatisfactory test results. Record repairs and adjustments.

3.07 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain network lighting controls.

END OF SECTION

SECTION 26 13 01

ENCLOSED SWITCHES

PART 1 GENERAL

1.01 SCOPE

A. Fusible switches

B. Non-fusible switches

C. Fuses

1.02 REFERENCES

A. NEMA KS 1 - Enclosed Switches.

B. NFPA 70 - National Electrical Code.

1.03 SUBMITTALS

A. Product Data:

B. Provide switch ratings and enclosure dimensions.

PART 2 PRODUCTS

2.01 MANUFACTURES

A. Cutler-Hammer

B. General Electric

C. Siemens

D. Square D

E. Government approved

2.02 ENCLOSED SWITCH

A. Fusible Switch Assemblies: NEMA KS 1, Heavy Duty load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse clips: Designed to accommodate Class J fuses.

B. Non-fusible Switch Assemblies: NEMA KS 1, Heavy Duty load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in On position. Handle lockable in the OFF position.

PART 3 EXECUTION

3.01 INSTALLATION

A. Furnish and install disconnect switches as indicated on Electrical Drawings.

B. Install fuses in fusible disconnect switches.

END OF SECTION

SECTION 26 24 16

PANELBOARDS

PART 1 GENERAL

1.01 SCOPE

A. Panelboards

B. Circuit breakers

1.02 REFERENCES

A. NECA - Standard of Installation (published by the National Electrical Contractors Association).

B. NEMA - AB1Molded Case Circuit Breakers.

C. NEMA ICS 2 - Industrial Control Devices, Controllers and Assemblies.

D. NEMA KS1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).

E. NEMA PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panel Boards Rated 600 Volts or Less.

F. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment (published by the Internationals Electrical Testing Association).

G. NFPA 70 - National Electrical Code, current edition.

1.03 SUBMITTALS

A. Product Data:

B. Panelboard.

C. Circuit Breakers.

PART 2 PRODUCTS

2.01 PANELBOARDS

A. Panel board

1. Description: NEMA 1 Panel.

2. Electrical Ampere as indicated on drawings.

3. Number of Spaces: as indicated on drawings.

4. Rated for service.

5. Minimum Short Circuit Rating as required to withstand fault current levels supplied by Xcel Energy and indicated in Overcurrent Protective Device Coordination Study.

6. Manufacturer:

7. Square D.

8. Approved equal.

2.02 CIRCUIT BREAKERS

A. Circuit breakers: bolt on type circuit breakers in panel boards.

PART 3 EXECUTION

3.01 INSTALLATION

A. Furnish and install all panels as indicated.

B. Provide a typed schedule for each panel identifying each circuit.

C. Install panel in accordance with NEMA PB 1.1 and the NECA "Standard of Installation".

D. Install panelboards plumb. Height: 6 feet to top of panelboard; install panelboards taller than 6 feet with bottom no more than 4 inches above floor.

E. Provide filler plates for unused spaces in panelboards. Provide typed circuit directory for each branch circuit panelboard. Revise directory to reflect circuiting changes required to balance phase loads.

F. Ground and bond panelboard enclosures per National Electrical Code.

G. Adjusting. Measure steady state load currents at each panelboard feeder; rearrange circuits in the panelboard to balance the phase loads to within 20 percent of each other. Maintain proper phasing for multi-wire branch circuits.

H. Label panelboard per section 26 05 53 Identification for Electrical Systems.

END OF SECTION

SECTION 26 27 26

WIRING DEVICES

PART 1 GENERAL

1.01 SCOPE

A. Wall switches.

B. Receptacles.

C. Device plates and decorative box covers.

1.02 REFERENCES

A. NECA Standard of Installation.

B. NEMA WD 1 General Requirements for Wiring Devices.

C. NEMA WD 6 Wiring Device -- Dimensional Requirements.

D. NFPA 70 National Electrical Code.

1.03 SUBMITTALS

A. Product Data

1. Recessed communication and power boxes with cover.

PART 2 PRODUCTS

2.01 WALL SWITCHES

A. Description: NEMA WD 1, Heavy-Duty, AC only general-use snap switch.

1. Body and Handle: Ivory plastic with toggle handle.

2. Ratings:

a. Voltage: 120 volts, AC.

b. Current: 20 amperes.

2.02 SWITCH-BOX MOUNTED OCCUPANCY SENSORS

A. Manufacturers:

1. Acuity Brands.

2. Eaton.

3. Hubbell Building Automation, Inc.

4. Leviton Manufacturing Co., Inc.

5. Hubbell Wiring Devices.

6. WattStopper Legrand.

B. Description: Occupancy sensor with integral power-switching contacts rated not less than 800-VA at 120 V, and suitable for light fixture control, or 1/6-hp motors; and rated for 1000 W at 277-V ac, suitable for light fixture control, or 1/3-hp motors, minimum.

1. Retain applicable features below; verify availability.

2. Include ground wire.

3. Standard Range: 180-degree field of view, field adjustable from 180 to 40 degrees; with a minimum coverage area of 1000 sq ft

4. Sensing Technology: Dual Technology

5. Ambient-Light Override: Concealed, field-adjustable, light-level sensor from 10 to 150 fc. The switch prevents the lights from turning on when the light level is higher than the set point of the sensor.

6. Concealed, field-adjustable, "off" time-delay selector at up to 30 minutes.

7. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and helps eliminate false "off" switching.

8. Color: White unless specified by Architect.

9. Unless otherwise indicated, or if it is the only means of control in the area, the occupancy sensor shall function as a vacancy sensor turning luminaires off when space is unoccupied.

2.03 RECEPTACLES

A. Description: NEMA WD 1, Commercial grade general use receptacle.

B. Device Body: Ivory plastic.

C. Configuration: NEMA WD 6, Type.

D. Convenience Receptacle: Type S-20 Amp.

E. GFCI Receptacle: Convenience receptacle with integral ground fault circuit interrupter to meet regulatory requirements.

F. Exterior receptacles shall be Weather Resistant.

2.04 WALL PLATES

A. Decorative Cover Plate: Ivory, smooth plastic.

B. Weatherproof Cover Plate: While in Use type, gasketed cast metal with hinged gasketed device cover.

2.05 FLOOR SERVICE FITTINGS

A. Products:

1. Hubbell

2. Wiremold

3. Leviton

B. Service fittings in "Type" Paragraph below are available for voice and data communication cabling as well as for power.

C. Type: Modular, recessed, dual-service units suitable for wiring method used.

D. Compartments: Barrier separates power from voice and data communication cabling.

E. Service Plate: Round or square, die-cast aluminum with satin finish unless indicated otherwise.

F. Power Receptacle: Two duplex NEMA WD 6 Configuration 5-20R, gray finish, unless otherwise indicated.

G. Data Communication Outlet: capacity for four modular, keyed, color-coded, RJ-45 jacks for twisted pair cable.

2.06 QUALIFICATIONS

A. Manufacturer(s) for all wiring device equipment must be a company (or companies) specializing in manufacturing the products specified in this section with minimum three years documented experience.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that outlet boxes are installed at proper height.

B. Verify that wall openings are neatly cut and will be completely covered by wall plates.

C. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

3.02 PREPARATION

A. Provide extension rings if needed to bring outlet boxes flush with finished surface.

B. Clean debris from inside of each outlet boxes.

3.03 INSTALLATION

A. Install in accordance with NECA "Standard of Installation."

B. Install devices plumb and level.

C. Install switches with OFF position down.

D. Install receptacles with grounding pole on the bottom.

E. Connect wiring device grounding terminal to branch circuit equipment grounding conductor.

F. Install decorative plates on switch, receptacle, and blank outlets in finished areas.

G. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.

H. Install protective rings on active flush cover service fittings.

I. Coordinate locations of outlet boxes provided under Section 26 05 34.

J. Install wall switch 48 inches above finished floor.

K. Install convenience receptacle 16 inches above finished floor.

L. Field quality control

1. Inspect each wiring device for defects.

2. Operate each wall switch with circuit energized and verify proper operation.

3. Verify that each occupancy sensor functions properly.

4. Verify that each receptacle device is energized.

5. Test each receptacle device for proper polarity.

6. Test each GFCI receptacle device for proper operation.

M. Adjust devices and wall plates to be flush and level.

N. Clean exposed surfaces to remove splatters and restore finish.

END OF SECTION

SECTION 26 29 13
MANUAL AND MAGNETIC MOTOR CONTROLLERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Manual motor controllers.
2. Combination full-voltage magnetic motor controllers.
3. Enclosures.
4. Accessories.
5. Identification.

