
PARKER INDIAN HEALTH CENTER DUPLEX DESIGN

IHS PROJECT NO. PH21CR03Q3

Parker, AZ

BWS Project Number: 1818.900

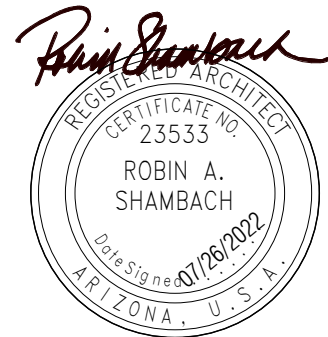
Construction Documents

July 26, 2022

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PROJECT MANUAL

Indian Health Services
Parker Duplex Quarters

CONSTRUCTION DOCUMENTS

July 26, 2022

TECHNICAL SPECIFICATIONS

Division 1 – General Requirements

011100	Summary
013100	Project Meetings
013300	Submittals
013526	Safety Requirements
014000	Quality Requirements References
014200	Temporary Facilities
015000	Product Requirements
016000	Warranties
017400	Project Closeout
017700	Operation and Maintenance Data
017823	Project Record Documents
017839	

Division 2 – Existing Conditions – Not Used

Division 3 - Concrete

033000	Cast-In-Place Concrete
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Division 4 – Masonry – Not Used

Division 5 - Metals

051200	Structural Steel
055000	Metal Fabrications

Division 6 – Wood, Plastics, and Composites

061000	Rough Carpentry
061753	Metal Plate Connected Wood Trusses
061850	Structural Glue-Laminated Timber

**Indian Health Services
Parker Duplex Quarters
CONSTRUCTION DOCUMENTS**

**IHS PH21CR03Q3
BWS 1818.900**

Division 7 - Thermal and Moisture Protection

072100	Insulation
072410	Exterior Insulation and Finish System – EIFS
072700	Air Barriers
074113	Preformed Metal Roofing
074600	Fiber Cement Siding
078400	Firestopping
079200	Joint Sealers

Division 8 - Doors and Windows

081113	Steel (Hollow Metal) Doors and Frames
081433	Interior Stile and Rail Wood Doors – Single Swing, Bi-Fold, and Sliding
081444	Fiberglass Entry Doors
081673	Fiberglass Sliding Doors
083113	Access Doors and Frames
085413	Fiberglass Picture and Casement Windows
086200	Tubular Skylights
087100	Finish (Door) Hardware and Hardware Schedule
088300	Frameless Mirrors

Division 9 – Finishes

092900	Gypsum Drywall Systems
093000	Tile
099000	Painting

Division 10 – Specialties

102800	Toilet Accessories
104400	Portable Fire Extinguishers

Division 11 – Equipment - Not Used

Division 12 – Furnishings

123530	Residential Casework
123640	Stone Countertops

Division 13 - Special Construction – Not Used

Division 14 – Conveyances – Not Used

Division 21- Fire Protection

211100	Fire Protection
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Division 22 – Plumbing

224000	Plumbing
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Division 23 – Heating, Ventilating and Air Conditioning

**Indian Health Services
Parker Duplex Quarters
CONSTRUCTION DOCUMENTS**

**IHS PH21CR03Q3
BWS 1818.900**

230500	Basic Mechanical Materials and Methods
230593	Testing, Adjusting, Balancing (TAB)
230700	Mechanical Insulation
232000	Building Services Piping
233000	Air Distribution
237000	Heating, Ventilating, and Air Conditioning Equipment - HVAC

Division 26 – Electrical – See Drawings

Division 28 – Fire Protection – See Drawings

Division 31 – Earthwork

312000	Earthwork
	Geotechnical Evaluation Report
313116	Termite Control

Division 32 – Exterior Improvements

321313	Portland Cement Concrete Paving
323119	Chain-Link Fences and Gates
328000	Irrigation System
329000	Landscape Work

END OF CONTENTS

SECTION 011100 - SUMMARY

PART 1 – GENERAL

1.1 SUMMARY

- A. A summary of the specifications as part of the Contract Documents

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

- A. Project Identification: The project consists of residential quarters for staff working at Parker Indian Health Center. The project will add 4 new units – 2 duplex quarters – each unit will have 2 bedrooms and 2 bathrooms. Exterior colors and details to match existing buildings.

1. Project Location: Parker, Arizona
2. Owner: Indian Health Service

- B. Architect Identification: The Contract Documents, dated June 17, 2022 were prepared for the Project by Burns Wald-Hopkins Shambach Architects (BWS) and their consultants.

1.4 USE OF PREMISES

- A. Contractor shall coordinate with service unit and will have an area near work site to use as a staging area.

1.5 SPECIFICATION FORMATS AND CONVENTIONS

- A. Specification Format

The Specifications are organized into Divisions and Sections using the 49-division format and CSI/CSC's "MasterFormat" numbering system.

1. Section Identification: The Specifications use section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of sections in the Contract Documents.

- B. Specification Content

The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Abbreviated Language: Language used in the Specifications and other Contract Documents may be abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
 - a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

1.6 DOCUMENT MANAGEMENT

- A, Section 013300 – Submittals: Submittals describe the requirement that the General Contractor procures use of Submittal Exchange or ProCore for the duration of the construction portion of the project. This shall be a cloud-based project management system that allows residence and management of all project documents, including drawings and specifications, submittals, RFI's, ASI's, COR's/Proposal Requests, etc. The GC shall administer the program during the construction period and provide general document management for the entire project construction team.

1.7 LAYING OUT OF THE WORK

- A. Prior to commencing work, the Contractor shall carefully compare and check all drawings, each with the other, that in any way affect the locations or elevation of the work to be executed by him, and should any discrepancy be found, he shall immediately report the same to the Architect for verifications and adjustments. Any duplication of work made necessary by failure or neglect on the Contractor's part to comply with this provision shall be done at his sole expense.
- B. The drawings accompanying these specifications indicate generally the design and arrangement of all apparatus, fixtures, accessories, etc., necessary to complete the work required. The exact location or arrangement of equipment is subject to minor changes necessitated by field conditions and shall be made as required without additional cost to the Owner.
- C. If there is a discrepancy between documents, the most stringent requirements shall be assumed to apply to the work. Contractor shall not scale drawings if dimensions are not shown but ask for clarification from the architect.
- D. Surveys, Benchmarks, Lines and Levels: Working from data established by his property survey, Contractor shall establish and maintain benchmarks and other dependable markers and set lines and levels for the work on site as needed to properly locate each element of entire project. Contractor shall calculate and measure required dimensions as shown (within recognized tolerances). Contractor shall not scale drawings to determine dimensions. Contractor shall advise tradesmen performing the work of marked lines and levels provided for their use in layout of work.

E. Existing Conditions

1. The existing utilities and other conditions shown or referred to on the drawings or in the specifications were located from existing reference drawings. While it may be reasonable to assume that the locations are reasonably accurate, the Contractor shall utilize blue staking services or other information as available for to verify all existing utilities. Contractor should use extreme caution in trenching, cutting asphalt, etc.
 - a. Reference also the Geotechnical Investigation Report. These are included after Section 312000 – Earthwork.
2. If the Contractor should encounter utilities or conditions not shown on available reference materials, immediately notify the Architect who will direct Contractor in removal, repair, and/or rerouting of utilities and resolution of unexpected conditions.
3. Utility Shutdowns: Contractor shall coordinate closely with Owner's Representative for all utility shutdowns and changeovers. Contractor shall conduct a planning meeting with all affected parties, coordinated with the Owner's Representative, a minimum of 2 weeks prior to any required shutdown.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION 011100

SECTION 013100 - PROJECT MEETINGS

PART 1 – GENERAL

1.1 SUMMARY

- A. This section specifies administrative and procedural requirements for project meetings including but not limited to:
 - 1. Pre-construction conference
 - 2. Pre-Installation Conferences as noted in individual spec sections
 - 3. Coordination meetings
 - 4. Progress meetings

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this section.

1.3 PRECONSTRUCTION CONFERENCE:

- A. To be held after execution of the Agreement and prior to commencement of construction activities.
- B. Attendees: The Owner, Architect, and their consultants, the Contractor and his/her superintendent, major subcontractors, manufacturers, suppliers and other concerned parties shall each be represented at the conference by persons familiar with and authorized to conclude matters relating to the work.
- C. Deliverable: Fully developed and vetted critical path construction schedule.
- D. Agenda: Discuss items of significance that could affect progress including such topics as:
 - 1. Critical work sequencing
 - 2. Designation of responsible personnel
 - 3. Procedures for processing change orders
 - 4. Procedures for processing applications for payment
 - 5. Distribution of contract documents
 - 6. Process for submittals of shop drawings, product data and samples
 - 7. Preparation of record documents
 - 8. Office, work, access, and storage areas

- 9. Equipment deliveries and priorities
 - 10. Housekeeping
 - 11. Working hours
- E. The Owner's Representative will chair the conference, record significant discussions, and electronically distribute copies of minutes of the conference promptly to everyone concerned.

1.4 COORDINATION MEETINGS:

- A. Conduct coordination meetings with subcontractors as required to expedite job progress. Project coordination meetings are in addition to specific meetings held for other purposes, such as regular progress meetings and special pre-installation meetings.
- B. Request representation at each meeting by every party currently involved in coordination or planning for the construction activities involved.
- C. The General Contractor will chair the meetings, record significant discussions of each meeting, and electronically distribute copies of minutes of each meeting promptly to everyone concerned.

1.5 PROGRESS MEETINGS:

- A. Job site meetings may be called by Owner as deemed necessary to coordinate, expedite, or schedule the work of this contract. At a minimum, meetings shall be held weekly at the job site with the Owner's representative(s), Architect's representative, and Contractor's Project Manager and Site Superintendent at the jobsite or online. Weekly progress meetings will continue through to final completion of the project. The Contractor will report on the progress of the construction, review "as-built" conditions, and provide an update on the schedules. Coordination meetings may be held concurrently with progress meetings.
- B. Agenda: Review, correct and approve minutes of the previous progress meeting. Include topics for discussion as appropriate to the current status of the project.
- C. Contractor's Construction Schedule: Review progress since the last meeting. Determine where each activity is in relation to the Contractor's construction schedule, whether on time or behind schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time. Review other items of significance that could affect progress.
- D. Documentation Status: Review status of critical submittals, requests for information, proposal requests/change proposals, change orders, and similar items.
- E. The Contractor will chair the meetings, record significant discussions and, soon after each meeting, electronically distribute copies of minutes of each meeting to each party present and to other members of the construction team.

PART 2 – PRODUCTS (Not Used)

**Indian Health Services
Parker Duplex Quarters
CONSTRUCTION DOCUMENTS**

**IHS PH21CR03Q3
BWS 1818.900**

PART 3 – EXECUTION (Not Used)

END OF SECTION 013100

SECTION 013300 - SUBMITTALS

PART 1 – GENERAL

1.1 SUMMARY

- A. Work related submittals including shop drawings, product data, samples and non-administrative miscellaneous submittals related directly to the work.

1.2 RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification sections, apply to work of this section.

- A. Coordination Drawings: The contractor shall work with appropriate subcontractors to provide coordination drawings for all work above ceilings. Drawings shall fully address mechanical, electrical, data, fire sprinklers, fire alarm, and other systems as appropriate.

1.3 RELATED SECTIONS

- A. Section 011100 – Summary: Summary for general discussion of cloud-based project management during construction, which shall be provided and administered by the General Contractor. Particular requirements for its use are included in this Submittals section.

1.4 DESCRIPTION OF REQUIREMENTS:

- A. General

Submittals, (as well as other project documentation, such as RFI, COR, ASI, drawings, specifications, etc.), will be handled through the cloud-based document management program described in this section.

- B. The types of submittal requirements specified in this section include shop drawings, product data, samples and miscellaneous work-related submittals. Individual submittal requirements are specified in applicable sections for each unit of work. Refer to other Division-1 sections and other contract documents for requirements of administrative submittals.

- C. Definitions: Work-related submittals of this section are categorized for convenience as follows:

- 1. Shop drawings include specially-prepared technical data for the project, including drawings, diagrams, performance curves, data sheets, schedules, templates, patterns, reports, calculations, instructions, measurements and similar information not in standard printed form for general application to more than one project.

2. Product data include standard printed information on materials, products and systems; not specially-prepared for this project, other than the designation of selections from among available choices printed therein. Include manufacturer's standard printed recommendations for application and use, compliance with standards, applications for labels and seals, maintenance information, and special coordination requirements for installation.
3. Samples include both fabricated and unfabricated physical examples of materials, products and units of work; both as complete units and as smaller portions of units of work; either for limited visual inspection or, (where indicated), for more detailed testing and analysis.
 1. Approved physical samples shall be delivered to the job site and be maintained in the job site office.
4. Miscellaneous submittals related directly to the work, (non-administrative), include warranties, coordination drawings, maintenance agreements, workmanship bonds, survey data and reports, physical work records, quality testing and certifying reports, copies of industry standards, record drawings, field measurement data, operating and maintenance materials, overrun stock, and similar information, devices and materials applicable to the work and not processed as shop drawings, product data or samples.

1.5 INTENT

- A. The review of shop drawings is intended to be a preview of what the Contractor intends to provide and functions as an effort to foresee unacceptable materials or methods and to avoid the possibility of their rejection at the project site. Review of submittals will be only for conformance with the design concept of the project and compliance with the information given in the Contract Documents. Review of shop drawings does not preclude Contractor from meeting all requirements of the Contract Documents and providing the work as documented therein.
- B. The Contractor is responsible for dimensions to be confirmed at the site; for information that pertains solely to fabrication processes or to the means, methods, techniques, sequences, and procedures of construction; for actual quantities of items to be furnished; and for coordination of the work of all trades. The Architect's approval of a specific item does not indicate approval of an assembly of which the item is a component.

1.6 GENERAL SUBMITTAL REQUIREMENTS:

- A. Coordination and Sequencing: Coordinate preparation and processing of submittals with performance of the work so that work will not be delayed by submittals. Coordinate and sequence different submittals for same work, and for interfacing units of work, so that one unit of work will not be delayed for coordination with another. The Contractor shall provide a list of all required submittals, along with a sequence that the submittals will be provided, for review by the Architect.
- B. No fabrication of work shall be done, or any parts thereof shipped to site prior to approval of required submittals for such work.

- C. Submittals will not be reviewed which do not bear Contractor's signature and statement that Contractor has reviewed submittal and the contents of the submittals are in full conformity with the contract documents, except as noted. Contractor will be held responsible for any delay in the progress of the work which may be due to his failure to observe these requirements, and the time for the completion of his contract will not be extended on account of his failure to submit information promptly.
- D. Review Times: The schedule of shop drawings shall include 14 calendar days for review of each submittal by the Architect, although the Architect will attempt to review submittals as quickly as possible. For complex submittals allow for a ten-calendar day resubmittal review time by the Architect, if required. Revise submittal schedule and resubmit when progress deviates from previous schedule by 7 calendar days.

1.7 PREPARATION OF SUBMITTALS

- A. Show Contractor's executed review and approval marking and provide space for Architect's "Action" marking. Package each submittal appropriately for transmittal and handling. Submittals which are received from sources other than through Contractor's office will be returned "without action".
 - 1. Installer's Copy: Do not proceed with ordering or installation of materials, products or systems until final copy of applicable submittal is in possession of Installer.

1.8 ADDITIONAL DISTRIBUTION AND COORDINATION OF SUBMITTALS BY CONTRACTOR

- A. Provide additional distribution of submittals (not included in foregoing copy submittal requirements) to subcontractors, suppliers, fabricators, installers, governing authorities and others as necessary for proper coordination of the work. Include such additional copies in transmittal to Architect where required to receive "Action" marking before final distribution. Show such distributions on transmittal forms.

1.9 SPECIFIC-CATEGORY SUBMITTAL REQUIREMENTS

- A. Shop drawing and product data submittals shall be transmitted to Architect in electronic (PDF) format using **Submittal Exchange or ProCore**, a cloud-based website service designed specifically for transmitting submittals between construction team members, and overall management of all types of documentation during the construction process.
- B. The intent of electronic submittals is to expedite the construction process by reducing paperwork, improving information flow, and decreasing turnaround time.
- C. The electronic submittal process is not intended for color samples, color charts, or physical material samples.

1.10 PROCEDURES

- A. Submittal Preparation: Contractor may use any or all of the following options:
 - 1. Subcontractors and Suppliers provide electronic (PDF) submittals to Contractor via the project management website.
 - 2. Subcontractors and Suppliers provide paper submittals to General Contractor who electronically scans and converts to PDF format.

3. Subcontractors and Suppliers provide paper submittals to Scanning Service which electronically scans and converts to PDF format.
- B. Contractor shall review and apply electronic stamp certifying that the submittal complies with the requirements of the Contract Documents including verification of manufacturer / product, dimensions, and coordination of information with other parts of the work.
- C. Contractor shall transmit each submittal to Architect, and any other designated construction team members using the project management system.
- D. Architect / Engineer review comments will be made available on the management website for downloading. Contractor will receive email notice of completed review.
- E. Distribution of reviewed submittals to subcontractors and suppliers is the responsibility of the Contractor.

1.11 COSTS

- A. General Contractor shall include the full cost of the project management system subscription in their bid proposal. This cost shall be included in the Contract Amount. The GC shall directly verify such costs with the service provider prior to bid.

1.12 INTERNET SERVICE AND EQUIPMENT REQUIREMENTS

- A. Email address and Internet access at Contractor's main office.
- B. Adobe Acrobat (www.adobe.com), Bluebeam PDF Revu (www.bluebeam.com), or other similar PDF review software for applying electronic stamps and comments.

1.13 MATERIAL SAFETY DATA SHEETS (MSDS)

- A. Comply with OSHA Globally Harmonized Criteria.

1.14 EQUIPMENT SUBMITTALS

- A. Submit all submittals for equipment in a given system, such as an air handling system, at one time.
 1. Piping, conduit, equipment, etc. submittals shall be accompanied with support/suspension information intended to be used for installation.

1.15 SAMPLES

- A. Provide units identical with final condition of proposed materials or products for the work. Include "range" samples (not less than 3 units) where unavoidable variations are to be expected and describe or identify variations between units of each set. Provide full set of optional samples where Architect's selection is required. Prepare samples to match Architect's sample where so indicated. Include information with each sample to show generic description, source or product name and manufacturer, limitations, and compliance with standards. Samples are submitted for review and confirmation of color, pattern, texture, and "kind" by Architect. Architect will not "test" samples (except as otherwise indicated) for compliance with other requirements, which are therefore the exclusive responsibility of the Contractor.

1.16 INSPECTION AND TEST REPORTS

- A. Classify each as either "shop drawing" or "product data", depending upon whether report is uniquely prepared for project or a standard publication of workmanship control testing at point of production, and process accordingly.

1.17 MATERIALS AND TOOLS

- A. Refer to individual work sections for required quantities of spare parts, extra and overrun stock, maintenance tools and devices, keys, and similar physical units to be submitted.

1.18 ACTION ON SUBMITTALS

- A. Architect's Action: Where action and return is required, Architect will review each submittal and return with comments within a reasonable period of time. Where submittal must be held for coordination, Contractor will be so advised without delay.
- B. Review comments may be interpreted as follows:
 - 1. "Approved" or "Reviewed": Work may proceed, provided it complies with Contract Documents.
 - 2. "Approved As Noted", "Correct as Noted", or "Reviewed with Comments": Work may proceed, provided it complies with notations and corrections on submittal and with Contract Documents. This may include some portions of submittals to be resubmitted or additional information to be provided.
 - 3. Revise and Resubmit", "Not Approved", "Rejected", or "Submit Specified Item": Do not proceed with the work. Revise submittal in accordance with notations and corrections and resubmit without delay.

PART 2 – PRODUCTS – NOT USED

PART 3 – EXECUTION – NOT USED

END OF SECTION 013300

SECTION 013526 - SAFETY REQUIREMENTS

TABLE OF CONTENTS

1.1 APPLICABLE PUBLICATIONS:.....	2
1.2 DEFINITIONS:.....	3
1.3 REGULATORY REQUIREMENTS:.....	4
1.4 ACCIDENT PREVENTION PLAN (APP):.....	4
1.5 ACTIVITY HAZARD ANALYSES (AHAs):.....	9
1.6 PRECONSTRUCTION CONFERENCE:.....	10
1.7 "SITE SAFETY AND HEALTH OFFICER" (SSHO) and "COMPETENT PERSON" (CP):...	10
1.8 TRAINING:.....	11
1.9 INSPECTIONS:.....	11
1.10 ACCIDENTS, OSHA 300 LOGS, AND MAN-HOURS:.....	12
1.11 PERSONAL PROTECTIVE EQUIPMENT (PPE):.....	13
1.14 FIRE SAFETY.....	13
1.15 ELECTRICAL.....	15
1.16 FALL PROTECTION.....	16
1.17 SCAFFOLDS AND OTHER WORK PLATFORMS.....	17
1.18 EXCAVATION AND TRENCHES.....	17
1.19 CRANES.....	19
1.20 CONTROL OF HAZARDOUS ENERGY (LOCKOUT/TAGOUT).....	20
1.21 CONFINED SPACE ENTRY.....	20
1.22 WELDING AND CUTTING.....	20
1.23 LADDERS.....	20
1.24 FLOOR & WALL OPENINGS.....	21

SECTION 013526 - SAFETY REQUIREMENTS

PART 1 - GENERAL

1.1 APPLICABLE PUBLICATIONS:

- A. Latest publications listed below form part of this Article to extent referenced. Publications are referenced in text by basic designations only.
- B. American Society of Safety Engineers (ASSE):
 - A10.1-2011 Pre-Project & Pre-Task Safety and Health Planning
 - A10.34-2012 Protection of the Public on or Adjacent to Construction Sites
 - A10.38-2013 Basic Elements of an Employer's Program to Provide a Safe and Healthful Work Environment American National Standard Construction and Demolition Operations
- C. American Society for Testing and Materials (ASTM):
 - E84-2013 Surface Burning Characteristics of Building Materials
- D. The Facilities Guidelines Institute (FGI):
 - FGI Guidelines for Design and Construction of Hospitals, latest version
 - FGI Guidelines for Design and Construction of Outpatient Facilities, latest version
- E. National Fire Protection Association (NFPA):
 - 10 Standard for Portable Fire Extinguishers
 - 30 Flammable and Combustible Liquids Code
 - 51B Standard for Fire Prevention During Welding, Cutting and Other Hot Work
 - 70 National Electrical Code
 - 70B Recommended Practice for Electrical Equipment Maintenance
 - 70E Standard for Electrical Safety in the Workplace
 - 99 Health Care Facilities Code
 - 101 Life Safety Code

241 Standard for Safeguarding Construction, Alteration, and
Demolition Operations

F. The Joint Commission (TJC)

TJC Manual Comprehensive Accreditation and Certification Manual

G. U.S. Occupational Safety and Health Administration (OSHA):

29 CFR 1910 Safety and Health Regulations for General Industry

29 CFR 1926 Safety and Health Regulations for Construction Industry

1.2 DEFINITIONS:

- A. Critical Lift. A lift with the hoisted load exceeding 75% of the crane's maximum capacity; lifts made out of the view of the operator (blind picks); lifts involving two or more cranes; personnel being hoisted; and special hazards such as lifts over occupied facilities, loads lifted close to power-lines, and lifts in high winds or where other adverse environmental conditions exist; and any lift which the crane operator believes is critical.
- B. OSHA "Competent Person" (CP). One who is capable of identifying existing and predictable hazards in the surroundings and working conditions which are unsanitary, hazardous or dangerous to employees, and who has the authorization to take prompt corrective measures to eliminate them (see 29 CFR 1926.32(f)).
- C. "Qualified Person" means one who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training and experience, has successfully demonstrated his ability to solve or resolve problems relating to the subject matter, the work, or the project.
- D. High Visibility Accident. Any mishap which may generate publicity or high visibility.
- E. Accident/Incident Criticality Categories:
 - 1. No impact – near miss incidents that should be investigated but are not required to be reported to the Government;
 - 2. Minor incident/impact – incidents that require first aid or result in minor equipment damage (less than \$5000). These incidents must be investigated but are not required to be reported to the Government;
 - 3. Moderate incident/impact – Any work-related injury or illness that results in:
 - a. Days away from work (any time lost after day of injury/illness onset);

- b. Restricted work;
 - c. Transfer to another job;
 - d. Medical treatment beyond first aid;
 - e. Loss of consciousness;
 - 4. A significant injury or illness diagnosed by a physician or other licensed health care professional, even if it did not result in (1) through (5) above or,
 - 5. Any incident that leads to major equipment damage (greater than \$5000).
- F. These incidents must be investigated and are required to be reported to the Government;
- 1 Major incident/impact – Any mishap that leads to fatalities, hospitalizations, amputations, and losses of an eye as a result of contractors' activities. Or any incident which leads to major property damage (greater than \$20,000) and/or may generate publicity or high visibility. These incidents must be investigated and are required to be reported to the Government as soon as practical, but not later than 2 hours after the incident.
- G. Medical Treatment. Treatment administered by a physician or by registered professional personnel under the standing orders of a physician. Medical treatment does not include first aid treatment even though provided by a physician or registered personnel.

1.3 REGULATORY REQUIREMENTS:

- A. In addition to the detailed requirements included in the provisions of this contract, comply with 29 CFR 1926, comply with 29 CFR 1910 as incorporated by reference within 29 CFR 1926, comply with ASSE A10.34, and all applicable [federal, state, and local] laws, ordinances, criteria, rules and regulations. Submit matters of interpretation of standards for resolution before starting work. Where the requirements of this specification, applicable laws, criteria, ordinances, regulations, and referenced documents vary, the most stringent requirements govern except with specific approval and acceptance by the Contracting Officer Representative.