1.2 DEFINITIONS

A. CPT: Control power transformer.

B. MCP: Motor circuit protector.

C. NC: Normally closed.

D. NRTL: Nationally Recognized Testing Laboratory.

E. OCPD: Overcurrent protective device.

F. SCCR: Short-circuit current rating.

G. SCPD: Short-circuit protective device.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For each type of magnetic controller.

1. Include plans, elevations, sections, and mounting details.
2. Indicate dimensions, weights, required clearances, and location and size of each field connection.
3. Wire Termination Diagrams and Schedules: Include diagrams for signal, and control wiring. Identify terminals and wiring designations and color-codes to facilitate installation, operation, and maintenance. Indicate recommended types, wire sizes, and circuiting arrangements for field-installed wiring, and show circuit protection features. Differentiate between manufacturer-installed and field-installed wiring.
4. Include features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

C. Product Schedule: List the following for each enclosed controller:

1. Each installed magnetic controller type.

2. NRTL listing.
3. Factory-installed accessories.
4. Nameplate legends.
5. SCCR of integrated unit.
6. For each combination magnetic controller include features, characteristics, ratings, and factory setting of the SCPD and OCPD.
    a) Listing document proving Type 2 coordination.
7. For each series-rated combination state the listed integrated short-circuit current (withstand) rating of SCPD and OCPDs by an NRTL acceptable to authorities having jurisdiction.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For magnetic controllers to include in operation and maintenance manuals.

1. In addition to items specified in Operation and Maintenance Data, include the following:
    a) Routine maintenance requirements for magnetic controllers and installed components.
    b) Manufacturer's written instructions for testing and adjusting circuit breaker and MCP trip settings.
    c) Manufacturer's written instructions for setting field-adjustable overload relays.
    d) Load-Current and Overload-Relay Heater List: Compile after motors have been installed, and arrange to demonstrate that selection of heaters suits actual motor nameplate full-load currents.
    e) Load-Current and List of Settings of Adjustable Overload Relays: Compile after motors have been installed, and arrange to demonstrate that switch settings for motor-running overload protection suit actual motors to be protected.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses for Fused Switches: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
2. Control Power Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than two of each size and type.
3. Indicating Lights: Two of each type and color installed.
4. Auxiliary Contacts: Furnish one spare for each size and type of magnetic controller installed.
5. Power Contacts: Furnish three spares for each size and type of magnetic contactor installed.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store controllers indoors in clean, dry space with uniform temperature to prevent condensation. Protect controllers from exposure to dirt, fumes, water, corrosive substances, and physical damage.

1.7 FIELD CONDITIONS

A. Ambient Environment Ratings: Rate equipment for continuous operation under the following conditions unless otherwise indicated:

1. Ambient Temperature: Not less than 23 deg F and not exceeding 104 deg F.
2. Altitude: Not exceeding 6600 feet for electromagnetic and manual devices.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

B. UL Compliance: Fabricate and label magnetic motor controllers to comply with UL 508 and UL 60947-4-1.

C. NEMA Compliance: Fabricate motor controllers to comply with ICS 2.

2.2 MANUFACTURERS

1. Subject to compliance with requirements, provide products by one of the following:

a) Eaton
b) ABB
c) Rockwell Automation, Inc.
d) SIEMENS Industry, Inc. Energy Management Division
e) Square D; by Schneider Electric
f) Government approved

2.3 MANUAL MOTOR CONTROLLERS

A. Fractional Horsepower Manual Controllers (FHPMC): "Quick-make, quick-break" toggle or push-button action; marked to show whether unit is off, on, or tripped.

1. Configuration: as required by motor.
2. Overload Relays: Inverse-time-current characteristics; NEMA ICS 2, Class 10 tripping characteristics; heaters matched to nameplate full-load current of actual protected motor; external reset push button melting alloy type.
3. Pilot Light: Red.

2.4 COMBINATION FULL-VOLTAGE MAGNETIC MOTOR CONTROLLER

A. Description: Factory-assembled, combination full-voltage magnetic motor controller consisting of the controller described in this article, indicated disconnecting means, SCPD and OCPD, in a single enclosure.

B. Standard: Comply with NEMA ICS 2, general purpose, Class A.

C. Configuration: as required by motor.

D. Contactor Coils: Pressure-encapsulated type with coil transient suppressors when indicated.

1. Operating Voltage: Manufacturer's standard, unless indicated.

E. Control Power:

1. For on-board control power, obtain from line circuit or from integral CPT. The CPT shall have capacity to operate integral devices and remotely located pilot, indicating, and control devices.

F. Overload Relays:

1. Solid-State Overload Relay:

   a) Switch or dial selectable for motor-running overload protection.
   b) Sensors in each phase.

   c) Class 10/20 selectable tripping characteristic selected to protect motor against voltage and current unbalance and single phasing.

G. Class II ground-fault protection shall comply with UL 1053 to interrupt low-level ground faults. The ground-fault detection system shall include circuitry that will prevent the motor controller from tripping when the fault current exceeds the interrupting capacity of the controller. Equip with start and run delays to prevent nuisance trip on starting, and a trip indicator.

H. Fusible Disconnecting Means:

   1. NEMA KS 1, heavy-duty, horsepower-rated, fusible switch with clips or bolt pads to accommodate indicated fuses.
   2. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.

2.5 ENCLOSURES

A. Comply with NEMA 250, type designations as indicated on Drawings or elsewhere in the specifications, complying with environmental conditions at installed location.

B. The construction of the enclosures shall comply with NEMA ICS 6.

C. Controllers in hazardous (classified) locations shall comply with UL 1203.

2.6 ACCESSORIES

A. General Requirements for Control Circuit and Pilot Devices: NEMA ICS 5; factory installed in controller enclosure cover unless otherwise indicated.

   1. Push Buttons, Pilot Lights, and Selector Switches: Standard-duty, except as needed to match enclosure type. Heavy-duty or oil-tight where indicated in the controller schedule.

      a) Push Buttons: As indicated in the controller schedule.
      b) Pilot Lights: As indicated in the controller schedule.

B. Motor protection relays shall be with solid-state sensing circuit and isolated output contacts for hardwired connections.

   1. Phase-failure.
   2. Phase-reversal, with bicolor LED to indicate normal and fault conditions. Automatic reset when phase reversal is corrected.
   3. Under/overvoltage, operate when the circuit voltage reaches a preset value, and drop out when the operating voltage drops to a level below the preset value. Include adjustable time-delay setting.

2.7 IDENTIFICATION

A. Controller Nameplates: Laminated acrylic or melamine plastic signs, as described in Section 26 05 53 "Identification for Electrical Systems," for each compartment, mounted with corrosion-resistant screws.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and space conditions for compliance with requirements for motor controllers, their relationship with the motors, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with NECA 1.

B. Wall-Mounted Controllers: Install magnetic controllers on walls with tops at uniform height indicated, and by bolting units to wall or mounting on lightweight structural-steel channels bolted to wall. For controllers not at walls, provide freestanding racks unless otherwise indicated.

C. Maintain minimum clearances and workspace at equipment according to manufacturer's written instructions and NFPA 70.

D. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.

E. Setting of Overload Relays: Select and set overloads on the basis of full-load current rating as shown on motor nameplate. Adjust setting value for special motors as required by NFPA 70 for motors that are high-torque, high-efficiency, and so on.

3.3 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Comply with the provisions of NFPA 70B, "Testing and Test Methods" Chapter.
2. Visual and Mechanical Inspection:

a) Compare equipment nameplate data with drawings and specifications.
b) Inspect physical and mechanical condition.
c) Inspect anchorage, alignment, and grounding.
d) Verify the unit is clean.
e) Inspect contactors:

1) Verify mechanical operation.
2) Verify contact gap, wipe, alignment, and pressure are according to manufacturer's published data.

f) Motor-Running Protection:

1) Verify overload element rating is correct for its application.

2) If motor-running protection is provided by fuses, verify correct fuse rating.

g) Inspect bolted electrical connections for high resistance using one of the two following methods:

1) Use a low-resistance ohmmeter. Compare bolted connection resistance values with values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.
2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method according to manufacturer's published data or NETA ATS Table 100.12. Bolt-torque levels shall be according to manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.12.

h) Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.

3. Electrical Tests:

a) Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with switch closed, and across each open pole. Insulation-resistance values shall be according to manufacturer's published data or NETA ATS Table 100.1. In the absence of manufacturer's published data, use Table 100.5. Values of insulation resistance less than those of this table or manufacturer's recommendations shall be investigated and corrected.
b) Measure fuse resistance. Investigate fuse-resistance values that deviate from each other by more than 15 percent.
c) Test motor protection devices according to manufacturer's published data.
d) Perform operational tests by initiating control devices.

C. Motor controller will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.5 SYSTEM FUNCTION TESTS

A. System function tests shall prove the correct interaction of sensing, processing, and action devices. Perform system function tests after field quality control tests have been completed and all components have passed specified tests.

1. Develop test parameters and perform tests for the purpose of evaluating performance of integral components and their functioning as a complete unit within design requirements and manufacturer's published data.
2. Verify the correct operation of interlock safety devices for fail-safe functions in addition to design function.
3. Verify the correct operation of sensing devices, alarms, and indicating devices.

B. Motor controller will be considered defective if it does not pass the system function tests and inspections.

C. Prepare test and inspection reports.

3.6 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain starters.

1. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, and maintaining equipment and schedules.
2. Schedule training with Owner, through Architect, with at least seven days' advance notice.

END OF SECTION

SECTION 26 51 00

INTERIOR LIGHTING

PART 1 GENERAL

A. SCOPE

1. Interior luminaires.
2. Exit lights.
3. Lamps.

1.02 REFERENCES

A. NFPA 70 - National Electrical Code, latest edition.

B. NFPA 101 - Life Safety Code.

C. NEMA WD 6 - Wiring Devices-Dimensional Requirements.

D. UL 924-90 UL - Standard for Safety Emergency Lighting and Power Equipment.

E. CEE Consortium for Energy Efficiency

1.03 SUBMITTALS

A. Product Data:

1. Ceiling Troffers.
2. Ceiling Wraparound.
3. Ceiling Troffers with Emergency Backup.
4. Wall Mount.
5. Downlights
6. Emergency/Exit Lights with Battery Backup.

B. System Documentation:

1. Warranty

a. Provide minimum of a five year warranty for emergency power battery and for fluorescent high bay ballasts.

PART 2 PRODUCTS

2.01 CEILING TROFFER

A. LED troffers shall have the following minimum initial lumen output: 2 feet x 2 feet – lumen as indicated on drawings, and 2 feet x 4 feet – lumen as indicated on drawings. LED power supply/driver efficiency at full load shall be ≥ 85%. LED parts (e.g. drivers, arrays) shall be easily accessible using a single tool and without uninstalling the luminaire. LED lighting shall have a nominal color temperature as specified by the site contact to match existing conditions or provide appropriate color for the activity (color temperatures from 3500 to 4100 kelvin are considered typical for office environments). Color Rendering Index shall be ≥80. Lumen maintenance shall be ≥77.4 at 36,000 hours.

B. Recessed, lay-in type for exposed grid suspension acoustical ceiling. Coordinate depth of fixture with ductwork.

2.02 DOWN LIGHTS

A. LED down lights shall have the following minimum initial lumen output: 6" diameter – lumen as indicated on drawings. LED power supply/driver efficiency at full load shall be ≥ 85%. LED parts (e.g. drivers, arrays) shall be easily accessible using a single tool and without uninstalling the luminaire. LED lighting shall have a nominal color temperature as specified by the site contact to match existing conditions or provide appropriate color for the activity (color temperatures from 3500 to 4100 kelvin are considered typical for office environments). Color Rendering Index shall be ≥80. Lumen maintenance shall be ≥77.4 at 36,000 hours.

B. Recessed, lay-in type for exposed grid suspension acoustical ceiling. Coordinate depth of fixture with ductwork.

2.03 CEILING STRIP LIGHTS

A. LED luminaires shall have the following minimum initial lumen output: 4 feet – lumen as indicated on drawings. LED power supply/driver efficiency at full load shall be ≥ 85%. LED parts (e.g. drivers, arrays) shall be easily accessible using a single tool and without uninstalling the luminaire. LED Lighting shall have a nominal color temperature as specified by the site contact to match existing conditions or provide appropriate color for the activity (color temperatures from 3500 to 4100 kelvin are considered typical for office environments). . Color Rendering Index shall be ≥80. Lumen maintenance shall be ≥77.4 at 36,000 hours.

B. Optics: Clear virgin acrylic prismatic diffuser with linear side prisms.

C. Surface mount.

2.04 TROFFERS WITH EMERGENCY BACKUP

A. LED luminaires shall have the following minimum initial lumen output: 2 feet x 2 feet – lumen as indicated on drawings,. LED power supply/driver efficiency at full load shall be ≥ 85%. LED parts (e.g. drivers, arrays) shall be easily accessible using a single tool and without uninstalling the luminaire. LED Lighting shall have a nominal color temperature as specified by the site contact to match existing conditions or provide appropriate color for the activity (color temperatures from 3500 to 4100 kelvin are considered typical for office environments). Color Rendering Index shall be ≥80. Lumen maintenance shall be ≥77.4 at 36,000 hours.

B. Emergency battery pack: Capable of operating fixture for 90 minutes. Shall mount inside low-profile fixture. Integral test switch/pilot light indicator to display charging, test activation, diagnostic status and provide manual activation and self diagnastic.

C. recessed.

D. LED luminaires shall have the following minimum requirements: light output ≥ 250 lumens, efficacy ≥ 45 lumens/watts, color temperature shall be 3500 to 4100 kelvin, Color Rendering Index shall be ≥80, lumen maintenance shall be ≥ 70 at 50,000 hours.

2.05 COMBINATION EXIT AND EMERGENCY LIGHT WITH BATTERY BACK-UP

A. LED exit sign with emergency lights, UL-Listed, to meet NFPA 101. Thermoplastic, white color. Single face exit sign with red LEDs.

B. Face: Exit sign with red LEDs 6" high with ¾" stroke.

C. Provide universal mounting accessory. Top, end or back mount, at location shown on drawing.

D. 120 -277 volt input, less than 7 watts energy consumption, rated LED life of 25 years or more.

E. Battery back-up shall be maintenance free NICAD battery to provide power to emergency lights for 90 minutes.

F. Warranty

1. Provide minimum of a five year warranty for emergency power battery.

2.06 EMERGENCY EXIT LIGHT WITH BATTERY BACK-UP

A. Description: LED exit sign, UL-Listed, to meet NFPA 101.

B. Construction: Impact resistant thermoplastic, UV stable, scratch resistant.

C. Face: Exit sign with red LEDs, 6 inches high with ¾" stoke.

D. Mounting: Universal mounting, and top, end or back mount, at location shown on drawing.

E. Electrical: 120-277 volt input, less than 7 watts energy consumption, rated LED life of 25 years or more.

F. Battery back-up with maintenance free lead- calcium battery to provide power to lamps for 90 minutes.

2.07 EMERGENCY LIGHT WITH BATTERY BACKUP

A. UL-Listed, to meet NFPA 101.

B. Housing: Thermoplastic, white color.

C. Face: Emergency light with two adjustable lamp heads.

D. Mounting: Wall or ceiling.

E. Electrical: 120-277 volt input, less than 7 watts energy consumption.

F. Battery back-up shall be maintenance free Ni-Cad battery to provide power to emergency lights for 90 minutes.

G. Warranty

1. Provide minimum of a five year warranty for emergency power battery.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrate and supporting grids for luminaires.

B. Examine each luminaire to determine suitability for lamps specified.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install surface mounted luminaires and exit signs plumb and adjust to align with building lines and with each other. Secure to prohibit movement.

C. Install wall mounted luminaires at height as scheduled.

D. Install ballasts, lamps, and other accessories specified or furnished with each luminaire.

E. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.