1.4 ACCIDENT PREVENTION PLAN (APP):

- A. The APP (aka Construction Safety & Health Plan) shall interface with the Contractor's overall safety and health program. Include any portions of the Contractor's overall safety and health program referenced in the APP in the applicable APP element and ensure it is site-specific. The Government considers the Prime Contractor to be the "controlling authority" for all worksite safety and health of each subcontractor(s). Contractors are responsible for informing their subcontractors of the safety provisions under the terms of the contract and the penalties for noncompliance, coordinating the work to prevent one craft from interfering with or creating

hazardous working conditions for other crafts, and inspecting subcontractor operations to ensure that accident prevention responsibilities are being carried out.

B. The APP shall be prepared as follows:

1. Written in English by a qualified person who is employed by the Prime Contractor articulating the specific work and hazards pertaining to the contract (model language can be found in ASSE A10.33). Specifically articulating the safety requirements found within these Government contract safety specifications. APP shall be made available in other languages as necessary to convey the contents of the plan.
2. Address both the Prime Contractors and the subcontractors work operations.
3. State measures to be taken to control hazards associated with materials, services, or equipment provided by suppliers.
4. Address all the elements/sub-elements and in order as follows:
 - a. **SIGNATURE SHEET.** Title, signature, and phone number of the following:
 - 1) Plan preparer (Qualified Person such as corporate safety staff person or contracted Certified Safety Professional with construction safety experience);
 - 2) Plan approver (company/corporate officers authorized to obligate the company);
 - 3) Plan concurrence (e.g., Chief of Operations, Corporate Chief of Safety, Corporate Industrial Hygienist, project manager or superintendent, project safety professional). Provide concurrence of other applicable corporate and project personnel (Contractor).
 - b. **BACKGROUND INFORMATION.** List the following:
 - 1) Contractor;
 - 2) Contract number;
 - 3) Project name;
 - 4) Brief project description, description of work to be performed, and location; phases of work anticipated (these will require an AHA).
 - c. **STATEMENT OF SAFETY AND HEALTH POLICY.** Provide a copy of current corporate/company Safety and Health Policy Statement, detailing commitment to providing a safe and healthful workplace for all employees. The Contractor's written

safety program goals, objectives, and accident experience goals for this contract should be provided.

d. **RESPONSIBILITIES AND LINES OF AUTHORITIES.** Provide the following:

- 1) A statement of the employer's ultimate responsibility for the implementation of the Safety and Occupational Health (SOH) program;
- 2) Identification and accountability of personnel responsible for safety at both corporate and project level. Contracts specifically requiring safety or industrial hygiene personnel shall include a copy of their resumes.
- 3) The names of Competent and/or Qualified Person(s) and proof of competency/qualification to meet specific OSHA Competent/Qualified Person(s) requirements must be attached.
- 4) Requirements that no work shall be performed unless a designated competent person is present on the job site;
- 5) Requirements for pre-task Activity Hazard Analysis (AHAs);
- 6) Lines of authority;
- 7) Policies and procedures regarding noncompliance with safety requirements (to include disciplinary actions for violation of safety requirements) should be identified;

e. **SUBCONTRACTORS AND SUPPLIERS.** If applicable, provide procedures for coordinating SOH activities with other employers on the job site:

- 1) Identification of subcontractors and suppliers (if known);
- 2) Safety responsibilities of subcontractors and suppliers.

f. **TRAINING.**

- 1) Site-specific SOH orientation training at the time of initial hire or assignment to the project for every employee before working on the project site is required.
- 2) Mandatory training and certifications that are applicable to this project (e.g., explosive actuated tools, crane operator, rigger, crane signal person, fall protection, electrical lockout/NFPA 70E, machine/equipment lockout, confined space, etc...) and any requirements for periodic retraining/recertification are required.
- 3) Procedures for ongoing safety and health training for supervisors and employees shall be established to address changes in site hazards/conditions.

- 4) OSHA 10-hour training is required for all workers on site and the OSHA 30-hour training is required for Trade Competent Persons (CPs)

g. SAFETY AND HEALTH INSPECTIONS.

- 1) Specific assignment of responsibilities for a minimum daily job site safety and health inspection during periods of work activity: Who will conduct (e.g., "Site Safety and Health CP"), proof of inspector's training/qualifications, when inspections will be conducted, procedures for documentation, deficiency tracking system, and follow-up procedures.
- 2) Any external inspections/certifications that may be required (e.g., contracted CSP or CSHT)

h. ACCIDENT/INCIDENT INVESTIGATION & REPORTING. The Contractor shall conduct mishap investigations of all Moderate and Major as well as all High Visibility Incidents. The APP shall include accident/incident investigation procedure and identify person(s) responsible to provide the following to the Contracting Officer Representative:

- 1) Exposure data (man-hours worked);
- 2) Accident investigation reports;
- 3) Project site injury and illness logs.

i. PLANS (PROGRAMS, PROCEDURES) REQUIRED. Based on a risk assessment of contracted activities and on mandatory OSHA compliance programs, the Contractor shall address all applicable occupational, patient, and public safety risks in site-specific compliance and accident prevention plans. These Plans shall include but are not be limited to procedures for addressing the risks associates with the following:

- 1) Emergency response;
- 2) Contingency for severe weather;
- 3) Fire Prevention;
- 4) Medical Support;
- 5) Posting of emergency telephone numbers;
- 6) Prevention of alcohol and drug abuse;
- 7) Site sanitation (housekeeping, drinking water, toilets);
- 8) Night operations and lighting;

- 9) Hazard communication program;
 - 10) Welding/Cutting "Hot" work;
 - 11) Electrical Safe Work Practices (Electrical LOTO/NFPA 70E);
 - 12) General Electrical Safety;
 - 13) Hazardous energy control (Machine LOTO);
 - 14) Site-Specific Fall Protection & Prevention;
 - 15) Excavation/trenching;
 - 16) Asbestos abatement;
 - 17) Lead abatement;
 - 19) Respiratory protection;
 - 20) Health hazard control program;
 - 21) Heat/Cold Stress Monitoring;
 - 22) Crystalline Silica Monitoring (Assessment);
 - 23) Demolition plan (to include engineering survey);
 - 24) Formwork and shoring erection and removal;
 - 25) PreCast Concrete;
 - 26) Public (Mandatory compliance with ANSI/ASSE A10.34-2012).
- C. Submit the APP to the Contracting Officer Representative for review for compliance with contract requirements in accordance with Section 013300 SUBMITTALS 15 calendar days prior to commencement of on-site work. Work cannot proceed without an accepted APP.
- D. Once accepted by the Contracting Officer Representative, the APP and attachments will be enforced as part of the contract. Disregarding the provisions of this contract or the accepted APP will be cause for stopping of work, at the discretion of the Contracting Officer in accordance with FAR Clause 52.236-13, *Accident Prevention*, until the matter has been rectified.
- E. Once work begins, changes to the accepted APP shall be made with the knowledge and concurrence of the Contracting Officer Representative Should any severe hazard exposure, i.e. imminent danger, become evident, stop work in the area, secure the area, and develop a plan to remove the exposure and control the hazard. Notify the Contracting Officer within 24 hours of discovery. Eliminate/remove the hazard. In the interim, take all necessary action to restore and

maintain safe working conditions in order to safeguard onsite personnel, visitors, the public and the environment.

1.5 ACTIVITY HAZARD ANALYSES (AHAs):

- A. AHAs are also known as Job Hazard Analyses, Job Safety Analyses, and Activity Safety Analyses. Before beginning each work activity involving a type of work presenting hazards not experienced in previous project operations or where a new work crew or sub-contractor is to perform the work, the Contractor(s) performing that work activity shall prepare an AHA.
- B. AHAs shall define the activities being performed and identify the work sequences, the specific anticipated hazards, site conditions, equipment, materials, and the control measures to be implemented to eliminate or reduce each hazard to an acceptable level of risk.
- C. Work shall not begin until the AHA for the work activity has been accepted by the Contracting Officer Representative and discussed with all engaged in the activity, including the Contractor, subcontractor(s), and Government on-site representatives at preparatory and initial control phase meetings.
 - 1. The names of the Competent/Qualified Person(s) required for a particular activity (for example, excavations, scaffolding, fall protection, other activities as specified by OSHA and/or other State and Local agencies) shall be identified and included in the AHA. Certification of their competency/qualification shall be submitted to the Contracting Officer Representative for acceptance prior to the start of that work activity.
 - 2. The AHA shall be reviewed and modified as necessary to address changing site conditions, operations, or change of competent/qualified person(s).
 - a. If more than one Competent/Qualified Person is used on the AHA activity, a list of names shall be submitted as an attachment to the AHA. Those listed must be Competent/Qualified for the type of work involved in the AHA and familiar with current site safety issues.
 - b. If a new Competent/Qualified Person (not on the original list) is added, the list shall be updated (an administrative action not requiring an updated AHA). The new person shall acknowledge in writing that he or she has reviewed the AHA and is familiar with current site safety issues.
 - 3. The AHA list will be reviewed periodically (at least monthly) at the Contractor supervisory safety meeting and updated as necessary when procedures, scheduling, or hazards change.
 - 5. Develop the activity hazard analyses using the project schedule as the basis for the activities performed. All activities listed on the project schedule will require an AHA. The AHAs will be

developed by the contractor, supplier, or subcontractor and provided to the prime contractor for review and approval and maintained onsite for review by Contracting Officer Representative.

1.6 PRECONSTRUCTION CONFERENCE:

- A. Contractor representatives who have a responsibility or significant role in implementation of the accident prevention program, as required by 29 CFR 1926.20(b)(1), on the project shall attend the preconstruction conference to gain a mutual understanding of its implementation. This includes the project superintendent, subcontractor superintendents, and any other assigned safety and health professionals.
- B. Deficiencies in the submitted APP will be brought to the attention of the Contractor within 14 days of submittal, and the Contractor shall revise the plan to correct deficiencies and re-submit it for acceptance. Do not begin work until there is an accepted APP.

1.7 "SITE SAFETY AND HEALTH OFFICER" (SSHO) and "COMPETENT PERSON" (CP):

- A. The Prime Contractor shall designate a minimum of one SSHO at each project site that will be identified as the SSHO to administer the Contractor's safety program and government-accepted Accident Prevention Plan. Each subcontractor shall designate a minimum of one CP in compliance with 29 CFR 1926.20 (b)(2) that will be identified as a CP to administer their individual safety programs.
- B. Further, all specialized Competent Persons for the work crews will be supplied by the respective contractor as required by 29 CFR 1926 (i.e. Asbestos, Electrical, Cranes, & Derricks, Demolition, Fall Protection, Fire Safety/Life Safety, Ladder, Rigging, Scaffolds, and Trenches/Excavations).
- C. These Competent Persons can have collateral duties as the subcontractor's superintendent and/or work crew lead persons as well as fill more than one specialized CP role (i.e. Asbestos, Electrical, Cranes, & Derricks, Demolition, Fall Protection, Fire Safety/Life Safety, Ladder, Rigging, Scaffolds, and Trenches/Excavations).
- D. The SSHO or an equally-qualified Designated Representative/alternate will maintain a presence on the site during construction operations in accordance with FAR Clause 52.236-6: *Superintendence by the Contractor*. CPs will maintain presence during their construction activities in accordance with above mentioned clause. A listing of the designated SSHO and all known CPs shall be submitted prior to the start of work as part of the APP with the training documentation and/or AHA as listed in Section 1.8 below.
- E. The repeated presence of uncontrolled hazards during a contractor's work operations will result in the designated CP as being deemed incompetent and result in the required removal of the employee in accordance with FAR Clause 52.236-5: Material and Workmanship, Paragraph (c).

1.8 TRAINING:

- A. The designated Prime Contractor SSHO must meet the requirements of all applicable OSHA standards and be capable (through training, experience, and qualifications) of ensuring that the requirements of 29 CFR 1926.16 and other appropriate Federal, State, Tribal, and local requirements are met for the project. As a minimum the SSHO must have completed the OSHA 30-hour Construction Safety class and have five (5) years of construction industry safety experience or three (3) years if he/she possesses a Certified Safety Professional (CSP) or certified Construction Safety and Health Technician (CSHT) certification or have a safety and health degree from an accredited university or college.
- B. All designated CPs shall have completed the OSHA 30-hour Construction Safety course within the past 5 years.
- C. In addition to the OSHA 30 Hour Construction Safety Course, all CPs with high hazard work operations such as operations involving asbestos, electrical, cranes, demolition, work at heights/fall protection, fire safety/life safety, ladder, rigging, scaffolds, and trenches/excavations shall have a specialized formal course in the hazard recognition & control associated with those high hazard work operations. Documented "repeat" deficiencies in the execution of safety requirements will require retaking the requisite formal course.
- D. All other construction workers shall have the OSHA 10-hour Construction Safety Outreach course and any necessary safety training to be able to identify hazards within their work environment.
- E. Prior to any worker for the contractor or subcontractors beginning work, they shall undergo a safety briefing provided by the SSHO or his/her designated representative. As a minimum, this briefing shall include information on the site-specific hazards, construction limits, Service Unit safety guidelines, means of egress, break areas, work hours, locations of restrooms, use of Government furnished equipment, emergency procedures, accident reporting etc... Documentation shall be provided to the Contracting Officer Representative that individuals have undergone contractor's safety briefing.
- G. Ongoing safety training will be accomplished in the form of weekly documented safety meeting.

1.9 INSPECTIONS:

- A. The SSHO shall conduct frequent and regular safety inspections (daily) of the site and each of the subcontractors CPs shall conduct frequent and regular safety inspections (daily) of their work operations as required by 29 CFR 1926.20(b)(2). Each week, the SSHO shall conduct a formal documented inspection of the entire construction areas with the subcontractors' "Trade Safety and Health CPs" present in their work areas. Coordinate with, and report findings and corrective actions weekly to Contracting Officer Representative.

- B. A Certified Safety Professional (CSP) with specialized knowledge in construction safety or a certified Construction Safety and Health Technician (CSHT) shall randomly conduct a monthly site safety inspection. The CSP or CSHT can be a corporate safety professional or independently contracted. The CSP or CSHT will provide their certificate number on the required report for verification as necessary.
1. Results of the inspection will be documented with tracking of the identified hazards to abatement.
 2. The Contracting Officer Representative will be notified immediately prior to start of the inspection and invited to accompany the inspection.
 3. Identified hazard and controls will be discussed to come to a mutual understanding to ensure abatement and prevent future reoccurrence.
 4. A report of the inspection findings with status of abatement will be provided to the Contracting Officer within one week of the onsite inspection.

1.10 ACCIDENTS, OSHA 300 LOGS, AND MAN-HOURS:

- A. The prime contractor shall establish and maintain an accident reporting, recordkeeping, and analysis system to track and analyze all injuries and illnesses, high visibility incidents, and accidental property damage (both government and contractor) that occur on site. Notify the ~~the~~ Contracting Officer Representative as soon as practical, but no more than four hours after any accident meeting the definition of a Moderate or Major incidents, High Visibility Incidents, or any weight handling and hoisting equipment accident. Within notification include contractor name; contract title; type of contract; name of activity, installation, or location where accident occurred; date and time of accident; names of personnel injured; extent of property damage, if any; extent of injury, if known, and brief description of accident (to include type of construction equipment used, PPE used, etc.). Preserve the conditions and evidence on the accident site until the Contracting Officer Representative determine whether a government investigation will be conducted.
- B. Conduct an accident investigation for all Minor, Moderate and Major incidents as defined in paragraph DEFINITIONS, and property damage accidents resulting in at least \$20,000 in damages, to establish the root cause(s) of the accident. Schedule a meeting within five (5) days with the COR and Facility Safety Officer to complete an ISTAR incident report.
- C. A summation of all man-hours worked by the contractor and associated sub-contractors for each month shall be available to the Contracting Officer Representative monthly.

- D. A summation of all Minor, Moderate, and Major incidents experienced on site by the contractor and associated sub-contractors for each month will be provided to the Contracting Officer Representative monthly. The contractor and associated sub-contractors' OSHA 300 logs will be made available to the Contracting Officer Representative as requested.

1.11 PERSONAL PROTECTIVE EQUIPMENT (PPE):

- A. PPE is governed in all areas by the nature of the work the employee is performing. For example, specific PPE required for performing work on electrical equipment is identified in NFPA 70E, Standard for Electrical Safety in the Workplace.
- B. Mandatory PPE shall be defined by the AHAs and the work conditions in the space.

1.14 FIRE SAFETY

- A. Fire Safety Plan: Establish and maintain a site-specific fire protection program in accordance with 29 CFR 1926. Prior to start of work, prepare a plan detailing project-specific fire safety measures, including periodic status reports, and submit to Contracting Officer Representative for review for compliance with contract requirements in accordance with 013300 SUBMITTALS. This plan may be an element of the Accident Prevention Plan.
- B. Site and Building Access: Maintain free and unobstructed access to facility emergency services and for fire, police and other emergency response forces in accordance with NFPA 241.
- E. Temporary Heating and Electrical: Install, use and maintain installations in accordance with 29 CFR 1926, NFPA 241 and NFPA 70.
- F. Means of Egress: Any changes to the Means of Egress shall be coordinated via a meeting with the Facility Safety Officer and Contracting Officer Representative through a preconstruction risk assessment (PCRA).
- G. Egress Routes for Construction Workers: Maintain free and unobstructed egress. Inspect daily. Report findings and corrective actions weekly to Contracting Officer Representative.
- H. Fire Extinguishers: Provide and maintain extinguishers in construction areas and temporary storage areas in accordance with 29 CFR 1926, NFPA 241 and NFPA 10.
- L. Existing Fire Protection: Do not impair automatic sprinklers, smoke and heat detection, and fire alarm systems, except for portions immediately under construction, and temporarily for connections. Provide fire watch for impairments more than 4 hours in a 24-hour period. Schedule interruptions in advance through a PCRA meeting. All existing or temporary fire protection systems (fire alarms, sprinklers) located in construction areas shall be tested as coordinated with the medical center. Parameters for the testing and results of any tests performed shall be

recorded by the medical center and copies provided to the Facility Manager and Contracting Officer Representative.

- M. Smoke Detectors: Prevent accidental operation. Remove temporary covers at end of work operations each day. Coordinate with Contracting Officer Representative.

N. **HOT WORK PERMIT**

(a) Hot work is defined as operations including, but not limited to, cutting, welding, thermal welding, brazing, soldering, grinding, thermal spraying, thawing pipes, or any similar situation. If such work is required, whenever possible, the contractor must notify the COR/Project Manager no less than fourteen day in advance of such work. The Facility Safety Officer will inspect the work area and issue a Hot Work Permit, authorizing the performance of such work.

(b) All hot work will be performed in compliance with the medical center's policy regarding Hot Work Permits and NFPA 241 and NFPA 51B; and applicable OSHA Standards. A Hot Work Permit will only be issued to individuals familiar with these regulations.

(c) A Hot Work Permit will be issued only for the period necessary to perform such work. A Hot Work Permit will apply only to the location identified on the permit. If additional areas involve hot work, then additional permits must be requested. All fire protection, detection and monitoring systems are to be returned to active status at the end of each work day. If this is not possible, the contractor will provide a continuous fire watch until the system(s) are reactivated.

(d) Contractors will not be allowed to perform hot work processes without the appropriate permit.

(e) Any work involving the medical center's fire protection system will require reasonable advance notification. Under no circumstance will the contractor or employee attempt to alter or tamper with the existing fire protection system.

The Facility Safety Officer will be notified within 30 minutes of the completion of all hot work to perform an inspection of the area to confirm that sparks or drops of hot metal are not present.

- O. Fire Hazard Prevention and Safety Inspections: Inspect entire construction areas weekly. Coordinate with, and report findings and corrective actions weekly to Contracting Officer Representative.

- P. Smoking: The use of tobacco products is prohibited on all IHS-operated properties (IHM, Part 5, Chapter 3) The term "tobacco" includes cigarettes, e-cigarettes, cigars, pipes, chewing tobacco, smokeless tobacco, electronic nicotine device system, and any other tobacco products. Security personnel may ask visitors who refuse to comply with the policy to leave the property and may document the incident.

- Q. Contractor shall remove and dispose of excess materials, debris, or waste generated by this project at an approved off-site location in accordance with applicable Local, Tribal, State and

Federal laws and regulations, and pay any related fees. Burning or burial of materials is not permitted. Contractor shall provide all required waste storage containers and coordinate their location on site with the COR or Facility Manager. Contractor shall remove and dispose of excess materials, debris, or waste generated by this project at an approved off-site location in accordance with applicable Local, Tribal, State and Federal laws and regulations, and pay any related fees. Burning or burial of materials is not permitted. Contractor shall provide all required waste storage containers and coordinate their location on site with the COR or Facility Manager..

1.15 ELECTRICAL

- A. All electrical work shall comply with NFPA 70 (NEC), NFPA 70B, NFPA 70E, 29 CFR Part 1910 Subpart J – General Environmental Controls, 29 CFR Part 1910 Subpart S – Electrical, and 29 CFR 1926 Subpart K in addition to other references required by contract.
- B. All qualified persons performing electrical work under this contract shall be licensed journeyman or master electricians. All apprentice electricians performing under this contract shall be deemed unqualified persons unless they are working under the immediate supervision of a licensed electrician or master electrician.
- C. All electrical work will be accomplished de-energized and in the Electrically Safe Work Condition (refer to NFPA 70E for Work Involving Electrical Hazards, including Exemptions to Work Permit). Any Contractor, subcontractor or temporary worker who fails to fully comply with this requirement is subject to immediate termination in accordance with FAR clause 52.236-5(c). Only in rare circumstance where achieving an electrically safe work condition prior to beginning work would increase or cause additional hazards, or is infeasible due to equipment design or operational limitations is energized work permitted. The Contracting Officer Representative with approval of the Facility Safety Officer will make the determination if the circumstances would meet the exception outlined above. An AHA specific to energized work activities will be developed, reviewed, and accepted by the Government prior to the start of that activity.
 - 1. Development of a Hazardous Electrical Energy Control Procedure is required prior to de-energization. A single Simple Lockout/Tagout Procedure for multiple work operations can only be used for work involving qualified person(s) de-energizing one set of conductors or circuit part source. Task specific Complex Lockout/Tagout Procedures are required at all other times.
 - 2. Verification of the absence of voltage after de-energization and lockout/tagout is considered “energized electrical work” (live work) under NFPA 70E, and shall only be performed by

- qualified persons wearing appropriate shock protective (voltage rated) gloves and arc rate personal protective clothing and equipment, using Underwriters Laboratories (UL) tested and appropriately rated contact electrical testing instruments or equipment appropriate for the environment in which they will be used.
3. Personal Protective Equipment (PPE) and electrical testing instruments will be readily available for inspection by the Contracting Officer Representative.
- D. Before beginning any electrical work, an Activity Hazard Analysis (AHA) will be conducted to include Shock Hazard and Arc Flash Hazard analyses (NFPA Tables can be used only as a last alternative and it is strongly suggested a full Arc Flash Hazard Analyses be conducted). Work shall not begin until the AHA for the work activity for energized work has been reviewed and accepted by the Contracting Officer Representative and discussed with all engaged in the activity, including the Contractor, subcontractor(s), and Government on-site representatives at preparatory and initial control phase meetings.
- E. Ground-fault circuit interrupters. GFCI protection shall be provided where an employee is operating or using cord- and plug-connected tools related to construction activity supplied by 125-volt, 15-, 20-, or 30- ampere circuits. Where employees operate or use equipment supplied by greater than 125-volt, 15-, 20-, or 30- ampere circuits, GFCI protection or an assured equipment grounding conductor program shall be implemented in accordance with NFPA 70E, Chapter 1, Article 110.4(C)(2)-

1.16 FALL PROTECTION

- A. The fall protection (FP) threshold height requirement is 6 ft (1.8 m) for ALL WORK, unless specified differently or the OSHA 29 CFR 1926 requirements are more stringent, to include steel erection activities, systems-engineered activities (prefabricated) metal buildings, residential (wood) construction and scaffolding work.
1. The use of a Safety Monitoring System (SMS) as a fall protection method is prohibited.
 2. The use of Controlled Access Zone (CAZ) as a fall protection method is prohibited.
 3. A Warning Line System (WLS) may ONLY be used on floors or flat or low-sloped roofs (between 0 - 18.4 degrees or 4:12 slope) and shall be erected around all sides of the work area (See 29 CFR 1926.502(f) for construction of WLS requirements). Working within the WLS does not require FP. No worker shall be allowed in the area between the roof or floor edge and the WLS without FP. FP is required when working outside the WLS.
 4. Fall protection while using a ladder will be governed by the OSHA requirements.

1.17 SCAFFOLDS AND OTHER WORK PLATFORMS

- A. All scaffolds and other work platforms construction activities shall comply with 29 CFR 1926 Subpart L.
- B. The fall protection (FP) threshold height requirement is 6 ft (1.8 m) as stated in Section 1.16.
- C. The following hierarchy and prohibitions shall be followed in selecting appropriate work platforms.
 - 1. Scaffolds, platforms, or temporary floors shall be provided for all work except that can be performed safely from the ground or similar footing.
 - 2. Ladders less than 20 feet may be used as work platforms only when use of small hand tools or handling of light material is involved.
 - 3. Ladder jacks, lean-to, and prop-scaffolds are prohibited.
 - 4. Emergency descent devices shall not be used as working platforms.
- D. Contractors shall use a scaffold tagging system in which all scaffolds are tagged by the Competent Person. Tags shall be color-coded: green indicates the scaffold has been inspected and is safe to use; red indicates the scaffold is unsafe to use. Tags shall be readily visible, made of materials that will withstand the environment in which they are used, be legible and shall include:
 - 1. The Competent Person's name and signature;
 - 2. Dates of initial and last inspections.

1.18 EXCAVATION AND TRENCHES

- A. All excavation and trenching work shall comply with 29 CFR 1926 Subpart P. Excavations less than 5 feet in depth require evaluation by the contractor's "Competent Person" (CP) for determination of the necessity of an excavation protective system where kneeling, laying in, or stooping within the excavation is required.
- B. All excavations and trenches 24 inches in depth or greater shall require a written trenching and excavation plan; including a permit (NOTE – some States and other local jurisdictions require separate state/jurisdiction-issued excavation permits). The permit shall have two sections, one section will be completed prior to digging or drilling and the other will be completed prior to personnel entering the excavations greater than 5 feet in depth. Each section of the permit shall be provided to the Contracting Officer Representative prior to proceeding with digging or drilling and prior to proceeding with entering the excavation. After completion of the work and prior to opening a new section of an excavation, the permit shall be closed out and provided to the

Contracting Officer Representative The permit shall be maintained onsite and the first section of the permit shall include the following:

1. Estimated start time & stop time. Specific location and nature of the work.
 2. Indication of the contractor's "Competent Person" (CP) in excavation safety with qualifications and signature. Formal course in excavation safety is required by the contractor's CP.
 3. Indication of whether soil or concrete removal to an offsite location is necessary.
 4. Indication of whether soil samples are required to determined soil contamination.
 5. Indication of coordination with local authority (i.e. "One Call") or contractor's effort to determine utility location with search and survey equipment.
 6. Indication of review of site drawings for proximity of utilities to digging/drilling.
- C. The second section of the permit for excavations greater than five feet in depth shall include the following:
1. Determination of OSHA classification of soil. Soil samples will be from freshly dug soil with samples taken from different soil type layers as necessary and placed at a safe distance from the excavation by the excavating equipment. A pocket penetrometer will be utilized in determination of the unconfined compression strength of the soil for comparison against OSHA table (Less than 0.5 Tons/FT² – Type C, 0.5 Tons/FT² to 1.5 Tons/FT² – Type B, greater than 1.5 Tons/FT² – Type A without condition to reduce to Type B).
 2. Indication of selected protective system (sloping/benching, shoring, shielding). When soil classification is identified as "Type A" or "Solid Rock", only shoring or shielding or Professional Engineer designed systems can be used for protection. A Sloping/Benching system may only be used when classifying the soil as Type B or Type C. Refer to Appendix B of 29 CFR 1926, Subpart P for further information on protective systems designs.
 3. Indication of the spoil pile being stored at least 2 feet from the edge of the excavation and safe access being provided within 25 feet of the workers.
 4. Indication of assessment for a potential toxic, explosive, or oxygen deficient atmosphere where oxygen deficiency (atmospheres containing less than 19.5 percent oxygen) or a hazardous atmosphere exists or could reasonably be expected to exist. Internal combustion engine equipment is not allowed in an excavation without providing force air ventilation to lower the concentration to below OSHA PELs, providing sufficient oxygen levels, and atmospheric testing as necessary to ensure safe levels are maintained.

- D As required by OSHA 29 CFR 1926.651(b)(1), the estimated location of utility installations, such as sewer, telephone, fuel, electric, water lines, or any other underground installations that reasonably may be expected to be encountered during excavation work, shall be determined prior to opening an excavation.
 - 1. The planned dig site will be outlined/marked in white prior to locating the utilities.
 - 2. Used of the American Public Works Association Uniform Color Code is required for the marking of the proposed excavation and located utilities.
 - 3. 811 and Tribal Utilities will be called two business days before digging on all local or State lands and public Right-of Ways.
 - 4. Digging will not commence until all known utilities are marked.
 - 5. Utility markings will be maintained.
- E. Excavations will be hand dug or excavated by other similar safe and acceptable means as excavation operations approach within 5 feet of identified underground utilities. Exploratory bar or other detection equipment will be utilized as necessary to further identify the location of underground utilities.
- F. Excavations greater than 20 feet in depth require a Professional Engineer designed excavation protective system.

1.19 CRANES

- A. All crane work shall comply with 29 CFR 1926 Subpart CC.
- B. Prior to operating a crane, the operator must be licensed, qualified or certified to operate the crane. Thus, all the provisions contained with Subpart CC are effective and there is no "Phase In" date.
- C. A detailed lift plan for all lifts shall be submitted to the Contracting Officer Representative 14 days prior to the scheduled lift complete with route for truck carrying load, crane load analysis, siting of crane and path of swing and all other elements of a critical lift plan where the lift meets the definition of a critical lift. Critical lifts require a more comprehensive lift plan to minimize the potential of crane failure and/or catastrophic loss. The plan must be reviewed and accepted by the General Contractor before being submitted to the Government for review. The lift will not be allowed to proceed without prior acceptance of this document.
- D. Crane operators shall not carry loads
 - 1. over any personnel

2. over any occupied building unless
 - a. the top two floors are vacated
 - b. or overhead protection with a design live load of 300 psf is provided

1.20 CONTROL OF HAZARDOUS ENERGY (LOCKOUT/TAGOUT)

- A. All installation, maintenance, and servicing of equipment or machinery shall comply with 29 CFR 1910.147 except for specifically referenced operations in 29 CFR 1926 such as concrete & masonry equipment [1926.702(j)], heavy machinery & equipment [1926.600(a)(3)(i)], and process safety management of highly hazardous chemicals (1926.64). Control of hazardous electrical energy during the installation, maintenance, or servicing of electrical equipment shall comply with Section 1.15 to include NFPA 70E and other Government specific requirements discussed in the section.

1.21 CONFINED SPACE ENTRY

- A. All confined space entry shall comply with 29 CFR 1926, Subpart AA except for specifically referenced operations in 29 CFR 1926 such as excavations/trenches [1926.651(g)].
- B. A site-specific Confined Space Entry Plan (including permitting process) shall be developed and submitted to the COR.

1.22 WELDING AND CUTTING

As specified in section 1.14, Hot Work: Perform and safeguard hot work operations in accordance with NFPA 241 and NFPA 51B. Submit plan to Contracting Officer Representative at least 5 working days in advance. Designate contractor's responsible project-site fire prevention program manager to plan hot work.

1.23 LADDERS

- A. All Ladder use shall comply with 29 CFR 1926 Subpart X.
- B. All portable ladders shall be of sufficient length and shall be placed so that workers will not stretch or assume a hazardous position.
- C. Manufacturer safety labels shall be in place on ladders
- D. Step Ladders shall not be used in the closed position
- E. Top steps or cap of step ladders shall not be used as a step
- F. Portable ladders, used as temporary access, shall extend at least 3 ft (0.9 m) above the upper landing surface.

1. When a 3 ft (0.9-m) extension is not possible, a grasping device (such as a grab rail) shall be provided to assist workers in mounting and dismounting the ladder.
 2. In no case shall the length of the ladder be such that ladder deflection under a load would, by itself, cause the ladder to slip from its support.
- G. Ladders shall be inspected for visible defects on a daily basis and after any occurrence that could affect their safe use. Broken or damaged ladders shall be immediately tagged "DO NOT USE," or with similar wording, and withdrawn from service until restored to a condition meeting their original design.

1.24 FLOOR & WALL OPENINGS

- A. All floor and wall openings shall comply with 29 CFR 1926 Subpart M.
- B. Floor and roof holes/openings are any that measure over 2 in (51 mm) in any direction of a walking/working surface which persons may trip or fall into or where objects may fall to the level below. Skylights located in floors or roofs are considered floor or roof hole/openings.
- C. All floor, roof openings or hole into which a person can accidentally walk or fall through shall be guarded either by a railing system with toeboards along all exposed sides or a load-bearing cover. When the cover is not in place, the opening or hole shall be protected by a removable guardrail system or shall be attended when the guarding system has been removed, or other fall protection system.
1. Covers shall be capable of supporting, without failure, at least twice the weight of the worker, equipment and material combined.
 2. Covers shall be secured when installed, clearly marked with the word "HOLE", "COVER" or "Danger, Roof Opening-Do Not Remove" or color-coded or equivalent methods (e.g., red or orange "X"). Workers must be made aware of the meaning for color coding and equivalent methods.
 3. Roofing material, such as roofing membrane, insulation or felts, covering or partly covering openings or holes, shall be immediately cut out. No hole or opening shall be left unattended unless covered.
 4. Non-load-bearing skylights shall be guarded by a load-bearing skylight screen, cover, or railing system along all exposed sides.
 5. Workers are prohibited from standing/walking on skylights.

PART 2 – PRODUCTS – (Not Used.)

Part 3 – EXECUTION – (Not Used.)

END OF SECTION 013526

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 – GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Section includes references to material mockups that are described in detail in other sections of the specifications.
- C. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-assurance and -control services needed by Architect, Owner, Commissioning Authority, or authorities having jurisdiction are not limited by provisions of this Section.
 - 4. Specific test and inspection requirements are not specified in this Section.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.3 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.
- C. Mockups: Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

1. Integrated Exterior Mockups: Mockups of the exterior envelope erected separately from the building but on Project site, consisting of multiple products, assemblies, and subassemblies.
- D. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- E. Testing Agency: An independent agency engaged to perform material tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- F. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1.4 DELEGATED DESIGN

- A. Performance And Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
- B. Delegated Design Submittals: In addition to Shop Drawings, Product Data, and other required submittals, submit a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.
 1. Reports: Testing agency will prepare and submit certified written reports that include:
 - a. Date of issue.
 - b. Project title and number.
 - c. Name, address, and telephone number of testing agency.
 - d. Dates and locations of samples and tests or inspections.
 - e. Names of individuals making tests and inspections.
 - f. Description of the Work and test and inspection method.
 - g. Identification of product and Specification Section.
 - h. Complete test or inspection data.
 - i. Test and inspection results and an interpretation of test results.
 - j. Ambient conditions at time of sample taking and testing and inspecting.
 - k. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 - l. Name and signature of laboratory inspector.

m. Recommendations on retesting and reinspecting.

2. Permits, Licenses, And Certificates: for Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.5 CONFLICTING REQUIREMENTS

- A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.6 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a verifiable record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.
- F. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- G. Mockups: Before installing portions of the Work requiring mockups, build project site mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
2. Notify Architect in advance of dates and times when mockups will be constructed.
3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at Project.
4. Demonstrate the proposed range of aesthetic effects and workmanship.
5. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
7. Mockup
 1. No mockups anticipated.

1.7 QUALITY CONTROL

A. Contractor Responsibilities:

1. Notify testing agencies at least 48 hours in advance of time when Work that requires testing or special inspections will be performed.
2. Quality-control services are Contractor's responsibility. Contractor will engage a qualified testing agency to perform these services.
 - a. Contractor will furnish Owner with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
 - b. Payment for these services will be made by Contractor.
 - c. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.
 - d. Contractor shall be responsible for coordinating test activities with the Owner's Representative.

B. Retesting/Reinspecting:

Contractor to provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

C. Testing Agency Responsibilities:

Cooperate with Architect, Commissioning Authority and Contractor in performance of duties.

1. Notify Architect, Commissioning Authority, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
4. Submit a certified written report, to Architect and Owner with copy to Contractor of each test, inspection, and similar quality-control service through Contractor.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform any duties of Contractor.

E. Associated Services:

Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspecting equipment at Project site.

F. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.8 SPECIAL TESTS AND INSPECTIONS

Contractor will engage a qualified testing agency or special inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, and as follows:

1. Testing agency will notify Architect, Contracting Officer's representative, and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
2. Testing agency will submit a certified written report of each test, inspection, and similar quality-control service to Architect, Contracting Officer's representative, and Contractor.
3. Testing agency will submit a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
4. Testing agency will interpret tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
5. Testing agency will retest and reinspect corrected work. All retests and reinspections will be paid for by Contractor.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION

3.1 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

SECTION 014200 – REFERENCES

PART 1 – GENERAL

1.1 SUMMARY

Definitions of terms, acronyms, industry standards, and contact data for professional organizations and committees.

1.2 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.3 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "approved," "required," and "permitted" have the same meaning as "directed."
- D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- H. "Provide": Furnish and install, complete and ready for the intended use.
- I. "Installer": Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
 - 1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.

- J. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.4 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents, unless otherwise indicated.
- C. Conflicting Requirements: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.
1. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.
- D. Copies of Standards: Each entity engaged in construction on Project must be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source and make them available on request.
- E. Abbreviations and Acronyms for Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. Names, telephone numbers, and Web-site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

ADAAG	Americans with Disabilities Act (ADA) Accessibility guidelines for buildings and facilities available from Access Board. www.access-board.gov ; (800) 872-2253 or (202) 272-5434
CFR	Code of Federal Regulations Available from Government Printing Office. www.access.gpo.gov/nara/cfr ; (888) 293-6498 or (202) 512-1530
CRD	Handbook for Concrete and Cement Available from Army Corps of Engineers Waterways Experiment Station. www.wes.army.mil ; (601) 634-2355

DOD	Department of Defense Specifications and Standards Available from Defense Automated Printing Service www.astimage.daps.dla.mil/online ; (215) 697-6257
FED-STD	Federal Standard (See FS)
FS	Federal Specification Available from Defense Automated Printing Service www.astimage.daps.dla.mil/online ; (215) 697-6257
	Also available from General Services Administration www.fss.gsa.gov/pub/fed-specs.cfm ; (202) 619-8925
	And available from National Institute of Building Sciences www.nibs.org ; (202) 289-7800
FTMS	Federal Test Method Standard (See FS)
MILSPEC	Military Specification and Standards Available from Defense Automated Printing Service www.astimage.daps.dla.mil/online ; (215) 697-6257

1.4 ABBREVIATIONS AND ACRONYMS

- A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale Research's "Encyclopedia of Associations" or in Columbia Books' "National Trade & Professional Associations of the U.S." Names, telephone numbers, and Web-site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

AA	Aluminum Association, Inc. (The) www.aluminum.org ; (202) 862-5100
AAADM	American Association of Automatic Door Manufacturers www.aaadm.com ; (216) 241-7333
AABC	Associated Air Balance Council www.aabchq.com ; (202) 737-0202
AAMA	American Architectural Manufacturers Association www.aamanet.org ; (847) 303-5664
AAN	American Association of Nurserymen (See ANLA)
AASHTO	American Association of State Highway and Transportation Officials www.aashto.org ; (202) 624-5800
AATCC	American Association of Textile Chemists and Colorists (The) www.aatcc.org ; (919) 549-8141

ABMA	American Bearing Manufacturers Association www.abma-dc.org ; (202) 367-1155
ACI	American Concrete Institute/ACI International www.aci-int.org ; (248) 848-3700
ACPA	American Concrete Pipe Association www.concrete-pipe.org ; (972) 506-7216
AEIC	Association of Edison Illuminating Companies, Inc. (The) www.aeic.org ; (205) 257-2530
AGA	American Gas Association www.aga.org ; (202) 824-7000
AGC	Associated General Contractors of America (The) www.agc.org ; (703) 548-3118
AHA	American Hardboard Association www.hardboard.org ; (847) 934-8800
AI	Asphalt Institute www.asphaltinstitute.org ; (859) 288-4960
AISC	American Institute of Steel Construction www.aisc.org ; (800) 644-2400 or (312) 670-2400
AISI	American Iron and Steel Institute www.steel.org ; (202) 452-7100
ALCA	Associated Landscape Contractors of America www.alca.org ; (800) 395-2522 or (703) 736-9666
ALSC	American Lumber Standard Committee (301) 972-1700
AMCA	Air Movement and Control Association International, Inc. www.amca.org ; (847) 394-0150
ANLA	American Nursery & Landscape Association (Formerly: AAN - American Association of Nurserymen) www.anla.org ; (202) 789-2900
ANSI	American National Standards Institute www.ansi.org ; (202) 293-8020
APA	APA - The Engineered Wood Association www.apawood.org ; (253) 565-6600
API	American Petroleum Institute www.api.org ; (202) 682-8000

ARI	Air-Conditioning & Refrigeration Institute www.ari.org ; (703) 524-8800
ASCE	American Society of Civil Engineers www.asce.org ; (800) 548-2723 or (703) 295-6300
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers (800) 527-4723 www.ashrae.org ; (404) 636-8400
ASME	ASME International (The American Society of Mechanical Engineers International) www.asme.org ; (800) 843-2763 or (212) 591-7722
ASSE	American Society of Sanitary Engineering www.asse-plumbing.org ; (440) 835-3040
ASTM	ASTM International (American Society for Testing and Materials International) www.astm.org ; (610) 832-9585
AWCI	AWCI International (Association of the Wall and Ceiling Industries International) www.awci.org ; (703) 534-8300
AWI	Architectural Woodwork Institute www.awinet.org ; (800) 449-8811 or (703) 733-0600
AWPA	American Wood-Preservers' Association www.awpa.com ; (817) 326-6300
AWS	American Welding Society www.aws.org ; (800) 443-9353 or (305) 443-9353
AWWA	American Water Works Association www.awwa.org ; (800) 926-7337 or (303) 794-7711
BHMA	Builders Hardware Manufacturers Association www.buildershardware.com ; (212) 297-2122
CCFSS	Center for Cold-Formed Steel Structures www.umn.edu/~ccfss ; (573) 341-4471
CISPI	Cast Iron Soil Pipe Institute www.cispi.org ; (423) 892-0137
CLFMI	Chain Link Fence Manufacturers Institute www.chainlinkinfo.org ; (301) 596-2583
CPPA	Corrugated Polyethylene Pipe Association www.cppa-info.org ; (800) 510-2772 or (202) 462-9607
CRSI	Concrete Reinforcing Steel Institute www.crsi.org ; (847) 517-1200

CSI	Construction Specifications Institute (The) www.csinet.org ; (800) 689-2900 or (703) 684-0300
CSSB	Cedar Shake & Shingle Bureau www.cedarbureau.org ; (604) 820-7700
DHI	Door and Hardware Institute www.dhi.org ; (703) 222-2010
FGMA	Flat Glass Marketing Association (See GANA)
FM	Factory Mutual System (See FMG)
FMG	FM Global (Formerly: FM - Factory Mutual System) www.fmgglobal.com ; (401) 275-3000
GA	Gypsum Association www.gypsum.org ; (202) 289-5440
GANA	Glass Association of North America (Formerly: FGMA - Flat Glass Marketing Association) www.glasswebsite.com/gana ; (785) 271-0208
GTA	Glass Tempering Division of Glass Association of North America (See GANA)
HMMA	Hollow Metal Manufacturers Association (See NAAMM)
HPVA	Hardwood Plywood & Veneer Association www.hpva.org ; (703) 435-2900
ICEA	Insulated Cable Engineers Association, Inc. www.icea.net ; (770) 830-0369
IEEE	Institute of Electrical and Electronics Engineers, Inc. (The) www.ieee.org ; (212) 419-7900
IESNA	Illuminating Engineering Society of North America www.iesna.org ; (212) 248-5000
IGCC	Insulating Glass Certification Council www.igcc.org ; (315) 646-2234
IGMA	Insulating Glass Manufacturers Alliance (The) www.igmaonline.org ; (613) 233-1510
ISSFA	International Solid Surface Fabricators Association (702) 567-8150
LMA	Laminating Materials Association (Formerly: ALA - American Laminators Association) www.lma.org ; (201) 664-2700

LPI	Lightning Protection Institute (800) 488-6864 www.lightning.org (847) 577-7200
LSGA	Laminated Safety Glass Association (See GANA)
MBMA	Metal Building Manufacturers Association www.mbma.com ; (216) 241-7333
MFMA	Metal Framing Manufacturers Association www.metalframingmfg.org ; (312) 644-6610
ML/SFA	Metal Lath/Steel Framing Association (See SSMA)
MPI	Master Painters Institute www.paintinfo.com ; (888) 674-8937
MSS	Manufacturers Standardization Society of The Valve and Fittings Industry Inc. www.mss-hq.com ; (703) 281-6613
NAAMM	National Association of Architectural Metal Manufacturers www.naamm.org ; (312) 332-0405
NAAMM	North American Association of Mirror Manufacturers (See GANA)
NACE	NACE International (National Association of Corrosion Engineers International) www.nace.org ; (281) 228-6200
NAIMA	North American Insulation Manufacturers Association (The) www.naima.org ; (703) 684-0084
NCMA	National Concrete Masonry Association www.ncma.org ; (703) 713-1900
NCPI	National Clay Pipe Institute www.ncpi.org ; (414) 248-9094
NCTA	National Cable & Telecommunications Association www.ncta.com ; (202) 775-3550
NEBB	National Environmental Balancing Bureau www.nebb.org ; (301) 977-3698
NECA	National Electrical Contractors Association www.necanet.org ; (301) 657-3110
NEMA	National Electrical Manufacturers Association www.nema.org ; (703) 841-3200
NETA	International Electrical Testing Association www.netaworld.org ; (303) 697-8441

NFPA	National Fire Protection Association www.nfpa.org ; (800) 344-3555 or (617) 770-3000
NFRC	National Fenestration Rating Council www.nfrc.org ; (301) 589-6372
NGA	National Glass Association www.glass.org ; (703) 442-4890
NRCA	National Roofing Contractors Association www.nrca.net ; (800) 323-9545 or (847) 299-9070
NRMCA	National Ready Mixed Concrete Association www.nrmca.org ; (888) 846-7622 or (301) 587-1400
NSF	NSF International (National Sanitation Foundation International) www.nsf.org ; (800) 673-6275 or (734) 769-8010
NWWDA	National Wood Window and Door Association (See WDMA)
PCI	Precast/Prestressed Concrete Institute www.pci.org ; (312) 786-0300
PDCA	Painting and Decorating Contractors of America www.pdca.com ; (800) 332-7322 or (703) 359-0826
PDI	Plumbing & Drainage Institute www.pdionline.org ; (800) 589-8956 or (508) 230-3516
RCSC	Research Council on Structural Connections www.boltcouncil.org ; (800) 644-2400 or (312) 670-2400
SDI	Steel Deck Institute www.sdi.org ; (847) 462-1930
SDI	Steel Door Institute www.steeldoor.org ; (440) 899-0010
SGCC	Safety Glazing Certification Council www.sgcc.org ; (315) 646-2234
SIGMA SJI	Sealed Insulating Glass Manufacturers Association (See IGMA) Steel Joist Institute www.steeljoist.org ; (843) 626-1995
SMA	Screen Manufacturers Association www.screenmfgassociation.org ; (561) 533-0991
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association www.smacna.org ; (703) 803-2980

SSMA	Steel Stud Manufacturers Association (Formerly: ML/SFA - Metal Lath/Steel Framing Association) www.ssma.com ; (312) 456-5590
SSPC	SSPC: The Society for Protective Coatings www.sspc.org ; (877) 281-7772 or (412) 281-2331
STI	Steel Tank Institute www.steeltank.com ; (847) 438-8265
SWI	Steel Window Institute www.steelwindows.com ; (216) 241-7333
SWRI	Sealant, Waterproofing, and Restoration Institute www.swrionline.org ; (816) 472-7974
TCA	Tile Council of America, Inc. www.tileusa.com ; (864) 646-8453
TIA/EIA	Telecommunications Industry Association/Electronic Industries Alliance www.tiaonline.org ; (703) 907-7700
UL	Underwriters Laboratories Inc. www.ul.com ; (800) 704-4050 or (847) 272-8800
WCLIB	West Coast Lumber Inspection Bureau www.wclib.org ; (800) 283-1486 or (503) 639-0651
WDMA	Window & Door Manufacturers Association (Formerly: NWWDA - National Wood Window and Door Association) www.wdma.com ; (800) 223-2301 or (847) 299-5200
WIC	Woodwork Institute of California www.wicnet.org ; (916) 372-9943
WWPA	Western Wood Products Association www.wwpa.org ; (503) 224-3930

- B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web-site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

IAPMO	International Association of Plumbing and Mechanical Officials (The) www.iapmo.org ; (909) 595-8449
ICBO	International Conference of Building Officials www.icbo.org ; (800) 284-4406 or (562) 699-0541
ICC	International Code Council, Inc. (Formerly: CABO - Council of American Building Officials) www.intlcode.org ; (703) 931-4533

- C. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web-site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

CE	Army Corps of Engineers www.usace.army.mil
CPSC	Consumer Product Safety Commission www.cpsc.gov ; (800) 638-2772 or (301) 504-0990
DOC	Department of Commerce www.doc.gov ; (202) 482-2000
EPA	Environmental Protection Agency www.epa.gov ; (202) 260-2090
FAA	Federal Aviation Administration www.faa.gov ; (202) 366-4000
FDA	Food and Drug Administration www.fda.gov ; (888) 463-6332
GSA	General Services Administration www.gsa.gov ; (202) 708-5082
OSHA	Occupational Safety & Health Administration www.osha.gov ; (800) 321-6742 or (202) 693-1999

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION 014200

SECTION 015000 - TEMPORARY FACILITIES

PART 1 – GENERAL

1.1 SUMMARY

Specific general administrative and procedural actions are specified in this section, as extensions of provisions in General Conditions and other contract documents. Nothing in this section is intended to limit types and amounts of temporary work required, and no omission from this section will be recognized as an indication that such temporary activity is not required for successful completion of the work and compliance with requirements of contract documents. Provisions of this section are applicable to, but not by way of limitation, utility services, construction facilities, support facilities, and security/protection provisions.

1.2 RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification sections, apply to work of this section.

1.3 QUALITY ASSURANCE

In addition to compliance with governing regulations and rules/recommendations of utility companies, comply with specific requirements indicated and with applicable local industry standards for construction work.

1.4 JOB CONDITIONS:

- A. General: Except as directed below, establish and initiate use of each temporary facility at time first reasonably required for proper performance of the work. Terminate use and remove facilities at earliest reasonable time, when no longer needed or when permanent facilities have, with authorized use, replaced the need.
- B. Conditions of Use: Install, operate, maintain and protect temporary facilities in a manner and at locations which will be safe, non-hazardous, sanitary and protect persons and property, and free of deleterious effects.

1.5 TEMPORARY UTILITY SERVICES:

- A. The types of services required include, but not by way of limitation, water, sewerage, surface drainage, electrical power and telephones. Locate and relocate services (as necessary) to minimize interference with construction operations.
- B. Services are available near the site, and the Contractor shall coordinate with each utility provider for temporary use and shall assume payment for all costs as work begins.
- C. Drinkable Water: Provide backflow prevention as required by local authorities.