F. Bond products and metal accessories to branch circuit equipment grounding conductor.

3.03 INTERFACE WITH OTHER PRODUCTS

A. Interface with air handling accessories furnished and installed.

3.04 FIELD QUALITY CONTROL

A. Operate each luminaire after installation and connection. Inspect for proper connection and operation.

3.05 ADJUSTING

A. Relamp luminaires that have failed lamps at prior to Final Inspection.

3.06 CLEANING

A. Clean electrical parts to remove conductive and deleterious materials.

B. Remove dirt and debris from enclosure.

C. Clean photometric control surfaces as recommended by manufacturer.

D. Clean finishes and touch up damage.

END OF SECTION

SECTION 26 52 00

EXTERIOR LIGHTING

PART 1 GENERAL

A. SCOPE

1. Exterior wallpacks.

2. Lamps.

1.02 REFERENCES

A. NFPA 70 - National Electrical Code, latest edition.

B. NFPA 101 - Life Safety Code.

C. NEMA WD 6 - Wiring Devices-Dimensional Requirements.

D. UL 924-90 UL - Standard for Safety Emergency Lighting and Power Equipment.

E. CEE Consortium for Energy Efficiency

1.03 SUBMITTALS

A. Product Data:

1. Outdoor Wallpack.

B. System Documentation:

1. Warranty

a. Provide minimum of a five year warranty for emergency power battery and for fluorescent high bay ballasts.

PART 2 PRODUCTS

2.01 OUTDOOR WALLPACK

A. General: Exterior wallpack, compact wall mounted LED fixture with integral photocell/motion sensor. Full cutoff, minimum luminaire efficacy of 70 lumen/watt, color temperature from 3500 to 4100 kelvin. Dark bronze polyester enamel finish. UL listed for wet locations.

B. 120-277 Volt and shall be rated for operation down to -30 degrees F. 50,000 hour minimum rated life. Provide a minimum 5 year factory warranty.

C. Unless indicated on drawings, mount 12 inches over exit door, according to manufacturer's recommendations.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrate and supporting grids for luminaires.

B. Examine each luminaire to determine suitability for lamps specified.

3.02 INSTALLATION

A. Install in accordance with manufacturer’s instructions.

B. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.

C. Bond products and metal accessories to branch circuit equipment grounding conductor.

D. Install luminaires level and adjust to align with building lines and with each other. Luminaires shall be mounted as low as possible while still meeting room functional needs.

3.03 INTERFACE WITH OTHER PRODUCTS

A. Interface with air handling accessories furnished and installed.

3.04 FIELD QUALITY CONTROL

A. Operate each luminaire after installation and connection. Inspect for proper connection and operation.

3.05 ADJUSTING

A. Relamp luminaires that have failed lamps at prior to Final Inspection.

3.06 CLEANING

A. Clean electrical parts to remove conductive and deleterious materials.

B. Remove dirt and debris from enclosure.

C. Clean photometric/motion control surfaces as recommended by manufacturer.

D. Clean finishes and touch up damage.

END OF SECTION

SECTION 27 05 26

GROUNDING FOR COMMUNICATIONS

PART 1 GENERAL

1.01 SCOPE

A. Provide system and equipment grounding systems to comply with local and State regulations, Article 250 of the National Electrical Code, I3A Technical Criteria for the Installation Information Infrastructure Architecture February 2010, and I3A Technical Guide for Grounding and Bonding September 2006.

1.02 REFERENCES

A. NFPA 70 - National Electrical Code.

B. MIL-STD-188-124B - Military Standard Grounding, Bonding, and Shielding.

C. I3A - Technical Guide for Grounding and Bonding September 2006.

D. I3A - Technical Criteria for the Installation Information Infrastructure Architecture February 2010.

1.03 QUALITY ASSURANCE

A. All exothermic connections shall meet the requirements of IEEE Standards and be listed in MIL 419 standard.

B. All compression type connections and ground rods shall be UL listed.

C. Entire system ground shall be tested by the fall of potential method as specified in Part 3 Execution.

PART 2 PRODUCTS

2.01 MATERIALS

A. Bare grounding conductors shall be soft drawn copper, Class B stranding, and shall meet ASTM standard 138.

B. Ground rods shall be 3/4” diameter minimum by not less than 10’ long copper clad steel.

PART 3 EXECUTION

3.01 INSPECTION, INSTALLATION, AND TESTING

A. System Grounding

1. Provide a grounding electrode system consisting of, but not limited to:

a. #4 AWG green insulated copper wire placed 2-6 feet outside the roof drip line, buried 30 inches below grade with a Minimum bend radius at corners of 8 inches.

b. A minimum of 2 grounding electrodes not less than 10 feet apart shall be used.

c. Copper ground bar shall ¼”x2”x10” min. pre-drilled and tapped for two hole lugs. Mount ground bar at the lower corner of the

plywood backboard with stainless steel mounting brackets and insulated standoffs.

2. Bond the grounding electrodes to the grounding conductor using exothermic welding or UL Listed high compression fittings torqued to manufacturer's specifications and suitable for direct burial.

B. Equipment Grounding

1. Provide a separate ground jumper across all flexible conduit connections.

2. A separate green ground wire shall be provided for flexible conduit connections to motors, equipment and fixtures.

3. Provide an approved ground system or a ground wire separate from the neutrals for all light fixtures, outlets, device boxes, junction boxes, motors, and all other electrical equipment.

4. When utilizing EMT or rigid conduit for the raceway system a separate ground wire sized per NEC shall be pulled in with all power conductors.

5. The grounding system shall meet all the requirements of the NEC current edition and all State, Federal, and local codes as required.

END OF SECTION

SECTION 27 05 28

FIRESTOPPING FOR COMMUNICATIONS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Firestopping of Through Penetrations in Fire Rated Assemblies.
SMOKE SEALS.

B. Construction enclosing compartmentalized areas.

1.2 RELATED SECTIONS

A. **Division 26 – Section 26 0534 – Electrical – Raceways and Conduit Systems.**

1.3 REFERENCES

A. ASTM E 84, “Surface Burning Characteristics of Building Materials”.

B. ASTM E 119, “Fire Tests of Building Construction and Materials”.

C. ASTM E 814, “Fire Tests of Through Penetration Firestops”.

D. ANSI/UL263, “Fire Tests of Building Construction and Materials”.

E. ANSI/UL723, “Surface Burning Characteristics of Building Materials”.

F. ANSI/UL1479, “Fire Tests of Through Penetration Firestops”.

G. Underwriters Laboratories Inc. (UL) – Fire Resistance Directory

H. National Fire Protection Association (NFPA) – NFPA 101: Life Safety Code.

I. National Fire Protection Association (NFPA) – NFPA 70: National Electrical Code.

1.4 PERFORMANCE REQUIREMENTS

A. Fire rated pathway devices shall be the preferred product and shall be installed in all locations where frequent cable moves, add-ons and changes will occur.

B. Where non- mechanical products are utilized, provide products that upon curing do no re-emulsify, dissolve, leach, breakdown or otherwise deteriorate over time from exposure to atmospheric moisture, sweating pipes, ponding water or other forms of moisture characteristic during or after construction.

C. Where it is not practical to use a mechanical device, openings within floors and walls designed to accommodate telecommunications and data cabling shall be provided with re-enterable products that do not cure or dry.

D. Openings for cable trays shall be sealed using re-enterable firestopping pillows.

1.5 SUBMITTALS

A. Submit under provisions of Section 01 3300.

B. Product Data: Provide manufacturer's standard catalog data for specified products demonstrating compliance with referenced standards and listing numbers of systems in which each product is to be used.

C. Shop Drawings: Submit schedule of opening locations and sizes, penetrating items, and required listed design numbers to seal openings to maintain fire resistance ratings.

D. Certificates: Product certificates signed by firestop system manufacturer certifying material compliance with applicable code and specified performance characteristics.

E. Installation Instructions: Submit manufacturer's printed installation instructions.

1.6 QUALITY ASSURANCE

A. Products/Systems: Provide firestopping systems that comply with the following requirements:

1. Firestopping tests are performed by a qualified, testing and inspection agency. A qualified testing and inspection agency is UL, or another agency performing testing and follow-up inspection services for firestop system acceptable to authorities having jurisdiction.
2. Firestopping products bear the classification marking of qualified testing and inspection agency.

B. Installer Qualifications: Experience in performing work of this section who is qualified by the firestopping manufacturer as having been provided the necessary training to install firestop products in accordance with specified requirements.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Delivery:

1. Manufacturer's original, unopened, undamaged containers, identification labels intact identifying product and manufacturer, date of manufacture; lot number; shelf life, if applicable; qualified testing and inspection agency's classification marking; and mixing instruction for multicomponent products.
2. Handle and store products according to manufacturer's recommendations published in technical materials. Leave products wrapped or otherwise protected and under clean and dry storage conditions until required for installation.

B. Storage and Protection: Store materials protected from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.

1.8 PROJECT CONDITIONS

A. Do not install firestopping products when ambient or substrate temperatures are outside limitations recommended by manufacturer.

B. Do not install firestopping products when substrates are wet due to rain, frost, condensation, or other causes.

C. Maintain minimum temperature before, during, and for a minimum 3 days after installation of materials.

D. Do not use materials that contain flammable solvents.

E. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.

F. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.

G. Schedule installation of firestopping after completion of penetrating item installation but prior to covering or concealing of openings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers

1. Specified Technologies Inc., 200 Evans Way, Somerville, NJ 08876. Tel: (800) 992-1180, Fax: (908) 526-9623, Email: specseal@stifirestop.com, Website: www.stifirestop.com.
2. HILTI USA Inc., 5400 S. 122nd East Ave. Tulsa, OK 74146. Phone (866) 445-8827, Fax (800) 879-7000, Website: www.us.hilti.com.

B. Single Source: Obtain firestop systems for each type of penetration and construction condition indicated only from a single manufacturer.

2.2 MATERIALS

A. General: Use only firestopping products that have been tested for specific fire resistance rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements, and fire rating involved for each separate instance.

B. Firestop Sealants: STI SpecSeal® Brand single component latex formulations that upon cure do not re-emulsify during exposure to moisture, the following products are acceptable:

1. Specified Technologies Inc. (STI) SpecSeal® Series SSS Sealant.
2. Specified Technologies Inc. (STI) SpecSeal® Series LCI Sealant.

C. Firestop Putty: STI SpecSeal® Brand intumescent, non-hardening, water resistant putties containing no solvents, inorganic fibers or silicone compounds, the following products are acceptable: Specified Technologies Inc. (STI) SpecSeal® Series SSP Putty.

D. Fire Rated Cable Pathways: HILTI speed sleeve steels pathway allowing 100% cable fill.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Before beginning installation, verify that substrate conditions previously installed under other sections are acceptable for installation of firestopping in accordance with manufacturer's installation instructions and technical information.

B. Surfaces shall be free of dirt, grease, oil, scale, laitance, rust, release agents, water repellants, and any other substances that may inhibit optimum adhesion.

C. Provide masking and temporary covering to protect adjacent surfaces.

D. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install through-penetration firestop systems in accordance with Performance Criteria and in accordance with the conditions of testing and classification as specified in the published design.

B. Manufacturer's Instructions: Comply with manufacturer's instructions for installation of firestopping products.

3.3 FIELD QUALITY CONTROL

A. Inspections: Owner shall engage qualified independent inspection agency to inspect through-penetration firestop systems.

B. Keep areas of work accessible until inspection by authorities having jurisdiction.

C. Where deficiencies are found, repair firestopping products so they comply with requirements.

3.4 ADJUSTING AND CLEANING

A. Remove equipment, materials, and debris, leaving area in undamaged, clean condition.

B. Clean all surfaces adjacent to sealed openings to be free of excess firestopping materials and soiling as work progresses.

END OF SECTION

SECTION 27 10 00

VOICE AND DATA COMMUNICATION CABLING

PART 1 GENERAL

1.01 SCOPE

A. This section includes wire, cable, connecting devices, installation, and testing for wiring systems to be used as signal pathways for interior voice and high-speed data transmission.

1.02 REFERENCES

A. NFPA 70 - National Electrical Code.

B. MIL-STD-188-124B - Military Standard Grounding Bonding, and Shielding.

C. I3A - Technical Guide for Grounding and Bonding September 2006.

D. I3A - Technical Criteria for the Installation Information Infrastructure Architecture February 2010.

E. United States Army Information Systems Engineering Command World Wide Outside Plant Design and Performance Requirements November 2007.

1.03 DEFINITIONS

A. EMI: Electromagnetic interference.

B. IDC: Insulation displacement connector.

C. LAN: Local area network.

D. PVC: Polyvinyl chloride.

E. STP: Shielded twisted pair.

F. UTP: Unshielded twisted pair.

1.04 SUBMITTALS

A. Product Data: Include data on features, ratings, and performance for each component specified. Include color and technical features.

B. Qualification Data: For Installer and testing agency.

C. Field quality-control test reports.

D. As-Built Drawings: In accordance with Cable Administration Drawings described in Part 3.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: System installer must have on staff a registered communication distribution designer certified by Building Industry Consulting Service International (BICSI).

B. Testing Agency Qualifications: A testing agency with the experience and capability to conduct the testing indicated, that is a member company of the International Electrical Testing Association or is a nationally recognized testing

laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

C. Testing Agency's Field Supervisor: Person currently certified by the International Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.

D. Source Limitations: Obtain all products except twisted-pair and fiber-optic cables through one source from a single manufacturer. Twisted pair and fiber-optic cable shall each be products of a single manufacturer (not necessarily the same manufacturer for both).

E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

F. Comply with NFPA 70 - National Electrical Code, latest edition.

1.06 COORDINATION

A. Coordinate layout and installation of voice and data communication cabling with the COR or Inspector.

B. Adjust arrangements and locations of distribution frames and cross-connect and patch panels in equipment rooms and wiring closets to accommodate and optimize arrangement and space requirements of telephone switch and LAN equipment.

PART 2 PRODUCTS

2.01 MOUNTING ELEMENTS

A. Backboards: 3/4-inch, interior-grade, fire-retardant-treated plywood.

B. Distribution Racks: Wall-mounted, modular-steel units designed for telecommunications terminal support and data service, coordinated with dimensions of units to be supported.

C. Approximate Module Dimensions:

D. Wall Mounted at 6’-0” to top of unit: 22.75 inches wide by 25 inches deep; front door only.

1. 48 inches high for high connectivity functions such as administrative buildings, offices, classrooms, buildings with meeting and conference rooms, etc. SELECT ONE

2. Maintain 2’-0” of unobstructed wall area to each side of the cabinet, extending from the floor to 7’-0” above floor level. There shall be no conduit, piping, ductwork, equipment, or other obstructions in this area for a distance of 4’-9” out from the wall the unit is mounted on.

E. Finish: Baked-polyester powder coat.

F. Doors: Acrylic front door, lockable; lockable rear door.

G. Ventilation: Low-dB forced air, top loaded, 400 cfm for free-standing modules.

H. Power strip to be included.

I. Similar to Hoffman Datacom Model EWMW 482225.

2.02 TWISTED-PAIR CABLES, CONNECTORS, AND TERMINAL EQUIPMENT

A. Cables: Listed as complying with CAT 6 of TIA/EIA-568-B, as required for applications in this project.

B. Conductors: Solid copper.

C. CAT 6 UTP Cable: Comply with TIA/EIA-568-B. Four, thermoplastic-insulated, individually twisted pairs of conductors; No. 23 AWG, color-coded; enclosed in PVC jacket. Jacket material color coded for various services as required.

D. CAT 6 UTP Plenum Cable: Listed for use in air-handling spaces. Features are as specified for cables, conductors, and UTP cable except materials are modified as required for listing.

E. Cat 6 UTP Cable Connecting Hardware: Comply with TIA/EIA-568-B. IDC type, using modules designed for punch-down caps or tools.

F. CAT 6 IDC Terminal Block Modules: Integral with connector bodies, including plugs and jacks.

G. CAT 6 IDC Connecting Hardware: Consistent throughout this project.

H. Number of Terminals per Field: One for each conductor in assigned cables.

I. Mounting: Backboard for voice; rack for data.

J. CAT 6 Patch Panel: Modular panels housing multiple-numbered jack units with IDC-type connectors at each jack for permanent termination of pair groups of installed cables.