- D. Temporary Power: Distribute as needed for the work.
1. Electrical Outlets: Provide properly configured NEMA polarized outlets to prevent insertion of 110-120 volt plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button and pilot light, for connection of power tools and equipment.
 2. Electrical Power Cords: Provide grounded extension cords; use "hard-service" cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords, if single lengths will not reach areas where construction activities are in progress.
 3. Lamps and Light Fixtures: Provide general service lamps of wattage required for adequate illumination for the task intended and required inspections. Provide guard cages or tempered glass enclosures, where exposed to breakage. Provide exterior fixtures where exposed to moisture.
- E. Temporary Construction Lighting: A temporary lighting system shall be furnished, installed and maintained as required to satisfy minimum requirements of safety and security for the task intended and required inspections. The temporary lighting system shall afford general illumination in all building areas and shall supply not less than 1 W/sq. ft. of floor area for illumination in the areas of the building where work is being performed.
- F. Dust Control
1. Contractor shall provide watering or other measures to control dust, flying particles, or other visible air pollution at construction site in accordance with local codes.
 2. Contractor shall also provide drainage mitigation as required by local jurisdictions in accordance with approved SWPPP.
- G. Toilet Facilities: Provide clean, well-maintained portable toilets during construction in compliance with OSHA requirements.
- H. Contractor Parking: Parking of Contractor's vehicles and vehicles of the Contractor's employees, as well as access to the site, shall be coordinated with Owner's Representative.
- I. Ventilation: Provide adequate temporary ventilation in enclosed areas to prevent accumulation of excess moisture, dust and dangerous vapors.
- J. Permanent Utilities: When the permanent utilities and services have been installed, they may be used as a source for construction purposes provided that the Contractor obtains the approval of the Owner's Representative; assumes full responsibility for the systems; and pays costs of maintenance and restoration of the systems to new condition. Utilities will be the responsibility of the Contractor until such time as Substantial Completion is obtained.

1.6 TEMPORARY SUPPORT FACILITIES:

- A. The types of temporary support facilities required include, but not by way of limitation, storage sheds, fabrication sheds, sanitary facilities, drinking water, first aid facilities, bulletin board, clean-up facilities, waste disposal service, rodent/pest control and similar miscellaneous general services, all as may be reasonably required for proficient performance of the work and accommodation of personnel at the site including Owner's personnel. Discontinue and remove temporary support facilities, and make incidental similar use of permanent work of the project, only when and in manner authorized by the Architect; and, if not otherwise indicated, immediately before time of substantial completion. Locate temporary support facilities for convenience of users, and for minimum interference with construction activities.
- B. Contractor shall provide an air conditioned and heated temporary modular office with space for meetings at the site for all project team members, viewing of plans, and a wireless laptop with copier/printer/scanner. Provide high speed internet access for all critical parties.
 - 1. Trailer shall be a conditioned 12' x 64' portable with meeting room with table to accommodate 8 persons, and offices as needed for GC. Provide a 4'x 8' whiteboard. Provide appropriate illumination.

1.7 SECURITY/PROTECTION PROVISIONS:

- A. Contractor is responsible for controlling access to the work area; providing appropriate safety and warning signs; securing materials stored on site to prevent theft. Protection provisions required include, but not by way of limitation, fire protection, barricades, warning signs/lights, site enclosure fence, building enclosure/lockup, environmental protection, and similar provisions intended to minimize property losses, personal injuries and claims for damages at project site.
- B. Security: The Contractor shall be responsible for the security of the building during the construction period. Provide secured storage areas for all equipment and materiel stored outside the building envelope.
 - 1. Provide temporary 6' high minimum chain link fencing with gates to secure the building perimeter and exterior staging and storage areas. Relocate as needed during the progress of construction to provide adequate security.
- C. Fire Protection
 - 1. The Contractor shall at all times maintain good housekeeping practices to reduce the risk of fire damage. Where electric or gas welding or cutting is done, shields of incombustible material shall be used to protect against fire damage due to sparks and hot metal.
 - 2. Fire Extinguishers: Provide types, sizes, numbers and locations as would be reasonably effective in extinguishing fires during early stages, by personnel at project site.
- D. Emergency Situations: Contractor shall provide to Owner and Architect a current list of 3 key employees available in case of off-hour emergencies. Post numbers of fire, police, ambulance, nearest medical center, and similar services by phone at site trailer.

**Indian Health Services
Parker Duplex Quarters
CONSTRUCTION DOCUMENTS**

**IHS PH21CR03Q3
BWS 1818.900**

- E. Safety: The Contractor shall comply with the Williams-Steiger Occupational Safety and Health Act of 1970.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION 015000

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 – GENERAL

1.1 SUMMARY

Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

1.2 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.3 DEFINITIONS

- A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
 - 3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

1.4 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.
- B. Delivery and Handling
 - 1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.

2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage

1. Use areas highlighted on documents for staging and storage of materials.
2. Store materials in a manner that will not endanger existing structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.

1.5 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

Definitions

1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.

1. Manufacturer's Standard Form

Modified to include Project-specific information and properly executed.

2. Specified Form

When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.

3. See other Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Section 017700 – Project Closeout.

PART 2 – PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Selection Procedures

1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
2. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:

1. Evidence that the proposed product does not require revisions to the Contract Documents, is consistent with the Contract Documents, and will produce the indicated results, and that it is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
5. Samples, if requested.

PART 3 – EXECUTION (Not Used)

END OF SECTION 016000

SECTION 017400 - WARRANTIES

PART 1 – GENERAL

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for warranties required by the Contract Documents, including manufacturers' standard warranties on products and special warranties.
 - 1. Refer to the General Conditions for terms of the Contractor's period for correction of the Work.
- B. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products. Manufacturer's disclaimers and limitations on product warranties do not relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.3 DEFINITIONS

- A. Standard product warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.
- B. Special warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.

1.4 WARRANTY REQUIREMENTS

- A. Related Damages and Losses: When correcting failed or damaged warranted construction, remove and replace construction that has been damaged as a result of such failure or must be removed and replaced to provide access for correction of warranted construction.
- B. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

- C. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition within 15 working days after notification by Owner, unless the Contractor can show that parts cannot be obtained in a timely manner. The Owner may complete such work if it is not completed by the Contractor in the provided time period, and the Owner shall charge the Contractor for any costs incurred in completion of the work. The performance of the work by the Owner shall not void or jeopardize warranties associated with the work in any way. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.
- D. Owner's Recourse: Expressed warranties made to the Owner are in addition to implied warranties and shall not limit the duties, obligations, rights, and remedies otherwise available under the law. Expressed warranty periods shall not be interpreted as limitations on the time in which the Owner can enforce such other duties, obligations, rights, or remedies.
1. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
- E. Where the Contract Documents require a special warranty, or similar commitment on the Work or part of the Work, the Owner reserves the right to refuse to accept the Work, until the Contractor presents evidence that entities required to countersign such commitments are willing to do so.
- F. Project Warranty: This warranty shall not replace or supercede any warranty requirements of particular sections of the specifications, but is in addition to those warranties. The General Contractor shall provide a project warranty for a period of **TWO YEARS following the date of the date of Substantial Completion.** The General Contractor shall provide a general project warranty supported by warranties from each of the subcontractors. All warranties shall state time of beginning of warranty, period of warranty, shall be an original document on the company's official letterhead, shall be signed by an authorized agent of the company and shall be notarized.

1.5 SUBMITTALS

- A. Submit written warranties to the Architect prior to the date certified for Substantial Completion. If the Architect's Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of the Architect.
1. When a designated portion of the Work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Architect within 15 days of completion of that designated portion of the Work.
- B. When the Contract Documents require the Contractor, or the Contractor and a subcontractor, supplier or manufacturer to execute a special warranty, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner, through the Architect, for approval prior to final execution.

- C. Prepare a written document utilizing the appropriate form, ready for execution by the Contractor, or by the Contractor, subcontractor, supplier, or manufacturer. Submit a draft to the Owner, through the Architect, for approval prior to final execution.
 - 1. Refer to Divisions 2 through 49 Sections for specific content requirements and particular requirements for submitting special warranties.
- D. Form of Submittal: At Final Completion compile 2 copies of each required warranty properly executed by the Contractor, or by the Contractor, subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the Project Manual.
- E. Bind warranties and bonds in heavy-duty, commercial-quality, durable 3-ring, vinyl-covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch.
 - 1. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address, and telephone number of the Installer.
 - 2. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project title or name, and name of the Contractor.
 - 3. When warranted construction requires operation and maintenance manuals, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION 017400

SECTION 017700 - PROJECT CLOSEOUT

PART 1 – GENERAL

1.1 SUMMARY

- A. Considerations and procedures relating to Project Closeout.

1.2 RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification sections, apply to work of this section.

- A. Section 017400 – Warranties
- B. Section 017839 – Project Record Documents
- C. Section 017823 – Operations and Maintenance Manuals

1.3 DESCRIPTION OF REQUIREMENTS:

- A. Definitions: Closeout is hereby defined to include general requirements near end of Contract Time, in preparation for final acceptance, final payment, normal termination of contract, occupancy by Owner and similar actions evidencing completion of the work. Specific requirements for individual units of work are specified in sections of Division 2 through 49. Time of closeout is directly related to "Substantial Completion", and therefore may be either a single time period for entire work or a series of time periods for individual parts of the work which have been certified as substantially complete at different dates. That time variation (if any) shall be applicable to other provisions of this section.
- B. Date of Substantial Completion of work or designated portion of the work is the date certified by the Owner and the Architect when construction is sufficiently complete, in accordance with Contract Documents, so Owner can occupy or utilize the work or designated portion of the work for use which it is intended, as expressed in Contract Documents.

1.4 PREREQUISITES TO SUBSTANTIAL COMPLETION:

- A. General: Prior to requesting inspection for certification of substantial completion (for either entire work or portions thereof), complete the following activities and list known deficiencies in request:
 - 1. List all work remaining which is known to be incomplete and transmit to Architect at time of request for observation.
 - 2. In final payment request coincident with or first following date claimed, show either 100% complete on for portion of work claimed as "substantially complete", or list incomplete items, value of incompleteness, and reasons for being incomplete.
 - 3. Include supporting documentation for completion as indicated in these Contract Documents.

4. Advise Owner of pending insurance change-over requirements.
5. Submit warranties, workmanship/maintenance bonds, maintenance agreements, final certifications and similar documents as required in particular specification sections.
6. Obtain and submit releases enabling Owner's full and unrestricted use of the work and access to services and utilities, including (where required) occupancy permits, operating certificates, and similar releases.
7. Deliver tools, spare parts, extra stocks of materials, and similar physical items to Owner at direction of and with documentation to Architect. Obtain receipt of material delivery from Owner's Representative to be submitted for final payment.
8. Complete start-up testing of systems, and instructions of Owner's operating/maintenance personnel. Discontinue (or change over) and remove from project site temporary facilities and services, along with construction tools and facilities, mock-ups and similar elements.
9. Complete final cleaning up requirements.

1.5. INSPECTION PROCEDURES

Upon receipt of Contractor's request, Architect will conduct preliminary inspection and advise Contractor of prerequisites not fulfilled. Following initial inspection, Architect will prepare list of work which must be performed prior to final inspection and issuance of certificate; and will repeat inspection when requested and assured that work has been substantially completed.

- A. It is recommended that the Contractor allow adequate time for inspection and review of shakedown operation of equipment and systems, and time for remedy by the Contractor of deficiencies or incomplete work discovered in the prefinal acceptance inspections.
- B. Inspections for Project Close-out: Staged inspections will be carried out in the following manner:
 1. Preliminary investigations of subsystems or project segments carried out during the course of construction, including informal inspections by the Owner, Architect and Architect.
- C. Appropriate O & M manuals, and training shall be provided by the Contractor. Training for security systems, HVAC systems, control systems, and electrical systems shall be held on-site. Contractor shall provide training videos for these systems, if available, which document operation and maintenance processes for reference use of maintenance personnel. See also particular specification requirements.

- D. General Operation and Maintenance Instructions: Arrange for each installer of work requiring continuing maintenance or operation to meet with Owner's personnel at project site to provide basic instructions needed for proper operation and maintenance of entire work. Include instructions by manufacturer's representatives where installers are not expert in the required procedures. Review maintenance manuals, including training videos, record documentation, tools, spare parts and materials, lubricants, fuels, identification system, control sequences, hazards, cleaning and similar procedures and facilities. For operational equipment, demonstrate start-up, shut-down, emergency operations, noise and vibration adjustments, safety, economy/efficiency adjustments, and similar operations. Review maintenance and operations in relation with applicable warranties, agreements to maintain, bonds, and similar continuing commitments.
- E. This phase of close-out inspections will result in written reports of specified tests and construction procedures required. All major deficiencies shall be corrected and verified prior to the next inspection.
- F. Preliminary inspections of systems and major project segments, to be undertaken when all major connective services, instrumentation, and materials are in-place to verify functional completeness. These pre-final inspections will include, but not be limited to, shake-down operational review of all systems included in the project. This inspection shall commence at a point mutually agreed upon, when the system to be inspected can satisfactorily be reviewed for functional completeness.
- G. Substantial Completion walkthrough will not be made until the contract work is ready for substantial completion. The Contractor shall notify the Architect no later than fifteen working days prior to the date on which the work will be ready for final inspection. Should it develop that the work installed does not justify such inspection at that time, or that the character of the materials or workmanship is such that reinspection is found necessary, the cost of such reinspection including the salary, traveling expense and other expenses of the inspector(s) shall be borne by the Contractor and will be deducted from any money due the Contractor on this Contract.
- H. Final inspection shall be completed prior to consideration of Final Acceptance by the Owner and Architect. All previously noted deficiencies or construction conditions identified as incomplete shall be verified corrected by the end of this phase of inspection, and prior to a call for Final Acceptance inspection.

1.6 PREREQUISITES TO FINAL ACCEPTANCE:

- A. General: Prior to requesting final inspection for certification of final acceptance and final payment, complete the following and list exceptions (if any) in request. These items to be furnished in duplicate, bound in 3-ring notebooks, marked "Closeout Documents" on cover.
- B. Submit final payment application with other documentation as required. Include final lien waivers as appropriate.
- C. Submit an updated final statement, accounting for final additional changes to the Contract Sum.
- D. Submit certified copy of Architect's final punch-list of itemized work to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance.

- E. Submit final meter readings for utilities, and similar data as of the date of the Substantial Completion or when the Owner took possession of and assumed final responsibility for corresponding elements of the work.
- F. Submit consent of surety to final payment.
- G. Submit a final liquidated damages settlement statement (as applicable).

1.8 REINSPECTION PROCEDURE

Upon receipt of Contractor's notice that work has been completed, including punch-list items resulting from earlier inspections, and excepting incomplete items delayed because of acceptable circumstances, Owner and Architect will reinspect work. Upon completion of reinspection, Architect will either prepare certificate of final acceptance or advise Contractor of work not completed or obligations not fulfilled as required for final acceptance. If necessary, procedure will be repeated.

1.9 RECORD DOCUMENT SUBMITTALS

See other sections in Division 1.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION

3.1 FINAL CLEANING

- A. **General:** Special cleaning for specific units of work may be specified in sections of Divisions 2 through 16. General cleaning during progress of work is specified in General and Supplemental Conditions. Provide final cleaning of the work, at time indicated, consisting of cleaning each surface or unit of work to like-new condition. Comply with manufacturer's instructions for cleaning operations.

The following are examples, but not by way of limitation, of cleaning required:

1. Remove labels which are not required as permanent labels.
2. Clean transparent materials, including mirrors and all exterior and interior glazing, including windows and door glass, to a polished condition, removing substances which are vision-obscuring. Replace broken glass and damaged transparent materials.
3. Clean exposed exterior and interior hard-surfaced finishes, free of dust, stains, films and similar noticeable substances. Except as otherwise indicated, avoid disturbance of natural weathering of exterior surfaces.
4. Wipe surfaces of mechanical and electrical equipment clean; remove excess lubrication and other substances.
5. Remove debris and surface dust from limited-access spaces.

6. Clean interior concrete floors using broom and damp mop. Sweep exterior concrete surfaces and remove all dirt, grease, stains, and other deleterious materials caused by construction processes.
7. Clean light fixtures and lamps to function with full efficiency. Replace burned out lamps.
8. Clean project site of litter and foreign substances. Sweep paved areas to a broom-clean condition; remove stains, oil spills and other foreign deposits. Rake any disturbed adjacent grounds, which are neither planted nor paved, to a smooth, even-textured surface.
9. Removal of Protection: Remove temporary protection devices and facilities which were installed during course of the work to protect previously completed work during remainder of construction period.
10. Compliances: Comply with safety standards and governing regulations for cleaning operations. Do not burn waste materials at site, or bury debris or excess materials on Owner's property, or discharge volatile or other harmful or dangerous materials into drainage systems; remove waste materials from site and dispose of in a lawful manner.

3.2 WALK-THROUGH WARRANTY INSPECTION

The Owner, Architect, and Contractor will make a two-year warranty inspection of the entire project within 6 months prior to expiration of the warranty. Architect will notify the Owner and Contractor in writing of items requiring correction under the provisions of the warranties and guaranties.

- A. This does not preclude use of the GC's standard warranty issue reporting process during the warranty period.

END OF SECTION 017700

SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 – GENERAL

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
 - 1. Operation and maintenance documentation directory.
 - 2. Emergency manuals.
 - 3. Operation manuals for systems, subsystems, and equipment.
 - 4. Maintenance manuals for the care and maintenance of products, materials, and finishes, systems, and equipment.

1.2 RELATED SECTIONS

- A. Section 017700 – Project Closeout: for submitting operations and maintenance manuals.
- B. Divisions 2 through 49 Sections for specific operation and maintenance manual requirements for products in those Sections.

1.3 DEFINITIONS

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 SUBMITTALS – **Digital and Hard Copy.**

- A. Initial Submittal: Submit draft copy of each manual at least 2 weeks before requesting inspection for Substantial Completion electronically, using the cloud-based project management system. Include a complete operation and maintenance directory. Architect will return the draft with comments toward completion of the manuals.
- B. Final Submittal
 - 1. Submit to Architect electronic copy of each manual in final using the cloud-based project management system. Architect and their consultants will review and return copy with comments.
 - 2. Correct or modify each manual to comply with comments. **Submit 2 hard copies of each corrected manual in 3-ring binders, and a PDF of all contents on flash drive or CD to the Owner' Representative.**

1.5 COORDINATION

- A. Where operation and maintenance documentation includes information on installations by more than one factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.

PART 2 – PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

- A. Organization: Include a section in the directory for each of the following:
 - 1. List of documents.
 - 2. List of systems.
 - 3. List of equipment.
 - 4. Table of contents.
- B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
- C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
- D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with the same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.2 MANUALS, GENERAL

- A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
 - 1. Title page.
 - 2. Table of contents.
 - 3. Manual contents.
- B. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:
 - 1. Subject matter included in manual.
 - 2. Name and address of Project.

3. Name and address of Owner.
4. Date of submittal.
5. Name, address, and telephone number of Contractor.
6. Name and address of Architect.
7. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents

1. List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
2. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

D. Manual Contents

1. Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
2. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets. **Binders must be new.**
 - a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
 - b. Identify each binder on front and spine, with printed title "OPERATIONS AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.
3. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
4. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.
5. Supplementary Text: Prepared on 8-1/2-by-11-inch 20-lb white bond paper.
6. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
 - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.

- b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.3 OPERATION MANUALS

- A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
 - 1. System, subsystem, and equipment descriptions.
 - 2. Performance and design criteria if Contractor is delegated design responsibility.
 - 3. Operating standards.
 - 4. Operating procedures.
 - 5. Operating logs.
 - 6. Wiring diagrams.
 - 7. Control diagrams.
 - 8. Piped system diagrams.
 - 9. Precautions against improper use.
 - 10. License requirements including inspection and renewal dates.
- B. Descriptions: Include the following:
 - 1. Product name and model number.
 - 2. Manufacturer's name.
 - 3. Equipment identification with serial number of each component.
 - 4. Equipment function.
 - 5. Operating characteristics.
 - 6. Limiting conditions.
 - 7. Performance curves.
 - 8. Engineering data and tests.
 - 9. Complete nomenclature and number of replacement parts.
- C. Operating Procedures: Include the following, as applicable:
 - 1. Startup procedures.

2. Equipment or system break-in procedures.
 3. Routine and normal operating instructions.
 4. Regulation and control procedures.
 5. Instructions on stopping.
 6. Normal shutdown instructions.
 7. Seasonal and weekend operating instructions.
 8. Required sequences for electric or electronic systems.
 9. Special operating instructions and procedures.
- D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- E. Piped Systems: Diagram piping as installed and identify color-coding where required for identification.

2.4 PRODUCT MAINTENANCE MANUAL

- A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. Product Information: Include the following, as applicable:
1. Product name and model number.
 2. Manufacturer's name.
 3. Color, pattern, and texture.
 4. Material and chemical composition.
 5. Reordering information for specially manufactured products.
- D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
1. Inspection procedures.
 2. Types of cleaning agents to be used and methods of cleaning.
 3. List of cleaning agents and methods of cleaning detrimental to product.
 4. Schedule for routine cleaning and maintenance.

5. Repair instructions.
- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
 1. Include procedures to follow and required notifications for warranty claims.

2.5 SYSTEMS AND EQUIPMENT MAINTENANCE MANUAL

- A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
- B. Source Information: List each system, subsystem, and piece of equipment included in the manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
 1. Standard printed maintenance instructions and bulletins.
 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
 3. Identification and nomenclature of parts and components.
 4. List of items recommended to be stocked as spare parts.
- D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
 1. Test and inspection instructions.
 2. Troubleshooting guide.
 3. Precautions against improper maintenance.
 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 5. Aligning, adjusting, and checking instructions.
 6. Demonstration and training videotape, if available.

- E. Maintenance and Service Schedules
 - 1. Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
 - 2. Scheduled Maintenance and Service

Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
 - 3. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- H. Warranties and Bonds
 - 1. Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
 - 2. Include procedures to follow and required notifications for warranty claims.

PART 3 – EXECUTION

3.1 MANUAL PREPARATION

- A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- B. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
 - 1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
 - 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

C. Manufacturers' Data

1. Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
2. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

D. Drawings

1. Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.
2. Do not use original Project Record Documents as part of operation and maintenance manuals.
3. Comply with requirements of newly prepared Record Drawings in Division 1 Section "Project Record Documents."

- E. Comply with Division 1 Section 017700 - Closeout Procedures for the schedule for submitting operation and maintenance documentation.

END OF SECTION 017823

SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 – GENERAL

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:
 - 1. Record Drawings.
 - 2. Record Specifications.
 - 3. Record Product Data.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.3 RELATED SECTIONS

- A. Section 017700: Project Closeout for general closeout procedures and maintenance manual requirements.
- B. Section 017823: Operation and Maintenance Data for operation and maintenance manual/documentation requirements.
- C. Divisions 2 through 49 Sections for specific requirements for Project Record Documents of products in those Sections.

1.4 SUBMITTALS

- A. Record Drawings: Comply with the following:
 - 1. Number of Copies: Submit one set of marked-up Record Prints.
- B. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications.

PART 2 – PRODUCTS

2.1 RECORD DRAWINGS

- A. Record Prints: Maintain one set of blue- or black-line white prints of the Contract Drawings and Shop Drawings.
 - 1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.

- a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Accurately record information in an understandable drawing technique.
 - c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
2. Content: Types of items requiring marking include, but are not limited to, the following:
 - a. Dimensional changes to Drawings.
 - b. Revisions to details shown on Drawings.
 - c. Depths of foundations below first floor.
 - d. Locations and depths of underground utilities.
 - e. Revisions to routing of piping and conduits.
 - f. Revisions to electrical circuitry.
 - g. Actual equipment locations.
 - h. Duct size and routing.
 - i. Locations of concealed internal utilities.
 - j. Changes made by Change Order or Construction Change Directive.
 - k. Changes made following Architect's written orders.
 - l. Details not on the original Contract Drawings.
 - m. Field records for variable and concealed conditions.
 - n. Record information on the Work that is shown only schematically.
3. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at the same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

7. Maintain a copy of the record prints in the job-site trailer to be reviewed monthly by the Architect and Owner's Representative as a condition precedent to the monthly Pay Application review.

2.2 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
 3. Record the name of the manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
 4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
 5. Note related Change Orders, Record Drawings, and Product Data where applicable.
 6. Maintain a copy of the record specifications in the job-site trailer to be reviewed monthly by the Architect and Owner's Representative as a condition precedent to the monthly Pay Application review.

2.3 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.
- B. Subcontractor List: Provide complete list of all project subcontractors, area of work, and contact.
- C. As-Built Material List: Provide a list showing all materials and finishes, with particular color/pattern name, supplier and contact, and location of use.
- D. No Asbestos: Submit a General Contractor signed letter certifying that no asbestos-containing materials have been installed on the project.

PART 3 – EXECUTION

3.1 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.

- B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

END OF SECTION 017839

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 – GENERAL

1.1 SUMMARY

- A. This Section specifies concrete work, including formwork, reinforcing, mix design, placement procedures, and finishes.
- B. Concrete work includes the following:
 - 1. Foundations and footings.
 - 2. Concrete slabs on grade.
 - 3. Equipment pads.
 - 4. Vapor barrier under slab.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.3 RELATED SECTIONS

- A. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Section 079200 – Joint Sealers.
 - 2. Division 9 for finish flooring products.
 - 3. Section 313116 – Termite Control.
 - 4. Section 321313 - Portland Cement Concrete Paving for non-structural concrete paving and walks.

1.4 SUBMITTALS

- A. General: Submit the following according to Conditions of the Contract and Division 1 Specification Sections.
 - 1. Product data for proprietary materials and items, including reinforcement and forming accessories including form boards, sealers, admixtures, and additives, patching compounds, joint systems, curing compounds, vapor retarders, and others if requested by Architect. Provide product data for any protective application to concrete during hot or windy weather.
 - 2. Shop drawings for reinforcement detailing fabricating, bending, and placing concrete reinforcement. Comply with ACI 315.
 - 3. Provide shop drawings showing placement of control and expansion or cold joints.

4. Provide shop drawings showing all cast-in and embedded items.
- B. Concrete mix designs for each concrete mixture and strength.
- C. Laboratory test reports for concrete materials and mix design tests.
- D. Material certificates are acceptable instead of material laboratory test reports. Material certificates shall be signed by manufacturer and Contractor, certifying that each material item complies with or exceeds specified requirements. Provide certification from admixture manufacturers that chloride content complies with specification requirements.