K. Number of Jacks per Field: One for each four-pair UTP cable required plus 25% spares.

L. CAT 6 Jacks and Jack Assemblies for UTP Cable: Modular, color-coded, RJ-45 receptacle units with integral IDC-type terminals. Use keyed CAT 6 orange jacks for data service and Cat 6 white jacks for voice.

M. CAT 6 UTP Patch Cords: Factory-made four-pair CAT 6 cables in 48-inch lengths, terminated with CAT 6 RJ-45 plugs at each end. Use keyed plugs for data service.

N. Workstation Outlets for Cubicles: Multigang faceplate with four CAT 6 jack-connector assemblies mounted in multigang faceplate for combined voice/data service that is service ready.

O. Outlet Boxes: 2 1/4” deep, 4 11/16” square for standard communications. Provide 5” square boxes for 1” conduit installations at all locations which may require current or future fiber optic cabling.

P. Jacks: 100-ohm, balanced, twisted-pair connector; four-pair, modular, CAT 6 RJ-45. Comply with TIA/EIA-568-B.1.

Q. Faceplate: Plastic.

R. Mounting: Flush, unless otherwise indicated.

S. Legend: Factory labeled, top and bottom jack of each pair "Voice" or "Data," as applicable, silk-screening or engraving.

T. 110 Punch Down Block for Voice Communications: Comply with TIA/EIA-568-B.

2.03 IDENTIFICATION PRODUCTS

A. Cable Labels: Self-adhesive vinyl or vinyl-cloth wraparound tape markers, machine printed with alphanumeric cable designations.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine pathway elements intended for cables. Check raceways, cable trays, and other elements for compliance with space allocations, installation tolerances, hazards to cable installation, and other conditions affecting installation. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 APPLICATION OF MEDIA

A. Horizontal Cable for Data and/or Voice Service: Use UTP Category 6 cable for runs between wiring closets and workstation outlets.

3.03 INSTALLATION

A. Install cables using techniques, practices, and methods that are consistent with Category 6 rating of components and that ensure Category 6 performance of completed and linked signal paths, end to end.

B. Install cables without damaging conductors, shield, or jacket.

C. Do not bend cables, in handling or in installing, to smaller radii than minimums recommended by manufacturer.

D. Pull cables without exceeding cable manufacturer's recommended pulling tensions. Pull cables according the manufacturer’s instructions and TIA/EIA-568.

E. Install exposed cables parallel and perpendicular to surfaces or exposed structural members and follow surface contours where possible.

F. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.

G. Wiring within Wiring Closets and Enclosures: Provide conductors of adequate length. Train conductors to terminal points with no excess. Use lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.

H. System components and appurtenances shall be installed in accordance with NFPA 70, manufacturer’s instructions, and as shown on the project drawings.

I. Necessary interconnections, services, and adjustments required for a complete and operable signal distribution system shall be provided. Components shall be labeled in accordance with EIA 606.

J. Penetrations in fire-rated construction shall be fire stopped for 1-hour fire rating.

K. Wiring shall be installed in accordance with EIA 568B. Wiring, terminal blocks, and outlets shall be marked in accordance with EIA 606.

L. Horizontal Distribution Cable:

M. The cable pulling tension rating shall not be exceeded. Cable shall not be stressed such that twisting, stretching, or kinking occurs. Cable shall not be spliced.

N. Copper cable not in a raceway shall be suspended a minimum of 8 inches above ceilings by cable supports no greater than 60 inches apart for bundles of less than 21 cables and no greater than 30 inches for bundles of 21 or more cables.

O. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items. Placement of cable parallel to power conductors shall be avoided; if possible, a minimum separation of 12 inches shall be maintained when such placement cannot be avoided.

P. Cables shall be terminated; no cable shall contain unterminated elements.

Q. Cable ties (Velcro Type) shall not be excessively tightened such that the transmission characteristics of the cable are altered. Minimum bending radius shall not be exceeded during installation or once installed.

R. Vertical Drops: Vertical cable support intervals shall be in accordance with manufacturer's recommendations. Cable bend radius shall not be less than ten times the outside diameter of the cable during installation and once installed. Maximum tensile strength rating of the cable shall not be exceeded. Cable shall not be spliced.

S. Telecommunications Outlets

1. Faceplates: As a minimum each jack shall be labeled as to its function and a unique number assigned to identify cable link.

T. Boxes shall be mounted at 16" A.F.F. unless otherwise noted.

U. Cables: Unshielded twisted pair shall have a minimum of 6 inches of slack cable loosely coiled into the telecommunications outlet boxes. Minimum manufacturer's bend radius for each type of cable shall not be exceeded.

V. Patch Panels or Terminal Blocks: Patch panels and terminal blocks shall be mounted in orderly rows and columns. Adequate vertical and horizontal wire routing areas shall be provided between groups of panels and blocks. Industry standard wire routing guides shall be utilized.

W. Separation of Wires: Comply with TIA/EIA-569-A rules for separating unshielded copper voice and data communication cabling from potential EMI sources, including electrical power lines and equipment.

X. Make splices, taps, and terminations only at indicated outlets, terminals, and cross-connect and patch panels.

Y. Use splice and tap connectors compatible with media types.

3.04 GROUNDING

A. See Section 27 05 26.

3.05 INSTALLATION IN EQUIPMENT ROOMS AND WIRING CLOSETS

A. Install 4’ x 8’ plywood backboards on walls of equipment rooms and wiring closets.

B. Mount patch panels, terminal strips, and other connecting hardware for voice service on backboards, unless otherwise indicated. Mount patch panels and related hardware for data service in equipment racks, unless otherwise indicated.

3.06 INSTALLATION STANDARDS

A. Comply with requirements in TIA/EIA-568-B and TIA/EIA-569-A.

B. Unshielded Twisted Pair Cable: Each pair shall be terminated on appropriate outlets, terminal blocks, and data patch panels. No cable shall be unterminated or contain unterminated elements. Pairs shall remain twisted together to within the proper distance from the termination as specified in EIA TSB 40-A. Conductors shall not be damaged when removing insulation. Wire insulation shall not be damaged when removing outer jacket.

3.07 IDENTIFICATION

A. Comply with TIA/EIA-606.

B. System: Use a unique, three-syllable, alphanumeric designation for each cable and label cables, jacks, connectors, and terminals. Use logical and systematic designations for the facility's architectural arrangement. Use cable and jack designations which follow the factory supplied numbering order on the patch panel.

C. First syllable identifies and locates equipment room or wiring closet where cables originate.

D. Second syllable identifies and locates cross-connect or patch-panel field in which cables terminate. Utilize the factory numbering provided on the cross-connect or patch-panel for numbering; do not renumber on the panels.

E. Third syllable designates type of media (copper or fiber) and position occupied by cable pairs or fibers in field.

F. Workstation: Label cables within outlet boxes.

G. Distribution Racks and Frames: Label each unit and field within that unit.

H. Within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.

I. Cables, General: Label each cable within 4 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as necessary.

J. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet.

K. Cable Schedule: Post in a prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover.

L. Cable Administration Drawings: Show building floor plans with cable administration point labeling. Identify labeling convention and show labels for telecommunications closets, backbone pathways and cables, entrance pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors. Comply with TIA/EIA-606.

3.08 FIELD QUALITY CONTROL (TESTING)

A. Testing Agency: Engage a qualified testing and inspecting agency to perform the following field tests and inspections and prepare test reports:

B. Category 6 UTP Cabling Tests:

C. Tests shall include all tests of Category 6, conducted from 1 to 250 MHz.

D. Channel and permanent link tests shall be performed with a tester that complies with performance requirements in TIA/EIA-568-B.2, Level III. Include tests for longitudinal or transverse conversion loss.

E. Performance shall comply with minimum criteria in TIA/EIA-568-B.2.

F. Data for each measurement shall be documented. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDM, or transferred from the instrument to the computer, saved as text files, printed, and submitted.

G. Remove and replace cabling where test results indicate that they do not comply with specified requirements.

H. Retest and inspect cabling to determine compliance of replaced or additional work with specified requirements.

END OF SECTION

SECTION 28 46 00

AUTOMATIC FIRE DETECTION AND ALARM SYSTEM

PART 1 GENERAL

1.01 SCOPE

A. Contractor shall design/build a Fire Alarm System in accordance with NFPA 72 (2013) with all required Fire Alarm System equipment and scope of work as indicated on the drawings. The system shall provide coverage for the entire building. Documents shall be stamped by a Qualified Fire Protection Engineer.

B. Fire Alarm Control Panel.`

C. Initiating Devices.

D. Notification Devices.

E. Mass Notification System.

F. Radio Reporting System.

G. Wiring Diagram.

1.02 REFERENCES

A. NFPA 2006 - Fire Alarm System Installation Guide.

B. UL 864 - Control Units and Accessories for Fire Alarm Systems.

C. NFPA 72 - National Fire Alarm Code.

1.03 SUBMITTALS:

A. Product data:

1. Fire Alarm Control Panel (FACP).
2. Fire Alarm Voice Evacuation Panel (VEP).
3. Fire Alarm Radio Reporting Transceiver (TXCVR or SG).
4. Smoke Detectors.
5. Heat Detectors.
6. Manual Pull Stations.
7. Fire Alarm Speaker Strobes, Strobes, and Weather Proof Horn/Strobes.
8. Carbon Monoxide Detector.
9. Natural Gas Detector.

B. Shop Drawings:

1. Fire Alarm and Voice Evacuation Systems Circuit Wiring Diagram.

C. Work Sheets:

1. FACP Current Draw Calculations.
2. FACP Standby Battery Calculations.
3. VEP Current Draw Calculations.

4. VEP Stand By Battery Calculations.

D. Qualifications:

1. The Fire Alarm Technician must have five years of similar experience in performing the work.

2. Provide a copy of the Fire Protection Engineer's State of Wisconsin License.

E. Project Completion Documentation :

1. Copy of the NFPA 72 "Fire Alarm System Record of Completion" and all supporting documentation.

2. Copy of operating instructions and maintenance and repair procedures.

3. Provide two keys for each type cabinet and for each manual pull station installed in the building.

1.04 SYSTEM DESCRIPTION

A. Fire Detection and Alarm System:

1. The system shall contain a Fire Alarm Control Panel (FACP):

a. To operate and supervise:

b. Heat and smoke detection devices.

c. Manual pull station devices.

d. Carbon Monoxide detector.

e. Natural Gas detector.

f. To activate:

g. Alarm notification devices.

h. Form C Relays.

2. The Fire Detection and Alarm will operate IAW NFPA 72.

3. The system includes a Radio Reporting System and Mass Notification System which are both connected to the FACP Form C relays.

B. All local automatic fire detection and alarm components shall be UL listed and shall work together as a system.

C. System Supervision:

1. Provide electrically-supervised system, with supervised alarm initiating and notification appliance circuits.

a. Occurrence of single ground or open condition in initiating or notification appliance circuits will cause the FACP to go into a TROUBLE mode.

b. Component or power supply failure will also cause the FACP to go into a TROUBLE mode.

D. General Building Alarm Sequence of Operation: Actuation of manual fire alarm pull station and/or change of state of carbon monoxide detector, smoke detectors

and heat detectors causes system to enter into ALARM, which includes the following operations:

1. Sound and display all local fire alarm signaling devices with required candela and temporal audible signal.

    a. Carbon monoxide detector shall initiate an audible alarm distinctly different from the fire alarm notification.

2. Indicate location of alarm zone on FACP.

3. Operate general alarm contacts which trigger the Voice Evacuation Panel and Radio Reporting System Transceiver.

E. Alarm Reset: Key-accessible RESET function resets alarm system out of ALARM if alarm initiating circuits have cleared.

F. Trouble Sequence of Operation: System trouble, including grounding or open circuit of supervised circuits or power or system failure, causes system to enter TROUBLE mode, which includes the following operations:

1. Visual and audible trouble alarm at the FACP displayed by initiating device circuit (zone), notification appliance circuit, Form C Relay circuit.

2. Manual ACKNOWLEDGE function at control panel silences audible trouble alarm. Visual alarm is displayed until initiating trouble is cleared.

3. Close auxiliary general trouble Form C contact.

G. Walk Test:

1. Manual WALK TEST function causes:

    a. Momentary alarm indication at each zone at fire alarm control panel.

    b. Triggers all Notification Appliance Circuits for 1 to 6 seconds.

    c. Stores each walk test event in the FACP event history buffer.

H. Drill Sequence of Operation:

1. Manual DRILL function causes ALARM mode operation to:

    a. Sound and display local fire alarm signaling devices.

    b. Indicate location of alarm zone on fire alarm control panel.

I. Zoning and Notification Appliance Circuits.

1. Fire alarm circuits shall only be installed after Contractor's wiring diagram has been approved by the COR.

2. The wiring diagram shall show how the Contractor intends to wire the fire alarm circuits.

    a. It shall reference and identify the components shown on plans including CO, heat and smoke detectors, pull stations, speaker strobes, strobes and weatherproof horn strobe, the FACP, the VEP and the TXCVR (SG).

b. The diagram shall indicate zoning, wire identification (color, striping, etc), component terminal identification, panel module terminal identification, and all splice boxes.

c. The fire alarm circuits shall contain no T-taps.

d. This wiring diagram shall be field verified by the COR during the final inspection.

3. Initiating Device Circuits (IDC) shall be installed in accordance with the shop drawings. All non-used IDC Zone Termination points on the FACP are to be dummy loaded with the Required End of Line Resistor and identified as "Spares".

4. Notification Appliance Circuits (NAC) shall be installed in accordance with the shop drawings. All non-used NAC Termination points on the FACP are to be dummy loaded with the Required End of Line Resistor and identified as "Spares".

5. Form C Relay Circuits will be installed and programmed in accordance with paragraph 3.01 H, 4.

PART 2 PRODUCTS

2.01 FIRE ALARM CONTROL PANEL (FACP)

A. A 24-Volt, 10 Zone FACP.

B. Modular construction keyed cabinet that can be either surface wall mounted or semi-flush mounted. The Contractor shall verify that the cabinet will fit in the location indicated or will make arrangements with the Construction Inspector to relocate the cabinet where it will fit.

C. FACP shall be programmable at the panel with no special software or additional equipment.

D. Provide TROUBLE, ACKNOWLEDGE, DRILL, and ALARM SILENCE function.

E. The FACP power supply shall:

1. Be adequate to serve control panel modules, remote detectors, and alarm signaling devices.

2. Include a battery-operated emergency power supply with the capacity for operating system in standby mode for 24 hours followed by alarm mode for 5 minutes.

a. Batteries shall be new and properly sized to operate the system IAW the FACP Battery Calculation Worksheet.

b. Back-up batteries shall be contained in the FACP in a separate cabinet.

c. Batteries shall be labeled with the date of manufacture.

F. The FACP shall have the following circuits:

1. Ten, Style B Initiating Device Circuits (Class B): Circuits are programmable to accept Normally Open Contact Devices and 2 Wire Smoke Detectors.

2. Two Style Y (Class B) Notification Appliance Circuits.

3. Four dry Form-C relay contacts programmable for Alarm, Trouble, and Supervisory.

G. Transient Protection: The control panel shall be protected against voltage surges and transients, such as those caused by lightning and high voltage switching at all A.C. power inputs and at communication signal inputs and outputs. Over voltage protection equipment shall comply with IEEE C62.41, Category B.

H. The FACP shall allow WALK TEST operation.

I. The FACP shall meet UL 864-91 requirements and UL listing requirements for NFPA 72.

J. The FACP shall go into "trouble condition" during a power outage only after back-up battery voltage drops to less than 80% of nominal voltage.

K. The FACP shall have an operating temperature range of 32° F to 120° F.

2.02 REMOTE ANNUNCIATOR

A. Description: Annunciator functions shall match those of fire-alarm control unit for alarm, supervisory, and trouble indications. Manual switching functions shall match those of fire-alarm control unit, including acknowledging, silencing, resetting, and testing.

1. Mounting: Flush cabinet, NEMA 250, Type 1.

B. Display Type and Functional Performance: Alphanumeric display and LED indicating lights shall match those of fire-alarm control unit. Provide controls to acknowledge, silence, reset, and test functions for alarm, supervisory, and trouble signals.

C. Voice type systems shall be able to make announcements in specific zones or all zones via microphone in Annunciator panel.