1.5 QUALITY ASSURANCE

- A. Codes and Standards: Comply with provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified:
 1. American Concrete Institute (ACI) 301, "Specifications for Structural Concrete for Buildings."
 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
 3. ACI 318, "Building Code Requirements for Reinforced Concrete."
 4. Concrete Reinforcing Steel Institute (CRSI) "Manual of Standard Practice."

1.6 TESTING

- A. Materials and installed work may require testing and retesting at any time during progress of Work. Tests, including retesting of rejected materials for installed Work, shall be done at Contractor's expense.

PART 2 – PRODUCTS

2.1 FORM MATERIALS

- A. Forms for Unexposed Finish Concrete: Plywood, lumber, metal, or another acceptable material. Provide lumber dressed on at least two edges and one side for tight fit.
- B. Form Release Agent: Provide commercial formulation form release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.2 REINFORCING MATERIALS

- A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.
- B. Steel Wire: ASTM A 82, plain, cold drawn steel.
- C. Supports for Reinforcement: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Use wire bar type supports complying with CRSI specifications.
- D. For slabs on grade, use supports with sand plates or horizontal runners where base material will not support chair legs.

2.3 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type II. Use one brand of cement throughout Project unless otherwise acceptable to Architect.
- B. Fly Ash: ASTM C 618, Type F.
- C. Normal Weight Aggregates: ASTM C 33 and as specified. Provide aggregates from a single source for exposed concrete. Sand shall be clean manufactured or natural sand.
- D. Water: Potable.
- E. Admixtures, General: Provide concrete admixtures that contain not more than 0.1 percent chloride ions.
- F. Air Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.
- G. Water Reducing Admixture: ASTM C 494, Type A.
- H. A vapor-impermeable barrier shall be provided beneath structural slabs on grade at indicated areas as follows:
 - 1. Permeance after mandatory conditioning: Less than 0.01 Perms ASTM E 1745 Section 7.1, Subparagraphs 7.1.2-.5
 - a. Strength: ASTM E 1745 Class A
 - b. Thickness: 15 mils minimum
 - c. Product: **Stego Wrap Vapor Barrier with accessories (Stego Tape, Stego Mastic).**
 - 2. Other Acceptable Products include:
 - a. **Poly-America Vapor Guard**
 - b. **WR Meadows Perminator**

2.4 RELATED MATERIALS

- A. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 oz. per sq. yd., complying with AASHTO M 182, Class 2.
- B. Moisture Retaining Cover: One of the following, complying with ASTM C 171.
 - 1. Waterproof paper.
 - 2. Polyethylene film.
 - 3. Polyethylene coated burlap.
- C. Liquid Membrane Forming Curing Compound - Do not use for slabs that will have a finish such as tile, carpet, resilient flooring, etc.- Liquid type membrane forming curing compound complying with ASTM C 309, Type I, Class A. Moisture loss not more than

0.55 kg/sq. meter when applied at 200 sq. ft./gal. V.O.C. compliant. May be used for interior and exterior curing of exposed concrete.

- D. Epoxy Adhesive: ASTM C 881, two component material suitable for use on dry or damp surfaces. Provide material type, grade, and class to suit Project requirements. Use for setting anchors.
- E. Post-Applied Seal/Hardener/Densifier: Silicate-based penetrating water-based liquid hardener/densifier. Seals pores of concrete making it denser, less dusty, and more impervious to dirt, oils, liquids.
 - 1. **Equal WR Meadow Sealtight Liqui-Hard.**

2.5 PROPORTIONING AND DESIGNING MIXES

- A. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. For the trial batch method, use an independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.
 - 1. Do not use the same testing agency for Field quality control testing.
 - 2. Limit use of fly ash not to exceed 20 percent of cement content by weight.
- B. Submit written reports to Architect of each proposed mix for each class of concrete at least 15 days prior to start of Work. Do not begin concrete production until proposed mix designs have been reviewed by Architect.
- C. Slump Limits: Proportion and design mixes to result in concrete slump at point of placement as follows:
 - 1. Slabs and sloping surfaces: Not more than 3 inches.
 - 2. Reinforced foundation systems: Not less than 3 inches and not more than 5 inches.
 - 3. Other concrete: Not more than 4 +/- 1" inches.
- D. Adjustment to Concrete Mixes: Mix design adjustments shall be submitted by the Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, as accepted by Architect. Laboratory test data for revised mix design and strength results must be submitted to and accepted by Architect before using in work.
- E. Provide normal weight concrete of the minimum compressive strengths noted on the Structural Notes.

2.6 ADMIXTURES

- A. Use air entraining admixture in exterior exposed concrete slabs unless otherwise indicated. Add air entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having total air content with a tolerance of plus or minus 1 1/2 percent within the following limits: All concrete nominal 5%.

- B. Use water-reducing admixture to achieve specified W/C and in pumped concrete as needed to enhance placement and workability.

2.7 CONCRETE MIXING

- A. Ready Mixed Concrete: Comply with requirements of ASTM C 94, and as specified.
 - 1. When air temperature is between 85 deg F and 90 deg F, reduce total mixing, delivery, and placement time from 1 1/2 hours to 75 minutes, and when air temperature is above 90 deg F, reduce time to 60 minutes.

PART 3 – EXECUTION

3.1 GENERAL

- A. Coordinate the installation of joint materials and other related materials with placement of forms and reinforcing steel.

3.2 VAPOR BARRIER INSTALLATION

- A. Preparation: Ensure that subsoil is approved by Architect or Geotechnical Engineer.
 - 1. Level and compact base material.
- B. Contact vapor barrier manufacturer to schedule a pre-construction meeting and to coordinate a review, in-person or digital, of the vapor barrier installation.
- C. Install vapor barrier in accordance ASTM E1643.
 - 1. Unroll vapor barrier with the longest dimension parallel with the direction of the concrete placement and face laps away from the expected direction of the placement whenever possible.
 - 2. Extend vapor barrier to the perimeter of the slab. If practicable, terminate it at the top of the slab, otherwise (a) at a point acceptable to the structural engineer or (b) where obstructed by impediments, such as dowels, water stops, or any other site condition requiring early termination of the vapor barrier. At the point of termination, seal vapor barrier to the foundation wall, grade beam or slab itself. Seal vapor barrier to the entire slab perimeter using equal of **Stego Crete Claw** with a surface that creates a mechanical seal to freshly placed concrete, per manufacturer's instructions.

OR

Seal vapor barrier to the entire perimeter wall or footing/grade beam with manufacturer's double-sided tape, or both termination bar and double-sided tape, per manufacturer's instructions. Ensure the concrete is clean and dry prior to adhering tape.

- 3. Overlap joints 6 inches and seal with manufacturer's seam tape.
- 4. Apply seam tape/textured tape/double-sided tape to a clean and dry vapor barrier.

5. Seal all penetrations (including pipes) per manufacturer's instructions.
6. Avoid the use of stakes driven through vapor barrier by utilizing screed and forming systems that will not leave punctures in the vapor barrier.
7. Repair damaged areas with vapor barrier material of similar (or better) permeance, puncture and tensile.

3.3 PLACING REINFORCEMENT

- A. General: Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars," for details and methods of reinforcement placement and supports and as specified.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials that reduce or destroy bond with concrete.
- C. Accurately position, support, and secure reinforcement against displacement to top or bottom of slab. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as shown on shop drawings, and reviewed by the Structural Engineer.
- D. Place reinforcement to maintain minimum coverages as indicated for concrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

3.4 JOINTS

- A. Construction Joints: Locate and install construction joints so they do not impair strength or appearance of the structure and in a regular and symmetrical arrangement as much as possible, as acceptable to Architect and shown on submitted drawings.
- B. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints except as indicated otherwise. Do not continue reinforcement through sides of strip placements.
- C. Contraction (Control) Joints in Slabs on Grade: Construct contraction joints in slabs on grade to form panels of patterns as shown. Use saw cuts 1/8 inch wide by one fourth of slab depth or inserts 1/4 inch wide by one fourth of slab depth, unless otherwise indicated.
 1. Saw cut as soon as possible after slab finishing as may be safely done without dislodging aggregate.
 - a. If joint pattern is not shown, provide joints not exceeding 12 feet in either direction and located to conform to bay spacing wherever possible (at column centerlines, half bays, third bays).
 - b. Joint fillers and sealants are specified in Section 079200 - Joint Sealants.

3.5 INSTALLING EMBEDDED ITEMS

- A. General: Set and build into formwork anchorage devices and other embedded items required for other work that is attached to or supported by cast in place concrete. Use submitted setting drawings, diagrams, instructions, and directions provided by suppliers of items to be attached.

3.6 FORMS

- A. Forms for Slabs: Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and contours in finished surfaces. Provide and secure units to support screed strips using strike off templates or compacting type screeds.

3.7 CONCRETE PLACEMENT

- A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.
- B. General: Comply with ACI 304, "Guide for Measuring, Mixing, Transporting, and Placing Concrete," and as specified.
- C. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened sufficiently to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation at its final location.
- D. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until completing placement of a panel or section.
1. Consolidate concrete during placement operations so that concrete is thoroughly worked around reinforcement, other embedded items and into corners.
 2. Bring slab surfaces to correct level with a straightedge and strike off. Use bull floats or darbies to smooth surface free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.
 3. Maintain reinforcing in proper position on chairs during concrete placement.
- E. Cold Weather Placement: Comply with provisions of ACI 306 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
- F. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
1. Do not use frozen material.
 2. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix designs.

- G. Hot Weather Placement: When hot weather conditions exist that would impair quality and strength of concrete, place concrete complying with ACI 305 and as specified.
1. Cool ingredients before mixing to maintain concrete temperature at time of placement to below 90 deg F. Mixing water may be chilled or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 2. 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 embedding in concrete.
 3. Fog spray forms, reinforcing steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without puddles or dry areas.
 4. Use water reducing retarding admixture when required by high temperatures, low humidity, or other adverse placing conditions, as acceptable to Architect.

3.8 MONOLITHIC SLAB FINISHES

- A. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as specified.
1. After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating, using float blades or float shoes only, when surface water has disappeared, or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power driven floats or by hand floating if area is small or inaccessible to power units.
 - a. Typical Surfaces: Finish surfaces to tolerance of 1/4" in 10 ft. measured using a 10 ft. straightedge consistently across the slab.
 2. Cut down high spots and fill low spots. Uniformly and positively slope surfaces to drains as shown. Immediately after shaping surfaces or leveling, refloat surface to a uniform, smooth, granular texture.
- B. Trowel Finish: Apply a trowel finish to monolithic slab surfaces exposed to view in the finished work and to those to receive a scratch and broom finish.
1. After floating, begin first trowel finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand troweling operation, free of trowel marks, uniform in texture and appearance, and finish surfaces to tolerance of 1/4" in 10 ft. measured using a 10 ft. straightedge at several points on the slab. Grind smooth any surface defects that would telegraph through applied floor covering system.
- C. Broom Finish: Apply medium broom finish at all exterior concrete platforms, steps, and ramps, and elsewhere as indicated.
- D. Scratch Finish: Provide a light scratch finish at all interior surfaces to receive finish flooring.

3.9 FINISHING SURFACES

- A. Unformed Surfaces: Strike-off smooth and finish with smooth texture to closely match that of formed surfaces.

3.10 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place, and cure concrete as specified to blend with in place construction. Provide other miscellaneous concrete filling shown or required to complete Work.
- B. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

3.11 CONCRETE CURING AND PROTECTION

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. In hot, dry, and windy weather protect concrete from rapid moisture loss before and during finishing operations with an evaporation control material. Apply according to manufacturer's instructions after screeding and bull floating, but before power floating and troweling.
 - 1. Exposed Concrete (to receive polished finish, or no finish): Cover and positively protect during construction, using materials like **Ramboard**, or others. Do not allow wheeled traffic, oil dripping, standing water, dropped heavy tools, etc. on unprotected concrete.
- B. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 7 days.
- C. Curing Methods
 - 1. Interior Concrete to Receive Finishes: Provide moisture or moisture-retaining cover curing by the following methods:
 - a. Keep concrete surface continuously wet by covering with water.
 - b. Use continuous water fog spray.
 - c. Cover concrete surface with specified absorptive cover, thoroughly saturate cover with water, and keep continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with a 4-inch lap over adjacent absorptive covers.
 - d. Provide moisture retaining cover curing as follows: Cover concrete surfaces with moisture retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3 inches and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

- D. Apply curing compound on exposed exterior slabs, walks, utilitarian interior slabs to remain exposed, and curbs as follows:
 - 1. Apply curing compound to concrete slabs as soon as final finishing operations are complete (within 2 hours and after surface water sheen has disappeared). Apply uniformly in continuous operation by power spray or roller according to manufacturer's directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.12 CONCRETE SURFACE REPAIRS

- A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removing forms.
- B. Mix dry pack mortar, consisting of one part Portland cement to 2 1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing.
 - 1. Cut out honeycombs, rock pockets, voids over 1/4 inch in any dimension down to solid concrete but in no case to a depth less than 1 inch. Make edges of cuts perpendicular to the concrete surface.
 - 2. Thoroughly clean, dampen with water, and brush coat the area to be patched with bonding agent. Place patching mortar before bonding agent has dried.
 - 3. For surfaces exposed to view, blend white Portland cement and standard Portland cement so that, when dry, patching mortar will match surrounding color. Provide test areas 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.
- C. Repairing Unformed Surfaces: Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface tolerances specified for each surface and finish. Correct low and high areas as specified. Test unformed surfaces sloped to drain for trueness of slope and smoothness by using a template having the required slope.
 - 1. Repair finished unformed surfaces containing defects that affect the concrete's durability. Surface defects include crazing and cracks in excess of 0.01 inch wide or that penetrate to the reinforcement or completely through nonreinforced sections regardless of width, spalling, pop outs, honeycombs, rock pockets, and other objectionable conditions.
 - 2. Correct high areas in unformed surfaces by grinding after concrete has cured at least 14 days.
 - 3. Correct low areas in unformed surfaces 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. Proprietary underlayment compounds may be used when acceptable to Architect.

4. Repair defective areas, except random cracks and single holes not exceeding 1 inch in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose reinforcing steel 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 to provide concrete of same type or class as original concrete. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
- D. Perform structural repairs with prior approval of Architect for method and procedure, using noted epoxy adhesive and mortar.
- E. Repair methods not specified above may be used, subject to acceptance of Architect.

3.13 APPLICATION OF LIQUID FLOOR TREATMENTS

- A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment in accordance with manufacturer's written instructions.
 1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
- B. Fresh Concrete:
 1. Apply **Liqui-Hard** or equal concrete densifier and chemical hardener as soon as concrete is firm enough to work on after final troweling.
 2. Apply undiluted concrete densifier and chemical hardener at approximately 300 sq. ft./gal. (4.91 sq. m./L), using a low-pressure sprayer or by spreading evenly with a soft - bristled broom.
 3. Do not allow material to puddle on the surface.

3.14 QUALITY CONTROL TESTING DURING CONSTRUCTION

- A. General: The Owner will employ a testing agency to perform tests and to submit test reports.
- B. Sampling and testing for quality control during concrete placement may include the following, as directed by Architect.
 1. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.
 - a. Slump: ASTM C 143; one test at point of discharge for each day's pour of each type of concrete; additional tests when concrete consistency seems to have changed. Provide an additional test for each 50 cy of concrete placed.
 - b. Air Content: ASTM C 173, volumetric method for lightweight or normal weight concrete; ASTM C 231, pressure method for normal weight concrete; one for each day's pour of each type of air entrained concrete.

- c. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below, when 80 deg F and above, and one test for each set of compressive strength specimens.
 - d. Compression Test Specimens: ASTM C 31; one set of four standard 6" x 12" cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field cured test specimens are required.
 - e. Compressive Strength Tests: ASTM C 39; one set for each day's pour exceeding 5 cu. yd. plus additional sets for each 50 cu. yd. more than the first 25 cu. yd. of each concrete class placed in any one day; one specimen tested at 7 days, two specimens tested at 28 days, and one specimen retained in reserve for later testing if required.
- 2. When frequency of testing will provide fewer than five strength tests for a given class of concrete, conduct testing from at least five randomly selected batches or from each batch if fewer than five are used.
 - 3. When total quantity of a given class of concrete is less than 50 cu. yd., Architect may waive strength testing if adequate evidence of satisfactory strength is provided.
 - 4. When strength of field cured cylinders is less than 85 percent of companion laboratory cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.
 - 5. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength and no individual strength test result falls below specified compressive strength by more than 500 psi.
- C. Test results will be reported in writing to Architect, Structural Engineer, Owner, ready mix producer, and Contractor within 24 hours after tests. Reports of compressive strength tests shall contain the Project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-day tests and 28-day tests.
 - D. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.
 - E. Additional Tests: The testing agency will make additional tests of in place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Architect. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.

END OF SECTION 033000

SECTION 051200 - STRUCTURAL STEEL

PART 1 GENERAL

1.1 SUMMARY

This Section includes fabrication and erection of structural steel work, as shown on drawings including schedules, notes, and details showing size and location of members, typical connections, and types of steel required.

- A. Structural steel is that work defined in American Institute of Steel Construction (AISC) "Code of Standard Practice" and as otherwise shown on drawings.
- B. This section also includes the touching-up of steel primers.

1.2 RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.3 RELATED SECTIONS

- A. Miscellaneous Metal Fabrications are specified in Section 055000.

1.4 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
 - 1. Product data or manufacturer's specifications and installation instructions for following products. Include laboratory test reports and other data to show compliance with specifications (including specified standards).
 - a. Structural steel primer paint.
 - b. Shrinkage resistant grout.
 - 2. Shop drawings, including complete details and schedules for fabrication and assembly of structural steel members, procedures, and diagrams.
 - a. Include details of cuts, connections, camber, holes, and other pertinent data. Indicate welds by standard AWS symbols and show size, length, and type of each weld.
 - b. Provide setting drawings, templates, and directions for installation of anchor bolts and other anchorages to be installed as work of other sections.
 - 3. Test reports conducted on shop and field bolted and welded connections. Include data on type(s) of tests conducted and test results.

1.5 QUALITY ASSURANCE

- A. Codes and Standards: Comply with provisions of following, except as otherwise indicated:
1. American Institute of Steel Construction (AISC) "Code of Standard Practice for Steel Buildings and Bridges."
 - a. Paragraph 4.2.1 of the above code is hereby modified by deletion of the following sentence:
 - i. "This approval constitutes the owner's acceptance of all responsibility for the design adequacy of any detail configuration of connections developed by the fabricator as a part of his preparation of these shop drawings."
 2. AISC "Specifications for Structural Steel Buildings," including "Commentary."
 3. "Specifications for Structural Joints using ASTM A 325 or A 490 Bolts" approved by the Research Council on Structural Connections.
 4. American Welding Society (AWS) D1.1 "Structural Welding Code Steel."
 5. ASTM A 6 "General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use."
- B. Qualifications for Welding Work: Qualify welding procedures and welding operators in accordance with AWS "Qualification" requirements.
1. Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests.
 2. If recertification of welders is required, retesting will be Contractor's responsibility.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to site at such intervals to ensure uninterrupted progress of work.
- B. Deliver anchor bolts and anchorage devices, which are to be embedded in cast in place concrete or masonry, in ample time to not to delay work.
- C. Store materials to permit easy access for inspection and identification. Keep steel members off ground by using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration. If bolts and nuts become dry or rusty, clean and relubricate before use.
1. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Metal Surfaces, General: For fabrication of work that will be exposed to view, use only materials that are smooth and free of surface blemishes including pitting, rust and scale seam marks, roller marks, rolled trade names, and roughness. Remove such blemishes by grinding, or by welding and grinding, prior to cleaning, treating, and applying surface finishes.
- B. W-Shapes: ASTM A992 Grade 50.
- C. Channels and Angle Shapes, Plates, and Bars: ASTM A 36, Fy = 36 KSI.
- D. Cold Formed Steel Tubing (rectangular HSS): ASTM A 500, Grade B, Fy = 46 KSI.
- E. Cold-Form Steel Piping (round HSS): ASTM A 50, Grade B, Fy = 42 KSI.
- F. Bolts: ASTM A 325N, Type 1.
- G. Anchor Bolts: Anchor rods shall be ASTM F1554, Grade 36.
- H. Threaded Rods: ASTM A 36.
- I. Electrodes for Welding: Comply with AWS Code. E70 Series low hydrogen rods unless noted otherwise; E90 series for Grade 60 reinforcing bars.
- J. Structural Steel Primer Paint: SSPC Primer: SSPC-Paint 23, latex primer.
- K. Nonmetallic Shrinkage Resistant Grout: Shall be 5000 psi – Five Star, Sika 212 or equal.

2.2 FABRICATION

- A. Shop Fabrication and Assembly: Fabricate and assemble structural assemblies in shop to greatest extent possible. Fabricate items of structural steel in accordance with AISC Specifications and as indicated on final shop drawings. Provide camber in structural members where indicated.
 - 1. Properly mark and match mark materials for field assembly. Fabricate for delivery sequence that will expedite erection and minimize field handling of materials.
 - 2. Where finishing is required, complete assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in final structure free of markings, burrs, and other defects.
 - a. Fabricate with exposed surfaces smooth, square, and free of surface blemishes including pitting, rust, scale, and roughness.
 - b. Remove blemishes by filling or grinding or by welding and grinding, before cleaning, treating, and shop priming.
 - c. Fabricate with piece marks fully hidden in the completed structure or made with media that permits full removal after erection.

- d. Fabricate to the tolerances specified in AISC 303.
- B. Connections: Weld or bolt shop connections, as indicated.
- C. Bolt field connections, except where welded connections or other connections are indicated.
- D. Welded Construction: Comply with AWS Code for procedures, appearance and quality of welds, and methods used in correcting welding work.
 - 1. Grind smooth and flush with adjacent surfaces all welds on exposed structural steel.
- E. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.
- F. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel framing members.
 - 1. Cut, drill, or punch holes perpendicular to steel surfaces.
 - 2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
 - 3. Weld threaded nuts to framing and other specialty items indicated to receive other work.
- G. Provide threaded nuts welded to framing and other specialty items as indicated to receive other work.
- H. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame cut holes or enlarge holes by burning. Drill holes in bearing plates.

2.3 SHOP PAINTING

- A. General: Shop paint structural steel, except those members or portions of members to be embedded in concrete or mortar. Paint embedded steel that is partially exposed on exposed portions and initial 2 inches of embedded areas only.
 - 1. Do not paint surfaces to be welded or high strength bolted with friction type connections.
 - 2. Apply 2 coats of paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.
- B. Surface Preparation: After inspection and before shipping, clean steelwork to be painted. Remove loose rust, loose mill scale, and spatter, slag, or flux deposits. Clean steel in accordance with Steel Structures Painting Council (SSPC) as follows:
 - 1. Interior: SSPC-SP 7/NACE No. 4, "Brush-Off Blast Cleaning."
 - 2. Exterior: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

- C. Painting: Immediately after surface preparation, apply structural steel primer in at least two coats in accordance with manufacturer's instructions and at a rate to provide dry film thickness of not less than 1.5 mils per coat. Use painting methods that result in full coverage of joints, corners, edges, and exposed surfaces.

2.4 SOURCE QUALITY CONTROL

- A. General: Materials and fabrication procedures are subject to inspection and tests in mill, shop, and field, conducted by a qualified inspection agency. Such inspections and tests will not relieve Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements.
 - 1. Promptly remove and replace materials or fabricated components that do not comply.
- B. Design of Members and Connections: Details shown are typical; similar details apply to similar conditions, unless otherwise indicated. Verify dimensions at site whenever possible without causing delay in the work.
 - 1. Promptly notify Architect whenever design of members and connections for any portion of structure are not clearly indicated.

PART 3 EXECUTION

3.1 ERECTION

- A. Temporary Shoring and Bracing: Provide temporary shoring and bracing members with connections of sufficient strength to bear imposed loads. Remove temporary members and connections when permanent members are in place and final connections are made. Provide temporary guy lines to achieve proper alignment of structures as erection proceeds.
- B. Temporary Planking: Provide temporary planking and working platforms as necessary to effectively complete work.
- C. Setting Bases and Bearing Plates: Clean concrete and masonry bearing surfaces of bond reducing materials and roughen to improve bond to surfaces. Clean bottom surface of base and bearing plates.
 - 1. Set loose and attached base plates and bearing plates for structural members on wedges or other adjusting devices.
 - 2. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims, but if protruding, cut off flush with edge of base or bearing plate prior to packing with grout.
 - 3. Pack grout solidly between bearing surfaces and bases or plates to ensure that no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure.
 - 4. For proprietary grout materials, comply with manufacturer's instructions.

- D. Field Assembly: Set structural frames accurately to lines and elevations indicated. Align and adjust various members forming part of complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces that will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
- E. Level and plumb individual members of structure within specified AISC tolerances.
- F. Splice members only where indicated and accepted on shop drawings.
- G. Erection Bolts: On exposed welded construction, remove erection bolts, fill holes with plug welds, and grind smooth at exposed surfaces.
 - 1. Comply with AISC Specifications for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
 - 2. Do not enlarge unfair holes in members by burning or by using drift pins, except in secondary bracing members. Ream holes that must be enlarged to admit bolts.
- H. Gas Cutting: Do not use gas cutting torches in field for correcting fabrication errors in primary structural framing. Cutting will be permitted only on secondary members that are not under stress, as acceptable to Architect. Finish gas cut sections equal to a sheared appearance when permitted.
- I. Touchup Painting: Clean and touchup field welds, bolted connections, and abraded areas of shop paint on structural steel.

3.2 QUALITY CONTROL

- A. Owner will engage an independent testing and inspection agency to perform inspections as detailed on the drawings.
- B. Testing agency shall conduct and interpret tests, state in each report whether test specimens comply with requirements, and specifically state any deviations.
- C. Provide access for testing agency to places where structural steel work is being fabricated or produced so that required inspection and testing can be accomplished.
- D. Testing agency may inspect structural steel at plant before shipment.
- E. Correct deficiencies in structural steel work that inspections and laboratory test reports have indicated to be not in compliance with requirements. Perform additional tests, at Contractor's expense, as necessary to reconfirm any noncompliance of original work and to show compliance of corrected work.
- F. Shop Bolted Connections: Inspect or test in accordance with AISC specifications.
- G. Shop Welding: Inspect and test during fabrication of structural steel assemblies, as follows:
 - 1. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.

2. Perform visual inspection of all welds.
- H. Field Welding: Inspect and test during erection of structural steel as follows:
1. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.
 2. Perform visual inspection of all welds.
 3. Multi-pass fillet welds and full penetration welds shall be continuously inspected.

END OF SECTION 051200

SECTION 055000 - METAL FABRICATIONS

PART 1 – GENERAL

1.1 SUMMARY

- A. This Section includes, but is not necessarily limited to, the following:
 - 1. Steel framing and supports for applications where framing and supports are not specified in other Sections.
 - 2. Loose bearing and leveling plates.
 - 3. Steel connective hardware.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.3 RELATED SECTIONS

- A. Section 033000 - Cast-in-Place Concrete: for installing anchor bolts, steel pipe sleeves, wedge-type inserts and other items indicated to be cast into concrete.
- B. Section 051200 - Structural Steel.
- C. Section 061000 – Rough Carpentry
- D. Section 099000 - Painting.

1.4 PERFORMANCE REQUIREMENTS

- A. Thermal Movements: Provide exterior metal fabrications that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F ambient; 180 deg F, material surfaces.

1.5 SUBMITTALS

- A. Product Data: For the following:
 - 1. Paint products.
 - 2. Grout.
- B. Shop Drawings: Show fabrication and installation details for metal fabrications.

1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
2. Provide templates for anchors and bolts specified for installation under other Sections.
3. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Welding certificates.

1.6 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel."
2. AWS D1.3, "Structural Welding Code--Sheet Steel."

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.
2. Provide allowance for trimming and fitting at site.

1.8 COORDINATION

- A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- B. Coordinate installation of steel weld plates and angles for casting into concrete that are specified in this Section but required for work of another Section. Deliver such items to Project site in time for installation.

PART 2 – PRODUCTS

2.1 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces, unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.2 FERROUS METALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Steel Tubing: ASTM A 500, cold-formed steel tubing.
- C. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.
- D. Iron Castings: Gray iron, Class 35-B, or better, for heavy duty use.

2.3 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, at exterior walls. Provide stainless-steel fasteners for fastening aluminum. Select fasteners for type, grade, and class required.
- B. Anchor Bolts: ASTM F 1554, Grade 36.
 - 1. Provide hot-dip or mechanically deposited, zinc-coated anchor bolts where item being fastened is indicated to be galvanized.
- C. Eyebolts: ASTM A 489.
- D. Machine Screws: ASME B18.6.3.
- E. Lag Bolts: ASME B18.2.1.
- F. Wood Screws: Flat head, ASME B18.6.1.
- G. Plain Washers: Round, ASME B18.22.1.
- H. Lock Washers: Helical, spring type, ASME B18.21.1.
- I. Cast-in-Place Anchors in Concrete: Anchors capable of sustaining, without failure, a load equal to four times the load imposed, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
 - 1. Threaded or wedge type; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, hot-dip galvanized per ASTM A 153/A 153M.
- J. Expansion Anchors: Anchor bolt and sleeve assembly with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and four

times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

1. Material for Anchors in Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.
2. Material for Anchors in Exterior Locations: Stainless-steel bolts complying with ASTM F 593 and nuts complying with ASTM F 594.

2.4 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79.
- C. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- D. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.
- E. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.]

2.5 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work true to line and level with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply with the following:
 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 2. Obtain fusion without undercut or overlap.
 3. Remove welding flux immediately.

4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts, unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.
 1. Furnish inserts if units are installed after concrete is placed.

2.7 LOOSE BEARING AND LEVELING PLATES

- A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

2.8 LOOSE STEEL LINTELS

- A. Fabricate loose structural steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated.
- B. Weld adjoining members together to form a single unit where indicated.
- C. Size and locate loose lintels as shown on structural drawings.

2.9 MISCELLANEOUS STEEL TRIM

- A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.

- B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.
 - 1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.

2.10 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal fabrications after assembly.

2.11 STEEL AND IRON FINISHES

- A. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:
 - 1. Exteriors (SSPC Zone 1B): SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 2. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."
- B. Shop Priming: Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
 - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
 - 2. Coat iron or steel that will be in contact with fresh concrete as recommended by manufacturer.

PART 3 – EXECUTION

3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.
 3. Remove welding flux immediately.
 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag bolts, wood screws, and other connectors.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.
- B. Anchor supports for operable partitions securely to and rigidly brace from building structure.

3.3 INSTALLING BEARING AND LEVELING PLATES

- A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.
- B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.
1. Use nonshrink grout, either metallic or nonmetallic, in concealed locations where not exposed to moisture; use nonshrink, nonmetallic grout in exposed locations, unless otherwise indicated.
 2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.4 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

END OF SECTION 055000

SECTION 061000 – ROUGH CARPENTRY

PART 1 – GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Dimensional wood framing, nailers, blocking, bucks, and hardware.
 - 2. Sheathing for roof and walls.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.3 RELATED SECTIONS

- A. Section 055000 - Metal Fabrications.
- B. Section 061753 – Metal Plate Connected Wood Trusses.
- C. Section 061850 - Glued Laminated Beams.
- D. Section 123530 – Residential Casework.

1.4 DEFINITIONS

- A. Rough carpentry includes carpentry work not specified as part of other Sections.

1.5 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Material certificates for dimensional lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use as well as design values approved by the Board of Review of American Lumber Standards Committee.
- C. Wood treatment data as follows including chemical treatment manufacturer's instructions for handling, storing, installation, and finishing of treated material:
 - 1. For each type of preservative treated wood product include certification by treating plant stating type of preservative solution and pressure process used, net amount of preservative retained, and compliance with applicable standards.
 - 2. For fire retardant treated wood products include certification by treating plant that treated material complies with specified standard and other requirements.
 - 3. Material test reports from qualified independent testing laboratory indicating and interpreting test results relative to compliance of fire-retardant treated wood products with requirements indicated.

4. Warranty of chemical treatment manufacturer for each type of treatment.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Delivery and Storage: Keep materials under cover and dry. Protect against exposure to weather and contact with damp or wet surfaces. Stack lumber as well as plywood and other panels; provide for air circulation within and around stacks and under temporary coverings including polyethylene and similar materials.
 1. For lumber and plywood pressure treated with waterborne chemicals, place spacers between each bundle to provide air circulation.

PART 2 – PRODUCTS

2.1 LUMBER, GENERAL

- A. Lumber Standards: Furnish lumber manufactured to comply with PS 20 "American Softwood Lumber Standard" and with applicable grading rules of inspection agencies certified by American Lumber Standards Committee's (ALSC) Board of Review.
- B. Inspection Agencies: Inspection agencies and the abbreviations used to reference them with lumber grades and species include the following:
 1. WCLIB West Coast Lumber Inspection Bureau.
 2. WWPA Western Wood Products Association.
- C. Grade Stamps: Provide lumber with each piece factory marked with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.
- D. Nominal sizes are indicated, except as shown by detail dimensions. Provide actual sizes as required by PS 20, for moisture content specified for each use.
 1. Provide dressed lumber, S4S, unless otherwise indicated.
 2. Provide seasoned lumber with 19 percent maximum moisture content at time of dressing and shipment for sizes 2 inches or less in nominal thickness, unless otherwise indicated.
- E. Dimension Lumber: Provide Douglas-fir-larch lumber with grade and allowable stresses as indicated on the Standard Structural Notes.

2.2 DIMENSION LUMBER FRAMING

- A. Maximum Moisture Content: 19 percent for 2-inch nominal thickness or less, no limit for more than 2-inch nominal thickness.
- B. Grade: "Standard" grade light framing size lumber of Douglas Fir-Larch species or board size lumber as required, provide stress ratings as noted on the structural drawings.

2.3 MISCELLANEOUS LUMBER

- A. General: Provide lumber for support or attachment of other construction including bucks, nailers, blocking, and similar members.
- B. Fabricate miscellaneous lumber from dimension lumber of sizes indicated and into shapes shown.
- C. Moisture content: 19 percent maximum for lumber items not specified to receive wood preservative treatment.
- D. Grade: "Standard" grade light framing size lumber of any species or board size lumber as required. "No. 3 Common" or "Standard" grade boards per WCLIB or WWPA rules or "No. 2 Boards" per SPIB rules.

2.4 CONSTRUCTION PANELS, GENERAL

- A. Construction Panel Standards: Comply with PS 1 "U.S. Product Standard for Construction and Industrial Plywood" for plywood construction panels and, for products not manufactured under PS 1 provisions, with APA PRP 108.
- B. Trademark: Furnish construction panels that are each factory marked with APA trademark evidencing compliance with grade requirements.
- C. Roof Sheathing: APA Rated Sheathing (plywood or oriented strand board).
 - 1. Exposure Durability Classification: EXPOSURE 1
 - 2. Span/Index Ratio: 32/16.
 - 3. Thickness: See Structural Drawings
- D. Wall Sheathing: APA Rated Sheathing (plywood or oriented strand board). Thicknesses for sheathing as indicated on the drawings.
 - 1. Exposure Durability Classification: EXPOSURE 1
 - 2. Span/Index Ratio: 24/0
 - 3. Thickness: 1/2" nominal (15/32").

2.5 CONCEALED PERFORMANCE RATED CONSTRUCTION PANELS

- A. General: Where construction panels are indicated for the following concealed types of applications, provide APA Performance Rated Panels complying with requirements designated under each application for grade designation, span rating, exposure durability classification, edge detail (where applicable), and thickness.
- B. Construction Panels for Backing:
 - 1. Plywood Backing Panels: For mounting electrical or communications equipment, provide fire retardant treated plywood panels with grade designation, APA C D PLUGGED EXTERIOR, not less than 15/32 inch, unless otherwise indicated. Paint to match adjacent walls in accordance with Section 099000.

2.6 FASTENERS AND ACCESSORIES

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture. Fasteners used in exterior applications shall be non-corrosive.
- B. Nails, Wire, Brads, and Staples: FS FF N 105.
- C. Power Driven Fasteners: National Evaluation Report NER 272.
- D. Wood Screws: ANSI B18.6.1. Provide flat washers at all attachments of hardboard panels.
- E. Lag Bolts: ANSI B18.2.1.
- F. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and where indicated, flat washers.
- G. Sill Gaskets: Polyethylene foam sill gasket, 5.5" wide. **Equal Owens FoamSealR Sill Gasket.**

2.7 METAL FRAMING ANCHORS

- A. General: Provide metal framing anchors of type, size, metal, and finish indicated that comply with requirements specified including the following:
 - 1. Current Evaluation/Research Reports: Provide products for which model code evaluation/research reports exist that are acceptable to authorities having jurisdiction and that evidence compliance of metal framing anchors for application indicated with the building code in effect for this Project.
 - 2. Allowable Design Loads: Provide products for which manufacturer publishes allowable design loads that are determined from empirical data or by rational engineering analysis and that are demonstrated by comprehensive testing performed by a qualified independent testing laboratory.

2.8 WOOD-PRESERVATIVE-TREATED LUMBER

- A. Preservative Treatment by Pressure Process: AWWA U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.
 - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
- D. Application: Treat the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing.
2. Wood sills, sleepers, blocking, and similar concealed members in contact with concrete.
3. Wood floor plates that are installed over concrete slabs-on-grade.

2.9 FIRE RETARDANT TREATMENT BY PRESSURE PROCESS

- A. General: Where fire retardant treated wood is required by an assembly, pressure impregnate lumber and plywood with fire retardant chemicals to comply with AWPA C20.
 1. Interior Type A: For interior locations, including backing boards for electrical or communications equipment.
 2. Inspect each piece of treated lumber or plywood after drying and discard damaged or defective pieces.

PART 3 – EXECUTION

3.1 INSTALLATION, GENERAL

- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.
- B. Framing Standard: Comply with AF&PA's "Details for Conventional Wood Frame Construction," unless otherwise indicated. All nailing shall be according to Table 2304.10.2 of the International Building Code.
- C. Discard units of material with defects that impair quality of rough carpentry construction and that are too small to use in fabricating rough carpentry with minimum joints or optimum joint arrangement.
- D. Metal Framing Anchors: Install metal framing to comply with manufacturer's written instructions.
- E. Do not splice structural members between supports, unless otherwise indicated.
- F. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
 1. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:
 - a. Fire block concealed spaces of wood-framed walls and partitions at ceiling line and at not more than 96 inches o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal thickness.

- G. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- H. Comply with AWPAC M4 for applying field treatment to cut surfaces of preservative-treated lumber. Use inorganic boron for items that are continuously protected from liquid water.
- I. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. NES NER-272 for power-driven fasteners.
 - 2. Table 2304.10.2, "Fastening Schedule," in ICC's International Building Code.
 - a. Fit rough carpentry to other construction; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds, and similar supports to allow attachment of other construction.
 - b. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated. Provide sill gaskets at all sill plates centered on wall.
 - c. Use common wire nails, unless otherwise indicated. Use finishing nails for finish work. Select fasteners of size that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting of wood; predrill as needed.

3.2 WOOD GROUNDS, NAILERS AND BLOCKING

- A. Install wood grounds, nailers and blocking where shown and where required for screeding or attachment of other work. Form to shapes as shown and cut as required for true line and level of work to be attached. Coordinate location with other work involved.
- B. Attach to substrates as required to support applied loading. Countersink bolts and nuts flush with surfaces, unless otherwise indicated. Where possible, anchor to formwork before concrete placement.

3.3 INSTALLATION OF CONSTRUCTION PANELS

- A. General: Comply with applicable recommendations contained in Form No. E30, "APA Design/Construction Guide Residential & Commercial," for types of construction panels and applications indicated.
- B. Fastening Methods: Fasten construction panels as shown on structural drawings and indicated below:
 - 1. Plywood Backing and Wall Panels: Screw to supports.
 - 2. Plywood Roof Panels: Fasten to supports as shown on drawings.

END OF SECTION 061000

SECTION 061753 – METAL-PLATE-CONNECTED WOOD TRUSSES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Wood roof trusses.
2. Wood truss bracing.
3. Metal truss accessories.

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.3 RELATED SECTIONS

1. Section 061000 – Rough Carpentry for sheathing, blocking, bucks, and framing.

1.3 DEFINITIONS

- A. Metal-Plate-Connected Wood Trusses: Planar structural units consisting of metal-plate-connected members fabricated from dimension lumber and cut and assembled before delivery to Project site.
- B. TPI: Truss Plate Institute, Inc.
- C. Lumber grading agencies, and the abbreviations used to reference them, include the following:
1. WCLIB: West Coast Lumber Inspection Bureau.
 2. WWPA: Western Wood Products Association.

1.4 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide metal-plate-connected wood trusses capable of withstanding design loads within limits and under conditions indicated. Comply with requirements in TPI 1 unless more stringent requirements are specified below.
1. Design Loads: As indicated on structural drawings.
 2. Maximum Deflection Under Design Loads:
 - a. Roof Trusses: Total Load – L/240
Live Load – L/360

1.5 SUBMITTALS

- A. Product Data: For metal-plate connectors, metal truss accessories, and fasteners.
- B. Shop Drawings: Prepared by or under the supervision of a qualified professional engineer. Show fabrication and installation details for trusses.
 - 1. Show location, pitch, span, camber, configuration, and spacing for each type of truss required.
 - 2. Indicate sizes, stress grades, and species of lumber.
 - 3. Indicate locations of permanent bracing required to prevent buckling of individual truss members due to design loads.
 - 4. Indicate type, size, material, finish, design values, orientation, and location of metal connector plates.
 - 5. Show splice details and bearing details.
 - 6. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer (structural), registered in the state of Arizona responsible for their preparation.
- C. Product Certificates: For metal-plate-connected wood trusses, signed by officer of truss fabricating firm.

1.6 QUALITY ASSURANCE

- A. Metal Connector-Plate Manufacturer Qualifications: A manufacturer that is a member of TPI and that complies with quality-control procedures in TPI 1 for manufacture of connector plates.
 - 1. Manufacturer's responsibilities include providing professional engineering services needed to assume engineering responsibility.
 - 2. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer (structural), registered in the state of Arizona.
- B. Comply with applicable requirements and recommendations of the following publications:
 - 1. TPI 1, "National Design Standard for Metal Plate Connected Wood Truss Construction."
 - 2. TPI DSB, "Recommended Design Specification for Temporary Bracing of Metal Plate Connected Wood Trusses."
 - 3. TPI HIB, "Commentary and Recommendations for Handling, Installing & Bracing Metal Plate Connected Wood Trusses."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Handle and store trusses to comply with recommendations of TPI HIB, "Commentary and Recommendations for Handling, Installing & Bracing Metal Plate Connected Wood Trusses."
 - 1. Store trusses flat, off of ground, and adequately supported to prevent lateral bending.
 - 2. Protect trusses from weather by covering with waterproof sheeting, securely anchored.
 - 3. Provide for air circulation around stacks and under coverings.
- B. Inspect trusses showing discoloration, corrosion, or other evidence of deterioration. Discard and replace trusses that are damaged or defective.

1.8 COORDINATION

- A. Time delivery and erection of trusses to avoid extended on-site storage and to avoid delaying progress of other trades whose work must follow erection of trusses.

PART 2 - PRODUCTS

2.1 DIMENSION LUMBER

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
 - 1. Factory mark each piece of lumber with grade stamp of grading agency.
 - 2. For exposed lumber indicated to receive a stained or natural finish, omit grade stamp, and provide certificates of grade compliance issued by grading agency.
 - 3. Provide dressed lumber, S4S.
 - 4. Provide dry lumber with 19 percent maximum moisture content at time of dressing.
- B. Grade and Species: For truss chord and web members, provide dimension lumber of any species, graded visually or mechanically, and capable of supporting required loads without exceeding allowable design values according to AF&PA's "National Design Specifications for Wood Construction" and its "Supplement."
- C. Permanent Bracing: Provide wood bracing that complies with requirements for miscellaneous lumber in 061000 - Rough Carpentry.

2.2 METAL CONNECTOR PLATES

- A. General: Fabricate connector plates to comply with TPI 1.

- B. Hot-Dip Galvanized Steel Sheet: ASTM A 653/A 653M; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G60 coating designation; and not less than 0.036 inch thick.

2.3 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
 - 1. Where trusses are exposed to weather, in ground contact, made from pressure-preservative treated wood, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: NES NER-272.
- D. Wood Screws: ASME B18.6.1.
- E. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).
- F. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

2.4 METAL TRUSS ACCESSORIES

- A. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.
- B. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 coating designation.

2.5 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: SSPC-Paint 20, with dry film containing a minimum of 94 percent zinc dust by weight.

2.6 FABRICATION

- A. Cut truss members to accurate lengths, angles, and sizes to produce close-fitting joints.
- B. Fabricate metal connector plates to sizes, configurations, thicknesses, and anchorage details required to withstand design loads for types of joint designs indicated.
- C. Assemble truss members in design configuration indicated; use jigs or other means to ensure uniformity and accuracy of assembly with joints closely fitted to comply with tolerances in TPI 1. Position members to produce design camber indicated.
 - 1. Fabricate wood trusses within manufacturing tolerances in TPI 1.

- D. Connect truss members by metal connector plates located and securely embedded simultaneously in both sides of wood members by air or hydraulic press.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install wood trusses only after supporting construction is in place and is braced and secured.
- B. If trusses are delivered to Project site in more than one piece, assemble trusses before installing.
- C. Hoist trusses in place by lifting equipment suited to sizes and types of trusses required, exercising care not to damage truss members or joints by out-of-plane bending or other causes.
- D. Install and brace trusses according to TPI recommendations and as indicated.
- E. Install trusses plumb, square, and true to line and securely fasten to supporting construction.
- F. Space trusses typically 24 inches; adjust and align trusses in location before permanently fastening.
- G. Anchor trusses securely at bearing points; using metal truss tie-downs. Install fasteners through each fastener hole in truss accessories according to manufacturer's fastening schedules and written instructions.
- H. Install and fasten permanent bracing during truss erection and before construction loads are applied. Anchor ends of permanent bracing where terminating at walls or beams.
- I. Install wood trusses within installation tolerances in TPI 1.
- J. Do not cut or remove truss members.
- K. Replace wood trusses that are damaged or do not meet requirements.
 - 1. Do not alter trusses in field.

3.2 REPAIRS AND PROTECTION

- A. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
- B. Repair damaged galvanized coatings on exposed surfaces with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

END OF SECTION 061753

SECTION 061850 - STRUCTURAL GLUED-LAMINATED TIMBER

PART 1 – GENERAL

1.1 SUMMARY

- A. This Section includes framing using structural glued-laminated timbers.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.3 RELATED SECTIONS

- A. Related Sections include the following:
 - 1. Section 061000 – Rough Carpentry for dimension lumber items associated with structural glued-laminated timber construction.
 - 2. Section 061753 – Metal Plate Connected Wood Trusses.

1.4 DEFINITIONS

- A. Structural Glued-Laminated (Glulam) Timber: An engineered, stress-rated timber product assembled from selected and prepared wood laminations bonded together with adhesives and with the grain of the laminations approximately parallel longitudinally.

1.5 SUBMITTALS

- A. Product Data: For structural glued-laminated timber and connectors.
 - 1. Include data on lumber, adhesives, fabrication, and protection.
 - 2. Include installation instructions for timber connectors.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Provide factory-glued structural units produced by an AITC- or APA-licensed firm.
 - 1. Factory mark each piece of structural glued-laminated timber with AITC Quality Mark or APA trademark. Place mark on surfaces that will not be exposed in the completed Work.
- B. Quality Standard: Comply with AITC A190.1, "Structural Glued Laminated Timber."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. General: Comply with provisions in AITC 111, "Recommended Practice for Protection of Structural Glued Laminated Timber during Transit, Storage, and Erection."

- B. Individually wrap members to protect from moisture-pickup.

PART 2 – PRODUCTS

2.1 STRUCTURAL GLUED-LAMINATED TIMBER

- A. General: Provide structural glued-laminated timber that complies with AITC 117--MANUFACTURING or research/evaluation reports acceptable to authorities having jurisdiction.
- B. Species and Grades for Structural Glued-Laminated Timber: Provide structural glued-laminated timber made from any species that complies with structural properties indicated on the structural drawings.
- C. Appearance Grade:
 - 1. Typical: Industrial, for non-exposed installation, complying with AITC 110.
- D. Adhesive: Wet-use type complying with ASTM D 2559.
 - 1. Use adhesive that contains no urea-formaldehyde resins.
- E. End Sealer: Manufacturer's standard, transparent, colorless wood sealer that is effective in retarding the transmission of moisture at cross-grain cuts.
- F. Penetrating Sealer: Manufacturer's standard, transparent, penetrating wood sealer.

2.2 TIMBER CONNECTORS

- A. General: Unless otherwise indicated, fabricate from the following materials:
 - 1. Structural-steel shapes, plates, and flat bars complying with ASTM A 36/A 36M.
- B. Fabricate beam seats from steel with 0.239-inch bearing plates, 3/4-inch- diameter by-12-inch- long deformed bar anchors, and 0.239-inch side plates.
- C. Fabricate beam hangers from steel with 0.179-inch stirrups and 0.239-inch top plates.
- D. Fabricate strap ties from steel 3 inches wide by 0.239 inch thick.
- E. Fabricate tie rods from round steel bars with upset threads connected with forged-steel turnbuckles complying with ASTM A 668/A 668M.
- F. Provide bolts, 3/4 inch, unless otherwise indicated, complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); nuts complying with ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.
- G. Finish steel assemblies and fasteners with rust-inhibitive primer, 2-mil dry film thickness.

2.3 FABRICATION

- A. Shop fabricate for connections to greatest extent possible, including cutting to length and drilling bolt holes.
- B. Camber: Fabricate beams with camber as indicated on the structural drawings.
- C. End-Cut Sealing: Immediately after end-cutting each member to final length, apply a saturation coat of end sealer to ends and other cross-cut surfaces, keeping surfaces flood-coated for not less than 10 minutes.
- D. Seal Coat: After fabricating, sanding, and end-coat sealing, apply a heavy saturation coat of penetrating sealer on all surfaces of each unit.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Examine substrates in areas to receive structural glued-laminated timber, with Installer present, for compliance with requirements, installation tolerances, and other conditions affecting performance of structural glued-laminated timber.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Erect structural glued-laminated timber true and plumb, with uniform, close-fitting joints. Provide temporary bracing to maintain lines and levels until permanent supporting members are in place.
 - 1. Lift with padded slings and protect corners with wood blocking.
 - 2. Install structural glued-laminated timber to comply with Shop Drawings.
 - 3. Install timber connectors as indicated.

3.3 PROTECTION

- A. Do not remove wrappings on individually wrapped members until they no longer serve a useful purpose including protection from weather, sunlight, soiling, and damage from work of other trades. Leave clean and ready for site finishing.

END OF SECTION 061850

SECTION 072100 - INSULATION

PART 1 – GENERAL

1.1 SUMMARY

- A. Applications of insulation specified in this section include the following:
 - 1. Blanket-type building insulation under roof deck or in perimeter/exterior walls.
 - 2. Rigid insulation between walls and drywall studs.

1.2 RELATED DOCUMENTS

- A. Extent of insulation work is shown on drawings and indicated by provisions of this section.

1.3 RELATED SECTIONS

- A. Section 074113 – Preformed Metal Roofing.
- B. Non-load bearing interior steel studs, drywall, and acoustical batts – Section 092900 – Gypsum Drywall Systems.
- C. Refer to drawings and Section 072410 – Exterior Insulation and Finish System – for information regarding continuous insulation.