2.03 VOICE EVACUATION PANEL

A. The contractor shall provide and install the voice evacuation panel.

B. The VEP shall be installed near and connected to the FACP. Contractor shall verify that all panels will fit in the space allowed and that the FACP and VEP will communicate with one another.

C. The VEP must be compatible with the Vision 21/DTX Mass Notification system via a supervised serial port connection. The VEP must have an RS232 or RS485 Input for this connection. The VEP manufacturer is responsible for providing the protocol for the VEP to SigCom.

D. The VEP shall have a built in UL listed power supply and internal battery charger and be capable of supporting an optional UL listed zone splitter that can be housed in the main voice control cabinet.

E. The VEP shall include a battery operated emergency power. Batteries shall be new and properly sized to operate the system IAW the VEP Battery Calculation Worksheet and shall be labeled with the date of manufacture.

F. The VEP must support a minimum of two pre-recorded messages and have the capability of adding at least one message. The VEP shall have the ability to provide a supervised microphone for the purpose of audible local instructions that will override the pre-recorded messages.

2.04 FIRE ALARM RADIO REPORTING TRANSCEIVER (TXCVR) PANEL

A. The contractor shall install a Government provided SigCom fire alarm transceiver. The Contractor shall provide and install the antenna, antenna wall mount bracket, and coaxial cable. The transceiver shall be connected to the voice evacuation panel. The batteries are Government furnished, Contractor installed. The system consists of:

1. Radio fire alarm receiving and reporting transmitter (TXCVR or SG).

a. Manufacturer: Signal Communications (SigCom) Corporation (SIGCOM) Model DTX-H1R2-N1016-VS transceiver, P.O. Box 2588, Woburn, MA 01888, Phone: 781-938-0370, Fax: 978-532-0297.

2. The Radio Antenna with a wall mount bracket shall be SigCom Part No. DTX-IK-11.

3. Antenna Cable: 50 ohm broadcast coaxial cable not to exceed 2.8 dB attenuation at 200 MHz Comparable to BELDEN RG-213/U.

B. The Government will program the TXCVR prior to final inspection. Notify the Construction Inspector that TXCVR is ready to program. Allow at least 7 calendar days for programming.

C. Batteries shall be new, properly sized, and labeled with the date of manufacture.

D. Contractor shall install two power limited supervisory circuits between the FACP and the TXCVR. Circuits shall be installed in red EMT conduit.

2.05 INITIATING DEVICES

A. All devices shall have indicator to show when in alarm status.

B. The Contractor is responsible for all mounting hardware and other accessories required for each product in order to provide a complete system.

C. Manual Pull Station:

1. Surface mounted.

2. Double action push/pull type manual station.

3. Tamper resistant reset key lock.

4. Meets requirements of UL-38.

5. Pull stations shall have protective covers.

D. System Smoke Detectors:

1. Smoke detectors shall be photoelectric type.

2. Detectors shall be UL listed to Standard 268 for this purpose and shall be documented compatible with the control equipment they are being connected to.

3. The detectors shall obtain their operating power from the fire alarm panel supervised detection circuit.

4. Detector shall have a green flashing LED for visual confirmation that the detector is operating within the normal sensitivity range.

5. Removal of the detector head shall interrupt the supervisory circuit of the fire alarm detection circuit and cause a trouble signal to be generated at the control panel.

6. To minimize nuisance alarms, smoke detector circuits will be programmed with alarm verification.

7. The detector design shall provide full solid-state construction and compatibility with other normally open fire alarm detection loop devices (heat detectors, pull stations, etc.).

8. Detectors shall be designed for mounting on an outlet box.

9. The detector head shall be easily disassembled to facilitate cleaning.

10. All smoke detectors shall be factory calibrated to the least allowable sensitivity adjustment.

E. System Heat Detectors:

1. Heat Detector shall be listed to Underwriters Laboratories UL 521 for Heat Detectors for Fire Protective Signaling Systems.

2. The detector shall be either a single-circuit or a dual-circuit type, normally open.

3. The detector shall be rated for activation at either 135°F or 194°F and shall activate by means of a combination fixed temperature/rate-of-rise thermal sensor.

a. The rate-of-rise element shall be activated by a rapid rise in temperature, approximately 15°F per minute.

b. The rate-of-rise element of combination fixed temperature/rate-of-rise models shall be restorable to allow for field-testing.

4. The detector shall contain alphanumeric markings on the exterior of the housing to identify its temperature rating and activation method.

5. The detectors shall include an external indicator to indicate when in alarm.

F. Carbon Monoxide Detector:

1. Carbon Monoxide Detector shall be listed to Underwriters Laboratories UL 521 for Fire Protective Signaling Systems.

G. Natural Gas Detector:

1. Natural Gas Detector shall be listed to Underwriters Laboratories UL 521 for Fire Protective Signaling Systems.

2.06 NOTIFICATION DEVICES

A. Strobe:

1. Strobe shall be listed to UL-1638 and be approved for fire protective signaling systems.

2. The Alarm Strobe shall be capable of operating at 15 or 75 Candella.

B. Wall Mount Weatherproof Speaker/Strobe:

1. Wall mount weatherproof speaker/strobe shall be listed to UL 1480 and UL 1638 and be approved for fire protective signaling systems.

2. Speaker shall be capable of operating at 25.0 nominal Vrms and shall have a frequency range of 400 to 4000 Hz.

3. Speaker shall have power taps which are selected by shunts.

4. The strobe shall comply with the NFPA72 requirements for visible signaling appliances, flashing at 1 Hz over the strobe's entire operating voltage range.

5. The strobe light shall consist of a xenon flash tube and associated lens/reflector system and be capable of operating at 15, 75, or 110 Candella on 24 volts DC.

C. Wall Mount Speaker/Strobe:

1. Wall mount speaker/strobe shall be listed to UL 1480 and UL 1638 and be approved for fire protective signaling systems.

2. Speaker shall be capable of operating at 25.0 nominal Vrms and shall have a frequency range of 400 to 4000 Hz.

3. Speaker shall have power taps which are selected by shunts.

4. The strobe shall comply with the NFPA72 requirements for visible signaling appliances, flashing at 1 Hz over the strobe's entire operating voltage range.

5. The strobe light shall consist of a xenon flash tube and associated lens/reflector system and be capable of operating at 15, 75, or 110 Candella on 24 volts DC.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install and program the FACP in accordance with manufacturer's instructions, this specification section, and the shop drawings.

B. Install all equipment in accordance with the manufacturer's instructions.

C. Install manual pull stations as indicated on Drawing E1.2 with the bottom of the device 48 inches above finished floor. Install back boxes and protective covers as specified in Part 2 of this section and as required for installation.

D. Install strobes and speaker/strobes on back boxes, and as indicated on Drawing E1.2.

E. Properly size copper conductors for the initiating and notification device circuits and install in accordance with the shop drawings in red EMT conduit. Provide conductors with color coded insulation or use color coded tape at each conductor termination and in junction boxes.

F. Properly size copper conductors for the power branch circuits when installing the FACP, VEP, and TXCVR (SG). Install these circuits in red EMT conduit. Terminate and identify them in the load center, each on its own dedicated 20 Amp circuit breaker.

G. All junction and splice box blank cover plates are to be painted red and marked with the letters "FA."

H. FACP Zone, NAC, and Form C Relay assignments and programming.

1. Initiating Device Circuits, Zone assignments and programming shall be per the shop drawings.

2. Smoke and heat detectors shall be on a separate zone from the pull stations.

3. Carbon monoxide shall be on a separate zone.

4. Notification Appliance Circuits (NAC) will be assigned and programmed in accordance with the shop drawings.

5. Form "C" Relay Circuit assignments and programming:

a. C-1 - Connect to SIG COM radio transceiver alarm input terminals and program as "General Alarm"

b. C-2 - Connect to SIG COM radio transceiver trouble input terminals and program as "General Trouble"

c. C-3 - Connect to Voice Evacuation Panel alarm input terminals and program as "General Alarm"

d. C-4 - Connect to SIG COM radio transceiver alarm input terminals and program as "CO NG Alarm"

I. Field quality control.

1. Field inspection and final testing will be performed under provisions of Section 01 10 10 with a representative of the Fort McCoy Fire Department and the Construction Inspector present.

2. Test in accordance with NFPA 72.

END OF SECTION