1.4 SUBMITTALS

- A. Submit manufacturer's product data and installation instructions for each type of insulation product.
- B. Submit nailing pattern for composite insulation board.

1.5 PRODUCT HANDLING

- A. Store insulation in undamaged original packaging and do not allow dirt or moisture pickup.

PART 2 – PRODUCTS

2.1 MATERIALS:

- A. Batt Insulation Under Roof Deck or In Perimeter Walls:
 - 1. Glass Fiber Blanket/Batt Insulation: Inorganic (nonasbestos) fibers formed with binders into resilient flexible blankets or semi-rigid batts; containing no formaldehyde; ASTM C 665, densities of not less than 0.5 lb. per cu. ft., k-value of 0.27; manufacturer's standard lengths and widths as required to coordinate with spaces to be insulated.

- a. Products: **Johns Manville, Certainteed**
2. Glasswool insulation blankets, manufactured with renewable organic binders (non phenol, formaldehyde, acrylics, or artificial colors), and high-recycled content fiberglass:
 - a. Product: **Knauf Building Insulation – Ecobatt Unfaced.**
3. Under Roof Deck: Layer of batt of a thickness necessary to provide R38
 - a. At concealed spaces (above ceilings) or where exposed above drywall partitions provide FSK 25 foil/kraft facing.
4. In Perimeter Walls: Layer of batt of a thickness necessary to provide R21.

2.2 AUXILIARY INSULATING MATERIALS:

- A. Mechanical Anchors: Type and size as recommended by particular insulation manufacturer for each type of application and condition of substrate.
 1. Powder Actuated Fasteners for Rigid Wall Insulation: Of depth to penetrate substrate at least $\frac{3}{4}$ " and in quantity to hold insulation in place until installation of studs and drywall. (GC may elect to use low VOC adhesive if desired to hold rigid in place prior to installation of studs and drywall.)

PART 3 – EXECUTION

3.1 INSPECTION AND PREPARATION:

- A. Installer shall examine substrates and conditions under which insulation work is to be performed. Obtain Installer's written report listing conditions detrimental to performance of work in this section. Do not proceed with installation of insulation until unsatisfactory conditions have been corrected.
- B. Clean substrates of substances harmful to insulations.

3.2 INSTALLATION, GENERAL:

- A. Comply with manufacturer's instructions for particular conditions of installation in each case. If printed instructions are not available or do not apply to project conditions, consult manufacturer's technical representative for specific recommendations before proceeding with work.
- B. Extend insulation full thickness as shown over entire area to be insulated. Cut and fit tightly around obstructions, and fill voids with insulation. Remove projections which interfere with placement.
- C. Apply a single layer of insulation of required thickness, unless shown as multiple layers.

3.3 INSTALLATION OF GENERAL BUILDING INSULATION:

- A. Rigid Insulation: Apply to substrate prior to installation of metal studs and secure in place until studs can be placed. Continue to roof deck.
- B. Batt Insulation: Fit units snugly between supports and fasten as required to maintain in place until covered by other materials.
 - 1. Above perimeter furring to roof deck, studs may be discontinued, and batts pinned through rigid insulation to wall.
- C. Set faced units with face to interior side of construction. Edges of units shall be tight against support. Do not obstruct ventilation spaces, except for firestopping. Tape all joints, gaps, and penetrations in facing.
- D. Stuff loose glass fiber insulation into all miscellaneous voids and cavity spaces. Compact to approximately 40% of normal maximum volume.

3.4 PROTECTION

- A. Protect installed insulation from weather exposure and physical abuse. Tape all tears in facings with matching tape. Temporarily seal exposed edges of composite insulation at the end of the day.
- B. Replace all insulation that has become wet or damaged during construction.

END OF SECTION 072100

SECTION 072410 - EXTERIOR INSULATION AND FINISH SYSTEM (EIFS)

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:

1. Exterior insulation and finish system (EIFS) applied over exterior sheathing.

B. System Description:

1. Class PB EIFS: A non-load bearing, exterior wall cladding system that consists of an insulation board attached adhesively to the substrate; an integrally reinforced base coat; and a textured protective finish coat

1.2 RELATED SECTIONS

1. Section 061000 – Rough Carpentry.

1.3 PERFORMANCE REQUIREMENTS

A. EIFS Performance:

1. Bond Integrity: Free from bond failure within EIFS components or between system and supporting wall construction, resulting from exposure to fire, wind loads, weather, or other in-service conditions.
2. Weathertightness: Resistant to water penetration from exterior into EIFS and assemblies behind it or through them into interior of building that results in deterioration of thermal-insulating effectiveness or other degradation of EIFS and assemblies behind it, including substrates, supporting wall construction, and interior finish.

B. Class PB EIFS: Provide EIFS having physical properties and structural performance that comply with the following:

1. Abrasion Resistance: Sample consisting of 1-inch thick EIFS mounted on ½ inch thick gypsum board; cured for a minimum of 28 days; and showing no cracking, checking, or loss of film integrity after exposure to 528 quarts of sand when tested per ASTM D 968, Method A.
2. Absorption-Freeze Resistance: No visible deleterious effects and negligible weight loss after 60 cycles per EIMA 101.01.
3. Accelerated Weathering: Five samples per ICC-ES AC219 showing no cracking, checking, crazing, erosion, rusting, blistering, peeling, delamination, or other characteristics that might affect performance as a wall cladding after testing for 2000 hours when viewed under 5 times magnification per ASTM G 153 or ASTM G 154.

4. Freeze-Thaw: No surface changes, cracking, checking, crazing, erosion, rusting, blistering, peeling, or delamination, or indications of delamination between components when viewed under five times magnification after 10 cycles per ICC-ES AC219.
5. Mildew Resistance of Finish Coat: Sample applied to 2-by-2-inch clean glass substrate, cured for 28 days, and showing no growth when tested per ASTM D 3273 and evaluated according to ASTM D 3274.
6. Salt-Spray Resistance: No deleterious effects when tested according to ICC-ES AC219.
7. Tensile Adhesion: No failure in the EIFS, adhesive, base coat, or finish coat when tested per EIMA 101.03 or ICC-ES AC219.
8. Water Penetration: Sample consisting of 1-inch thick EIFS mounted on ½ inch thick gypsum board, cured for 28 days, and showing no water penetration into the plane of the base coat to expanded-polystyrene board interface of the test specimen after 15 minutes at 6.24 lbf/sq. ft. of air pressure difference or 20 percent of positive design wind pressure, whichever is greater, across the specimen during a test period when tested per EIMA 101.02.
9. Water Resistance: Three samples, each consisting of 1-inch thick EIFS mounted on ½ inch thick gypsum board; cured for 28 days; and showing no cracking, checking, crazing, erosion, rusting, blistering, peeling, or delamination after testing for 14 days per ASTM D 2247.
10. Wind-Driven-Rain Resistance: Resist wind-driven rain according to ICC-ES AC219.
11. Impact Resistance: Sample consisting of 1-inch-thick EIFS when constructed, conditioned, and tested per EIMA 101.86; and meeting or exceeding the following:
 - i. Medium Impact Resistance: 50 to 89 inch-lb.
12. Structural Performance Testing: EIFS assembly and components shall comply with ICC-ES AC219 when tested per ASTM E 330.

1.4 SUBMITTALS

- A. Product Data: For each type and component of EIFS.
- B. Shop Drawings: Include plans, elevations, sections, details of components, details of penetration and termination, flashing details, joint locations and configurations, fastening and anchorage details including mechanical fasteners, and connections and attachments to other work.
- C. Samples: Color cards indicating full range of colors for selection to match existing.
- D. Maintenance Data: For EIFS to include in maintenance manuals.
- E. Mockup: Provide in-place first install panel to review quality of color and texture match to existing. Acceptable panel may remain in place.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An installer who is certified in writing by EIFS manufacturer as qualified to install manufacturer's system using trained workers.
- B. Source Limitations: Obtain EIFS from single source from single EIFS manufacturer and from sources approved by EIFS manufacturer as compatible with system components.
- C. Fire Test Response Characteristics: Provide EIFS and system components with the following fire-test-response characteristics as determined by testing identical EIFS and system components per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing agency.
 - 1. Fire Resistance Characteristics: Provide materials and construction tested for fire resistance per ASTM E 119.
 - 2. Full-Scale Multistory Fire Test: Tested mockup, representative of completed multistory wall assembly of which EIFS is a part, complies with UBC Standard 26-4 for test method and required fire-test-response characteristics of exterior non-load-bearing wall panel assemblies containing foam-plastic insulation.
 - 3. Full-Scale Diversified Fire Test: Tested mockup, representative of completed multistory wall assembly of which EIFS is a part, showing no significant contribution to vertical or horizontal flame spread per ASTM E 108 modified for testing vertical walls.
 - 4. Intermediate-Scale Multistory Fire Test: Tested mockup, representative of completed multistory wall assembly of which EIFS is a part, complies with NFPA 285 for test method and required fire test response characteristics of exterior non-load-bearing wall panel assemblies containing foam-plastic insulation.
 - 5. Radiant Heat Exposure: No ignition of EIFS when tested according to NFPA 268.
 - 6. Potential Heat: Acceptable level when tested according to NFPA 259.
 - 7. Surface-Burning Characteristics: Provide insulation board, adhesives, base coats, and finish coats with flame-spread index of 25 or less and smoke-developed index of 450 or less, per ASTM E 84.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original, unopened packages with manufacturers' labels intact and clearly identifying products.
- B. Store materials inside and under cover; keep them dry and protected from weather, direct sunlight, surface contamination, aging, corrosion, damaging temperatures, construction traffic, and other causes.
 - 1. Stack insulation board flat and off the ground.
 - 2. Protect plastic insulation against ignition at all times. Do not deliver plastic insulating materials to Project site before installation time.

3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.
4. Keep insulation covered and do not allow exposure to the sun or other elements.

1.7 PROJECT CONDITIONS

- A. Weather Limitations: Apply when ambient temperatures are above 40° F for minimum 24 hours before, during, and after adhesives or coatings are applied. Do not apply EIFS adhesives or coatings during rainfall. Proceed with installation only when existing and forecast weather conditions and ambient outdoor air, humidity, and substrate temperatures permit EIFS to be applied, dried, and cured according to manufacturer's written instructions and warranty requirements.

1.8 COORDINATION

- A. Coordinate installation of EIFS with related Work specified in other Sections to ensure that wall assemblies, including sheathing, flashing, trim, joint sealants, windows, and doors, are protected against damage from the effects of weather, age, corrosion, moisture, and other causes. Do not allow water to penetrate behind flashing and barrier coating of EIFS.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with Specifications, products by these manufacturers may be submitted:
 1. **Dryvit Systems (dryvit.com).**
 2. **Parex (parex.com).**
 3. **Senergy (senergy.basf.com).**
 4. **Sto (stocorp.com).**

2.2 MATERIALS

- A. Compatibility: Provide adhesive, fasteners, board insulation, reinforcing meshes, base and finish coat systems, sealants, and accessories compatible with each other and with substrates, and approved for use by EIFS manufacturer for Project.
- B. Primer/Sealer: EIFS manufacturer's standard substrate conditioner with VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24), designed to seal substrates from moisture penetration and to improve the bond between substrate and adhesive used for application of insulation.
- C. Flexible-Membrane Flashing: Cold-applied, fully self-adhering, self-healing, rubberized-asphalt and polyethylene-film composite sheet or tape and primer; EIFS manufacturer's standard or product recommended in writing by EIFS manufacturer.

- D. Insulation Adhesive: EIFS manufacturer's standard formulation designed for indicated use compatible with substrate; and with VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24). Comply with the following:
1. Job-mixed formulation of Portland cement complying with ASTM C 150, Type I, and polymer-based adhesive specified for base coat.
 2. Factory-blended dry formulation of Portland cement, dry polymer admixture, and fillers specified for base coat.
 3. Factory-mixed non cementitious formulation designed for adhesive attachment of insulation to substrates of type indicated, as recommended by EIFS manufacturer.
- E. Molded, Rigid Cellular Polystyrene Board Insulation:
1. Comply with ASTM C 578, Type I; EIFS manufacturer's requirements; and EIMA "Guideline Specification for Expanded Polystyrene (EPS) Insulation Board" for most stringent requirements for material performance and qualities of insulation, including dimensions and permissible variations.
 2. Aging: Before cutting and shipping, age insulation in block form by air drying for not less than six weeks or by another method approved by EIMA that produces equivalent results.
 3. Flame-Spread and Smoke-Developed Indexes: 25 and 450 or less, respectively, per ASTM E 84.
 4. Dimensions: Provide insulation boards not more than 24 by 48 inches and in thickness indicated, but not more than 4 inches thick or less than thickness allowed by ASTM C 1397.
 5. Foam Shapes: Provide with profiles and dimensions indicated on Drawings.
 6. Thickness: 1-1/2" for a nominal R-value of 6.
- F. Reinforcing Mesh: Balanced, alkali-resistant, open-weave, glass fiber mesh treated for compatibility with other EIFS materials, made from continuous multiend strands with retained mesh tensile strength of not less than 120 lbf/in. per ASTM E 2098. Comply with ASTM D 578 and the following:
1. Intermediate-Impact Reinforcing Mesh: Not less than 12.0 oz./sq. yd. with impact resistance of 50-89 inch/pound.
- G. Base-Coat Materials:
1. EIFS manufacturer's standard mixture complying with the following:
 - a. Factory-blended dry formulation of Portland cement, dry polymer admixture, and inert fillers to which only water is added at Project site.

H. Waterproof Adhesive/Base-Coat Materials:

1. EIFS manufacturer's standard waterproof formulation with VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24) complying with the following:
 - a. Job-combined formulation of manufacturer's standard polymer-emulsion adhesive and manufacturer's standard dry mix containing Portland cement.

I. Primer: EIFS manufacturer's standard factory-mixed, elastomeric-polymer primer for preparing base-coat surface for application of finish coat.

J. Finish-Coat Materials:

1. EIFS manufacturer's standard acrylic-based coating complying with the following:
 - a. Sealer: Manufacturer's waterproof, clear acrylic-based sealer for protecting finish coat.
 - b. Colors: Selected to closely match color of adjacent building. GC verify color using manufacturer's selection chart with mockup review with Owner in the field.
 - c. Texture: Match existing.

K. Water: Potable.

L. Trim Accessories:

1. Type as designated or required to suit conditions indicated and to comply with EIFS manufacturer's written instructions; manufactured from UV-stabilized PVC; and complying with ASTM D 1784, manufacturer's standard Cell Class for use intended, and ASTM C 1063.
2. Casing Bead: Prefabricated, one-piece type for attachment behind insulation, of depth required to suit thickness of coating and insulation, with face leg perforated for bonding to coating and back leg.
3. Drip Screed/Track: Prefabricated, one-piece type for attachment behind insulation with face leg extended to form a drip, of depth required to suit thickness of coating and insulation, with face leg perforated for bonding to coating and back leg.
4. Expansion Joint: Prefabricated, one-piece V profile; designed to relieve stress of movement.

2.3 MIXING

- A. General: Comply with EIFS manufacturer's requirements for combining and mixing materials. Do not introduce admixtures, water, or other materials except as recommended by EIFS manufacturer. Mix materials in clean containers. Use materials within time period specified by EIFS manufacturer or discard.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of EIFS.
- B. Examine wall framing, flashings, openings, substrates, and interface with other construction for suitable conditions where EIFS will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.
 - 1. Begin coating application only after surfaces are dry.
 - 2. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Protect contiguous work from moisture deterioration and soiling caused by application of EIFS. Provide temporary covering and other protection needed to prevent spattering of exterior finish coats on other work.
- B. Protect EIFS, substrates, and wall construction behind them from inclement weather during installation. Prevent penetration of moisture behind EIFS and deterioration of substrates.
- C. Prepare and clean substrates to comply with EIFS manufacturer's written instructions to obtain optimum bond between substrate and adhesive for insulation.

3.3 EIFS INSTALLATION, GENERAL

- A. Comply with ASTM C 1397 and EIFS manufacturer's written instructions for installation of EIFS as applicable to substrate indicated.

3.4 SUBSTRATE PROTECTION APPLICATION

- A. Primer/Sealer: Apply over exterior sheathing substrates to protect substrates from degradation and where required by EIFS manufacturer for improving adhesion of insulation to substrate.
- B. Flexible-Membrane Flashing: Install over weather-resistive barrier, applied and lapped to shed water; seal at openings, penetrations, terminations, and where indicated by EIFS manufacturer's written instructions to protect wall assembly from degradation. Prime substrates, if required, and install flashing to comply with EIFS manufacturer's written instructions and details.

3.5 TRIM INSTALLATION

- A. Trim: Apply trim accessories at perimeter of EIFS, at expansion joints and elsewhere as indicated, according to EIFS manufacturer's written instructions. Coordinate with installation of insulation.

1. Drip Screed/Track: Use at bottom edges of EIFS at all locations, including masonry site walls.
2. Expansion Joint: Use where indicated on Drawings.
3. Casing Bead: Use at other locations.

3.6 INSULATION INSTALLATION

A. Board Insulation:

1. Adhesively attach insulation to sheathing substrate in compliance with ASTM C 1397, EIFS manufacturer's written instructions, and the following:
 - a. Apply adhesive to insulation by notched-trowel method in a manner that results in coating the entire surface of sheathing with adhesive once insulation is adhered to sheathing unless EIFS manufacturer's written instructions specify using primer/sealer with ribbon-and-dab method. Apply adhesive to a thickness of not less than 1/4 inch for factory mixed and not less than 3/8 inch for field mixed, measured from surface of insulation before placement.
 - b. Press and slide insulation into place. Apply pressure over the entire surface of insulation to accomplish uniform contact, high initial grab, and overall level surface.
 - c. Allow adhered insulation to remain undisturbed for period recommended by EIFS manufacturer, but not less than 24 hours, before beginning rasping and sanding insulation, or applying base coat and reinforcing mesh.
 - d. Apply insulation over dry substrates in courses with long edges of boards oriented horizontally.
 - e. Begin first course of insulation from a level base line and work upward.
 - f. Stagger vertical joints of insulation boards in successive courses to produce running bond pattern. Locate joints so no piece of insulation is less than 12 inches wide or 6 inches high. Offset joints not less than 6 inches from corners of window and door openings and not less than 4 inches from aesthetic reveals.
 - g. Interlock ends at internal and external corners.
 - h. Abut insulation tightly at joints within and between each course to produce flush, continuously even surfaces without gaps or raised edges between boards. If gaps greater than 1/16 inch occur, fill with insulation cut to fit gaps exactly; insert insulation without using adhesive or other material.
 - i. Cut insulation to fit openings, corners, and projections precisely and to produce edges and shapes complying with details indicated.

- j. Rasp or sand flush entire surface of insulation to remove irregularities projecting more than 1/32 inch from surface of insulation and to remove yellowed areas due to sun exposure; do not create depressions deeper than 1/16 inch.
- k. Cut aesthetic reveals in outside face of insulation with high-speed router and bit configured to produce grooves, rabbets, and other features that comply with profiles and locations indicated. Do not reduce insulation thickness at aesthetic reveals to less than 3/4 inch.
- l. Interrupt insulation for expansion joints where indicated.
- m. Form joints for sealant application by leaving gaps between adjoining insulation edges and between insulation edges and dissimilar adjoining surfaces. Make gaps wide enough to produce joint widths indicated after encapsulating joint substrates with base coat and reinforcing mesh.
- n. Form joints for sealant application with back-to-back casing beads for joints within EIFS and with perimeter casing beads at dissimilar adjoining surfaces. Make gaps between casing beads and between perimeter casing beads and adjoining surfaces of width indicated.
- o. After installing insulation and before applying reinforcing mesh, fully wrap board edges with strip reinforcing mesh. Cover edges of board and extend encapsulating mesh not less than 2-1/2 inches over front and back face unless otherwise indicated on Drawings.
- p. Treat exposed edges of insulation as follows:
 - i. Except for edges forming substrates of sealant joints, encapsulate with base coat, reinforcing mesh, and finish coat.
 - ii. Encapsulate edges forming substrates of sealant joints within EIFS or between EIFS and other work with base coat and reinforcing mesh.
 - iii. At edges trimmed by accessories, extend base coat, reinforcing mesh, and finish coat over face leg of accessories.
- q. Coordinate installation of flashing and insulation to produce wall assembly that does not allow water to penetrate behind flashing and EIFS protective-coating lamina.

B. Expansion Joints:

- 1. Install at locations indicated, where required by EIFS manufacturer, and as follows:
 - a. At expansion joints in substrates behind EIFS.
 - b. Where EIFS adjoin dissimilar substrates, materials, and construction, including other EIFS.
 - c. Where wall height or building shape changes.

- d. Where EIFS manufacturer requires joints in long continuous elevations.
- e. Where panels abut one another.

3.7 BASE COAT INSTALLATION

- A. Masonry: Apply base, mesh, and finish coats directly over masonry site wall, with metal trim at bottom of wall.
- B. Base Coat: Apply to exposed surfaces of insulation in minimum thickness recommended in writing by EIFS manufacturer, but not less than 1/16-inch dry coat thickness.
- C. Reinforcing Mesh: Embed mesh in wet base coat to produce wrinkle-free installation with mesh continuous at corners and overlapped not less than 2-1/2 inches or otherwise treated at joints to comply with ASTM C 1397 and EIFS manufacturer's written instructions. Do not lap reinforcing mesh within 8 inches of corners. Completely embed mesh, applying additional base-coat material if necessary, so reinforcing-mesh color and pattern are not visible.
- D. Additional Reinforcing Mesh: Apply strip reinforcing mesh around openings extending 4 inches beyond perimeter. Apply additional 9-by-12-inch strip reinforcing mesh diagonally at corners of openings (re-entrant corners). Apply 8-inch-wide strip reinforcing mesh at both inside and outside corners unless base layer of mesh is lapped not less than 4 inches on each side of corners.
 - 1. Embed strip reinforcing mesh in base coat before applying first layer of reinforcing mesh.

3.8 FINISH COAT INSTALLATION

- A. Primer: Apply over dry base coat according to EIFS manufacturer's written instructions.
- B. Finish Coat: Apply over dry primed base coat, maintaining a wet edge at all times for uniform appearance, in thickness required by EIFS manufacturer to produce a uniform finish of color and texture matching approved sample and free of cold joints, shadow lines, and texture variations.
- C. Sealer Coat: Apply over dry finish coat, in number of coats and thickness required by EIFS manufacturer.

3.9 CLEANING AND PROTECTION

- A. Remove temporary covering and protection of other work. Promptly remove coating materials from window and door frames and other surfaces outside areas indicated to receive EIFS coatings.

END OF SECTION 072410

SECTION 072700 - AIR BARRIERS (BUILDING WRAP)

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. This section includes the following:

1. Mechanically attached flexible sheet air barrier (building wrap) located in the non-accessible part of the wall as underlayment at areas to receive fiber cement panels, see Section 074600, Fiber Cement Siding.
2. Materials to bridge and seal the following air leakage pathways and gaps:
 - a. Connections of the walls to the roof air barrier.
 - b. Expansion joints.
 - c. Openings and penetrations of window frames, storefront.
 - d. Door frames.
 - e. Piping, conduit, duct and similar penetrations.
 - f. All other air leakage pathways in the building envelope.

B. Related Work in other Sections includes the following:

1. Section 061000 – Rough Carpentry.
2. Section 074600 – Fiber Cement Vertical Panel Systems.
3. Section 081673 – Fiberglass Sliding Doors.
4. Section 085413 – Fiberglass Picture and Casement Windows

1.2 SUBMITTALS

- A. Submittals: Submit in accordance with Division 1 requirements.
- B. Submit product data and installation instructions.

1.3 PERFORMANCE REQUIREMENTS

- A. Material Performance: Provide air barrier materials which have an air permeance not to exceed 0.004 cubic feet per minute per square foot under a pressure differential of 1.57 pounds per square foot (0.004 cfm/ft² @ 1.57 psf), [0.02 liters per square meter per second under a pressure differential of 75 Pa (0.02 L/(s·m²) @ 75 Pa)] when tested in accordance with ASTM E2178 (unmodified).
- B. The water vapor permeance Desiccant method, (Procedure A) and Water method (Procedure B)] shall be determined in accordance with ASTM E96 and shall be declared by the material manufacturer.

- C. Assembly Performance: Provide a continuous air barrier in the form of an assembly that has an air leakage not to exceed 0.04 cubic feet per minute per square foot under a pressure differential of 1.57 pounds per square foot (0.04 cfm/ft² @ 1.57 psf) when tested in accordance with ASTM E2357. The assembly shall accommodate movements of building materials by providing expansion and control joints as required. Expansion / control joints, changes in substrate and perimeter conditions shall have appropriate accessory materials at such locations.
 - 1. The air barrier assembly shall be capable of withstanding combined design wind, fan and stack pressures, both positive and negative on the envelope without damage or displacement and shall transfer the load to the structure.
 - 2. Materials of the air barrier assembly shall not displace adjacent materials in the assembly under full load.
 - 3. The air barrier assembly shall be joined in an airtight and flexible manner to the air barrier materials of adjacent assemblies, allowing for the relative movement of assemblies due to thermal and moisture variations, creep, and anticipated seismic movement.
- D. Connections to Adjacent Materials: Provide connections to prevent air leakage at the following locations:
 - 1. Foundation and walls, including penetrations, ties, and anchors.
 - 2. Walls, windows, doors.
 - 3. Different assemblies and fixed openings within those assemblies.
 - 4. Wall and roof connections.
 - 5. Walls across construction, control, and expansion joints.
 - 6. Wall utility, pipe, and duct penetrations.
 - 7. Expansion joints.
 - 8. All other potential air leakage pathways in the building envelope.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in original packages with seals unbroken, labeled with the material manufacturer's name, product, date of manufacture, and directions for storage.
- B. Store materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by Mechanically Attached Flexible Sheet Air Barrier Manufacturer. Protect stored materials from direct sunlight.
- C. Handle materials in accordance with material manufacturer's recommendations.

1.5 PROJECT CONDITIONS

- A. Temperature: Install Mechanically Attached Flexible Sheet Air Barriers within range of ambient and substrate temperatures recommended by the primary air barrier manufacturer. Do not apply air barrier to a damp or wet substrate.
- B. Field Conditions: Do not install air barrier in rain, fog, or mist. Do not install air barrier when the temperature of substrate surfaces and surrounding air temperatures are below those recommended by the primary material manufacturer.
- C. Sequencing. Do not install air barrier material before the roof assembly has been sufficiently installed to prevent a buildup of water in the interior of the building

- D. Compatibility. Do not allow mechanically attached flexible sheet air barriers to come in contact with chemically incompatible materials.
- E. Ultra-violet exposure. Do not expose air barrier materials to sunlight longer than as recommended by the primary material manufacturer

1.6 WARRANTY

- A. Material Warranty: Provide primary material manufacturer's standard product warranty, for a minimum TWO (2) years from date of Substantial Completion.

PART 2 - MATERIALS

2.1 AIR BARRIER MATERIALS:

- A. Mechanically Attached Flexible Sheet Air Barriers: Air Barrier. Subject to compliance with requirements, provide one of the following:

- 1. Basis of Design Material: **DuPont™ Tyvek® Commercial Wrap® D by DuPont Weatherization Systems**:www.tyvek.com

- a. AIR BARRIER MATERIAL PROPERTIES:

- i. Air permeance for this material has been tested and reported as being 0.00045 cubic feet per minute per square foot when tested in accordance with ASTM E2178 (unmodified).
- ii. The water vapor permeance for this material has been tested and reported as being 2437 nanograms per second per square meter divided by the pascals of vapor pressure per when tested in accordance with ASTM E96 (desiccant method - unmodified).
- iii. The water vapor permeance for this material has been tested and reported as being 2427 nanograms per second per square meter divided by the pascals of vapor pressure per meter when tested in accordance with ASTM E96 (water method - unmodified).

- b. AIR BARRIER ACCESSORY MATERIALS: Tape, fasteners and sealers as recommended by manufacturer of primary material.

- 2. Material: **GreenGuard MAX Building Wrap by Pactiv Building Products**:

- a. AIR BARRIER MATERIAL PROPERTIES:

- i. Air permeance for this material has been tested and reported as being < 0.0002 cubic feet per minute per square foot under a pressure differential of 1.57 pounds per square foot when tested in accordance with ASTM E2178 (unmodified).
- ii. The water vapor permeance for this material has been tested and reported as being 773 nanograms per second per square meter divided by the pascals of vapor pressure per meter when tested in accordance with ASTM E96 (desiccant method - unmodified).

- b. AIR BARRIER ACCESSORY MATERIALS: As recommended by manufacturer of primary materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. The Contractor shall examine substrates, areas, and conditions under which the air barrier assembly will be installed for compliance with the following requirements.
 - 1. Verify that surfaces and conditions are suitable prior to commencing work of this section. Do not proceed with installation until unsatisfactory conditions have been corrected.
 - 2. Verify substrate is visibly dry.
 - 3. Ensure that the following conditions are met:
 - a. Surfaces are sound, dry, even, and free of excess mortar or other contaminants.
 - b. Inspect surfaces to be smooth without large voids or sharp protrusions. Inform General Contractor if substrates are not acceptable and need to be repaired by the concrete sub-trade.
 - c. Inspect masonry joints to be reasonably flush and completely filled, and ensure all excess mortar sitting on masonry ties has been removed. Inform General Contractor if masonry joints are not acceptable and need to be repaired by the mason sub-trade.
 - 4. Verify sealants are compatible with flexible sheet air barrier proposed for use.
 - 5. Notify Architect in writing of anticipated problems installing the air barrier material over substrate prior to proceeding.

3.2 INSTALLATION

- A. Installation instructions for Mechanically Attached Flexible Sheet Air Barrier: Install flexible sheet air barrier in a way that provides continuity throughout the building envelope. Install materials in accordance with manufacturer's instructions and the following (unless manufacturer requires other procedures in writing based on project conditions or particular requirements of their recommended materials):
 - 1. Install the head flashing material over all doors and windows which will be later covered by the air barrier material for proper drainage of water away from the window.
 - 2. Install building wrap over cast-in-place concrete, masonry, backup sheathing board, rigid insulation or other fully-supported continuous substrates as per manufacturer's instructions.
 - 3. Begin by aligning the bottom edge of the roll approximately 4 inches below the base of the wall onto the foundation, approximately 24 inches from a corner, with the print side facing out. Fold greater than 4 inches of material under itself and fasten securely to a stud, structural sheathing or through insulation board to an underlying framing member.
 - 4. Ensure air barrier material is plum and level on foundation, and unroll extending over window and door openings.
 - 5. Ensure air barrier material is applied over back edge of weep screed for proper water drainage.
 - 6. Unroll the air barrier material with the printed side facing out, wrapping the entire building, including door and window openings.

7. Attach into wood stud framing, through insulated sheathing board or into metal stud framing with plastic cap nails or fasteners specified by air barrier material manufacturer. The fasteners must penetrate the framing member a minimum of 1/2 inch on every vertical stud line.
8. When attaching to masonry, use adhesive or other method of fastening as instructed by the air barrier material manufacturer.
9. Fasteners need to be installed along every stud vertically and 12" or closer together as specified by the material manufacturer apart horizontally to maintain integrity of air barrier assembly to ensure the material is fastened to building when negative and positive pressures are exerted.
10. Install with drainage plane surface pattern in horizontal position. Install lower level air barrier material ensuring the upper layers of air barrier material lap the bottom layer to ensure proper shingling and water drainage.
11. Overlap at all corners of building by a minimum of 12 inches.
12. Overlap vertical seams by a minimum of 6 inches.
13. Prepare each window and door rough opening as recommended by the air barrier manufacturer or prepare by cutting a modified "I" pattern and wrap excess material to the inside of the rough opening and fasten securely to a framing member. At the window header, make a 6 to 8 inch [150 – 200 mm] diagonal cut at the corners of the air barrier and fold the material up above the rough opening, exposing the underlying sheathing. If windows are already in place when installing air barriers, trim as close to them as possible and tape all edges with manufacturer approved sealant tape. Use of window flashing materials is required as described in the International Building Code.
14. Detail remaining terminations and penetrations with accessory materials as per manufacturer's instructions for air leakage and ensuring lapping of the material for proper shingling and drainage of bulk water.
15. When the end of a roll is reached, fold the edge of the building wrap under itself and attach to the structural sheathing or through non-structural sheathing to the nearest framing member.
16. Tape all horizontal and vertical seams with manufacturer approved construction tape.
17. Seal top and bottom edges of rolled out material to substrate with manufacturer approved construction tape.
18. Seal all tears and cuts with manufacturer approved construction tape.

3.3 PROTECTING AND CLEANING

- A. Protect air barrier materials from damage during installation and the remainder of the construction period, according to primary material manufacturer's written instructions.
 1. Coordinate with installation of materials which cover the air barrier assemblies, to ensure exposure period does not exceed that recommended by the air barrier material manufacturer.
- B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction and acceptable to the primary material manufacturer.

END OF SECTION 072700

SECTION 074113 - PREFORMED METAL ROOFING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Preformed, prefinished metal roofing, underlayment, and flashings.
- B. Miscellaneous trim, flashing, closures, drip flashing, gutters, downspouts, and accessories.
- C. Sealant
- D. Fastening devices.

1.02 RELATED SECTIONS

- A. Section 061000, Rough Carpentry for sheathing and trim.
- B. Section 079200, Joint Sealers.
- C. Section 086200 Tubular Skylights.

1.03 REFERENCES

- A. American Iron & Steel Institute (AISI) Specification for the Design of Coldformed Steel Structural Members.
- B. ASTM A-525 Steel Sheet, Zinc-Coated (Galvanized)
- C. ASTM E-1680
- D. ASTM E-1646
- E. ASTM E-1592
- E. Spec Data Sheet - Aluminum Zinc Alloy Coated Steel (Galvalume) Sheet Metal by Bethlehem Corp.
- F. SMACNA - Architectural Sheet Metal Manual.
- G. Building Materials Directory - Underwriter's Laboratories, Test Procedure 580.

1.04 ASSEMBLY DESCRIPTION

- A. The roofing assembly includes preformed sheet metal panels, related accessories, valleys, hips, ridges, eaves, corners, rakes, miscellaneous flashing and attaching devices.

1.05 SUBMITTALS

- A. Submit detailed drawings showing layout of panels, anchoring details, joint details, trim, flashing, and accessories. Show details of weatherproofing, terminations, and penetrations of metal work.
- B. Submit a sample of roof panel, complete with factory finish.
- C. Submit results indicating compliance with minimum requirements of the following performance tests:
 - 1. Air Infiltration ASTM E 1680
 - 2. Water Infiltration ASTM E 1646
 - 3. Wind Uplift - U.L.90
- D. Submit calculations with registered engineer seal, verifying roof panel and attachment method resists wind pressures imposed on it pursuant to applicable building codes.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Upon receipt of panels and other materials, installer shall examine the shipment for damage and completeness.
- B. Panels should be stored in a clean, dry place. One end should be elevated to allow moisture to run off.
- C. Panels with strippable film must not be stored in the open, exposed to the sun.
- D. Stack all materials to prevent damage and to allow for adequate ventilation.

1.07 WARRANTY

- A. Paint finish shall have a **twenty-year** guarantee against cracking, peeling and fade (not to exceed 5 N.B.S. units).
- B. Applicator shall furnish guarantee covering watertightness of the roofing system for the period of **two (2) years** from the date of substantial completion.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Metal Roofing: 24 ga. roll-formed 12" wide metal panels with snap-on seam covers.
Basis of Design: **MBCI Craftsman Small Batten Panels with 1" joint covers**, or equal by **ATAS, Berridge, RollFab**.

- 1. Color: As selected from full range of standard 2-coat **Kynar** colors.

2.02 SHEET MATERIALS

- A. Prefinished Metal shall be Hot-Dipped Galvanized - ASTM A653-94 Grade C G90 Coating A924-94 24-gauge core steel.
- B. Finish shall be full strength Kynar 500® PVDF resin-based coating, applied by the manufacturer on a continuous coil coating line, with a top side dry film thickness of 0.70 to 0.80 mil over 0.20 to 0.30 mil prime coat, to provide a total topside dry film thickness of 1.0 plus or minus 0.10 mil. Reverse side shall be coated with primer and wash coat of 0.30 mil plus or minus 0.05 mil. Finish shall conform to all tests for adhesion, flexibility, and longevity as specified by the **Kynar 500® PVDF** resin-based coating supplier.
- C. Strippable film shall be applied to the top side of the painted coil to protect the finish during fabrication, shipping, and field handling. This strippable film shall be removed immediately before installation or if panels are exposed to heat or direct sunlight.
- D. Sheet Metal and Flashings: Flashings, gutters shall be fabricated of matching materials. Downspouts shall be 22 ga

2.03 ACCESSORY MATERIALS

- A. Fasteners: Cadmium Plated Steel or other corrosion-resistant material recommended by manufacturer, with washers where required.

- B. Sealant: Sealant must be an ultra low modulus, high performance, one-part, moisture curing silicone joint sealant. (Do not use a clear sealant or sealants which release a solvent or acid during curing).

Sealant shall be resistant to environmental conditions such as wind loading, wind driven rain, snow, sleet, acid rain, ozone, ultraviolet light, and extreme temperature variations.

Features shall include joint movement capabilities of +100% & -50% ASTM C-719, capable of taking expansion, compression, transverse and longitudinal movement, service temperature range -65°F to 300°F (-54°C to 149°C), Flow, sag or slump: ASTM C-639; Nil, Hardness (Shore A): ASTM C-661; 15, Tensile strength at maximum elongation: ASTM D-412; 200 psi, Tensile strength at 100% elongation: ASTM D-412; 35 psi, Tear strength, (die "C"); ASTM D-624; 40 pli, Peel strength (Aluminum, Glass, Concrete): ASTM C-794; 30 pli

- C. Joint covers receive factory-applied weatherseal mastic.
- D. Underlayment: One of the following is acceptable, or an equal product:
1. Spunbonded Polypropylene: **Grace Tri-Flex 30 Roofing Underlayment**
 2. Coated Woven Synthetic Underlayment: **Titanium UDL 25 Plus Synthetic Roofing Underlayment.**

2.04 FABRICATION

- A. All exposed adjacent flashing shall be of the same material and finish as the roof panels.
- B. Hem all exposed edges of flashing on underside, 1/2 inch.
- C. Fabricated gutters and downspouts as shown on drawings.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Substrate:
1. Examine structural wood panel roof deck to ensure proper attachment to framing.
 2. Inspect to verify deck is clean and smooth, free of depressions, waves or projections, level to 1/4" in 20', joints are flush; and properly sloped to eaves.
 3. Verify roof openings, curbs, pipes, sleeves, ducts, or vents through roof are solidly set, and nailing strips located.
- B. Underlayment:
1. Install underlayment over sheathing using galvanized roofing nails with coated felt caps.
 2. Felt installed horizontally, starting at eave to ridge with a 6" minimum overlap and 18" endlaps.
 3. Ensure that all nail heads are totally flush with the substrate.

3.02 INSTALLATION

- A. Comply with manufacturers standard instructions and conform to standards set forth in the Architectural Sheet Metal Manual published by SMACNA, in order to achieve a watertight installation.
- B. Install panels in such a manner that horizontal lines are true and level and vertical lines are plumb.
- C. Install starter and edge trim before installing roof panels.
- D. Remove protective strippable film prior to installation of roof panels.
- E. Attach panels using manufacturer's standard clips and fasteners, spaced in accordance with approved shop drawings.
- F. Make only cuts as needed for penetrations shown on drawings. Remove cut scraps and drill shaving immediately from roof.
- G. Install sealants for preformed roofing panels as approved on shop drawings.
- H. Do not allow panels or trim to come into contact with dissimilar materials.
- I. Do not allow traffic on completed roof. If required, provide cushioned walk boards.
- J. Protect installed roof panels and trim from damage caused by adjacent construction until completion of installation.
- K. Remove and replace any panels or components which are damaged beyond successful repair.

3.03 CLEANING

- A. Clean any grease, finger marks or stains from the panels per manufacturer's recommendations.
- B. Remove all scrap and construction debris from the site.

END OF SECTION 074113

SECTION 074600 - FIBER CEMENT SIDING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Fiber cement siding.
 - 2. Extruded aluminum reveal trim, flashings, and accessories.
 - 3. Aluminum soffit vents.
- B. Related Sections:
 - 1. Division 01: Administrative, procedural, and temporary work requirements.
 - 2. Section 061000, Rough Carpentry for sheathing and framing.
 - 3. Section 072700, Air Barriers
 - 4. Section 079200, Joint sealers and accessories.
 - 5. Section 099000, Painting.

1.2 REFERENCES

- A. American Society of Civil Engineers (ASCE) 7 - Minimum Design Loads for Buildings and Other Structures.
- B. ASTM International (ASTM):
 - 1. B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
 - 2. C1186 - Standard Specification for Flat, Non-Asbestos, Fiber-Cement Sheets.
 - 3. E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 4. E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
 - 5. E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 degrees C.
 - 6. E330 - Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

1.3 SYSTEM DESCRIPTION

- A. Design Requirements: Design and install panel system to withstand minimum wind pressures in accordance with Building Code and tested to ASTM E330.

1.4 SUBMITTALS

- A. Submittals for Review:
 - 1. Product Data: Indicate panel profiles, sizes, fastening methods, surface texture, and finish. Submit fire resistance information.
 - 2. Shop Drawings: Provide complete drawings showing installation. Indicate panel arrangement, each type of trim, fastener arrangement, and typical details – top, bottom, corners, junctures with other materials, etc.
 - 3. Warranty: Sample warranty form.

1.5 QUALITY ASSURANCE

- A. Single Source Responsibility: Panels, metal trim, and fasteners furnished by single manufacturer.
- B. Installer Qualifications: Minimum 3 years documented experience in work of this Section.

1.6 WARRANTIES

- A. Provide manufacturer's non-pro-rated 30-year warranty providing coverage against hail and termite damage and defects in materials and workmanship.
- B. Provide manufacturer's 15-year warranty providing coverage against peeling, cracking, and chipping of panel finish.
- C. Provide installer's 2-year warranty providing coverage against defects in installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Contract Documents are based on fiber cement product **James Hardie HardiePlank Lap Siding**.
- B. Other acceptable manufacturers include:
 - 1. **Nichiha**
 - 2. **Allura Corp., allurausa.com**
 - 3. **Certainteed**

2.2 MATERIALS

- A. Fiber Cement Smooth Lap Siding:
 - 1. Factory primed for site painting.
 - 2. Meet ASTM C1186, Grade A, Type II.
 - 3. Formulated from Portland cement, ground sand, cellulose fibers, additives, and water; formed under pressure to required profile.
 - 4. Size: Minimum 8 inches wide.
 - 5. Thickness: 5/16 inch.
 - 6. Surface texture: Smooth.
 - 7. Fire hazard classification: Maximum flame spread/smoke developed rating of 0/5, tested to ASTM E84.
 - 8. Combustibility; Noncombustible, tested to ASTM E136.
- B. Metal Trim:
 - 1. Material: Extruded aluminum, ASTM B221, 6063-T5 alloy and temper, clear anodized finish.
 - 2. Shapes:
 - a. Vertical Trim.
 - b. Horizontal Trim.
 - c. Drip Cap Trim.
 - d. Inside Corner Trim.
 - e. Outside Corner Trim.
 - f. J-Channel Trim.
 - 3. Soffit Vent: Continuous factory-painted aluminum soffit vent, perforated, 2-3/4" x 96", providing

9 sq

2.3 ACCESSORIES

- A. Fasteners: Stainless steel, Tor pan head type as recommended by panel manufacturer, of equal or greater holding power than required by manufacturer's Code compliance reports.
- B. Edge Sealer: Type recommended by panel manufacturer.
- C. Joint Sealers: Specified in Section 079200.

PART 3- EXECUTION

3.1 INSTALLATION

- A. Install panel system in accordance with manufacturer's instructions and approved Shop Drawings.
- B. Provide minimum 6-inch clearance between panel system and finished grade.
- C. Maintain 2-inch clearance between panel system and horizontal surfaces other than at grade.
- D. Install metal trim in accordance with drawing layouts and details.
 - 1. Over openings in walls and at bottom of walls: Install Drip Cap Trim.
 - 2. Install soffit vent following manufacturer's instructions at locations shown on drawings.
- E. Fasten trim at maximum 24 on center.
- F. Leave 1/2-inch gap between horizontal drainage flashings and bottom of panel above. Do not seal this space.
- G. Allow minimum vertical clearance between edge of panel system and adjacent materials in accordance with manufacturer's instructions.
- H. Cut panels to fit around penetrations with maximum 3/16" gaps. Smooth and seal cut edges.
- I. Fasten panel system at maximum spacing per manufacturer's Code compliance reports. Place fasteners exposed, minimum 3/8 inch (10 mm) from panel edges and 2 inches (50 mm) from top and bottom edges at panel corners, in orderly fastening pattern as shown on reviewed shop drawings.
- J. Apply joint sealer between panel system and adjacent surfaces as specified in Section 079200 except at horizontal drainage flashings.

END OF SECTION 074600

SECTION 078400 - FIRESTOPPING

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:

1. Firestopping systems for penetrations through fire-resistance-rated assemblies, including both empty openings and openings containing penetrating items:
 - a. Penetrations through fire-resistance rated assemblies, both vertical and horizontal.
 - b. Penetration through smoke barriers.
2. Fire-resistive joint systems for:
 - a. Floor to wall joints.
 - b. Wall to deck joints.
 - c. Holes through walls or floors.
3. Identification labels for firestopping installations.

1.2 RELATED SECTIONS

1. Divisions 20, 21, 22, and 23 Sections specifying duct and piping penetrations.

1.3 PERFORMANCE REQUIREMENTS

- A. General: For the following constructions, provide firestopping systems in accordance with International Building Code and fire-resistive joint systems to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assembly penetrated.
- B. F-Rated Systems: Provide through-penetration firestopping systems with F-ratings indicated, as determined per ASTM E 814, but not less than that equaling, or exceeding fire-resistance rating of constructions penetrated.
- C. T-Rated Systems: For the following conditions, provide through-penetration firestopping systems with T-ratings indicated, as well as F-ratings, as determined per ASTM E 814, where systems protect penetrating items exposed to potential contact with adjacent materials in occupied floor areas:
1. Penetrations located in construction containing fire-rated openings.
 2. Penetrating items larger than 4-inch- diameter nominal pipe or 16 sq. in. in overall cross-sectional area.
- D. For firestopping systems exposed to view, traffic, moisture, and physical damage, provide products that after curing do not deteriorate when exposed to these conditions both during and after construction.

1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant firestopping systems.
 2. For penetrations involving insulated piping, provide firestopping systems not requiring removal of insulation.
- E. For firestopping systems exposed to view:
1. Provide products with flame-spread ratings of less than 25 and smoke-developed ratings of less than 450, as determined per ASTM E 84.
 2. Load-bearing capabilities as determined by evaluation during the time test.
- F. Fire Resistance of Perimeter Fire-Containment Systems: Integrity and insulation ratings indicated as determined by UBC Standard 26-9 and UL 2079.

1.4 SUBMITTALS

- A. Product Data: For each type of firestopping system product indicated.
- B. Shop Drawings: For each firestopping system and fire-resistive joint system, show each kind of construction condition penetrated, relationships to adjoining construction, and kind of penetrating item. Include firestopping design designation of testing and inspecting agency acceptable to authorities having jurisdiction that evidences compliance with requirements for each condition indicated.
1. Submit documentation, including illustrations, from qualified testing agency that is applicable to each firestopping system configuration for construction and penetrating items.
 2. Where Project conditions require modification of qualified testing agency's illustration to suit a particular firestopping condition, submit illustration, with modifications marked, approved by firestopping system manufacturer's fire-protection engineer.
- C. Qualification Data: For firms and persons specified, to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names, and addresses of architects and owners, and contact information.
- D. Product Certificates: Signed by manufacturers of firestopping system products certifying that products furnished comply with Specifications.
- E. Product Test Reports: From qualified testing agency indicating firestopping system complies with Specifications, based on comprehensive testing of current products.
- F. Compatibility and Adhesion Test Reports, from fire-resistive joint system manufacturer indicating:
1. Materials forming joint substrates have been tested for compatibility and adhesion with fill materials.
 2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

- G. Evaluation Reports: Evidence of fire-resistive joint system compliance with ICBO ES AC30, from the ICBO Evaluation Service.
- H. At time of Substantial Completion, submit photographs of typical firestopping installations labeled with locations in Project.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed firestopping systems similar in material, design, and extent to this Project and whose work has resulted in construction with record of successful in-service performance.
- B. Source Limitations: Obtain firestopping systems, for each kind of penetration and construction condition indicated, from a single manufacturer.
- C. Fire-Test-Response Characteristics: Provide firestopping systems that comply with the following requirements and those specified:
 - 1. Firestopping tests are performed by a qualified testing agency such as Underwriters Laboratories (UL).
 - 2. Through-penetration firestopping systems are identical to those tested per ASTM E 814.
 - 3. Fire-resistive joint systems are identical to those tested per ICBO ES AC30 and are qualified for types of joints and joint movement capabilities indicated in current Evaluation Report by ICBO Evaluation Service.
 - 4. Perimeter fire-containment systems are identical to those tested per UL 2079.
 - 5. Firestopping systems are identical with firestopping system designations listed by UL Fire Resistance Directory.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver firestopping system products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying:
 - 1. Product and manufacturer.
 - 2. Date of manufacture.
 - 3. Lot number.
 - 4. Shelf life.
 - 5. Qualified testing agency classification marking applicable to Project.
 - 6. Curing time.
 - 7. Mixing instructions for multicomponent materials.
 - 8. Identifications labels for all firestopping locations.

- B. Store and handle materials for firestopping systems to prevent deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install firestopping systems when ambient or substrate temperatures are outside limits permitted by firestopping system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Ventilate firestopping systems per manufacturer's written instructions by natural means or, if necessary, forced-air circulation.

1.8 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure firestopping systems are installed according to Specifications.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate firestopping systems.
- C. Do not cover up firestopping system installations that will become concealed behind other construction until building inspector, if required by authorities having jurisdiction, has examined each installation.

PART 2 – PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS

- A. Subject to compliance with Specifications, through-penetration and fire-resistive joint systems by these manufacturers may be submitted:
 - 1. **AD Fire Protection Systems (adfire.com)**
 - 2. **Hilti Construction Chemicals (us.hilti.com)**
 - 3. **Grace Construction Products (na.graceconstruction.com)**
 - 4. **Nelson Firestop Products (nelsonfirestopping.com)**
 - 5. **Specified Technologies (stifirestopping.com)**
 - 6. **3M Fire Protection Products (3m.com)**
 - 7. **Tremco (tremcosealants.com)**

2.2 FIRESTOPPING, GENERAL

- A. Compatibility: Provide firestopping systems compatible with one another, with substrates forming openings, and with items penetrating firestopping systems, under conditions of service and application, as demonstrated by firestopping system manufacturer based on testing and field experience.
- B. Accessories: Provide components for each firestopping system needed to install fill materials and to comply with Performance Requirements Article. Use only components

specified by firestopping system manufacturer and approved by qualified testing and inspecting agency for firestopping systems indicated. Accessories include, but are not limited to:

1. Permanent forming/damming/backing materials, including:
 - a. Slag-rock-wool-fiber insulation.
 - b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
 - c. Fire-rated form board.
 - d. Fillers for sealants.
2. Temporary forming materials.
3. Substrate primers.
4. Collars.
5. Steel sleeves.

2.3 FILL MATERIALS

- A. General: Provide firestopping systems containing fill materials indicated by reference to types of materials described in this Article. Fill materials are those referred to in directories of referenced testing and inspecting agencies as fill, void, or cavity materials.
- B. Cast in Place Firestopping Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with intumescent strip, a radial extended flange attached to one end of sleeve for fastening to concrete formwork, and neoprene gasket.
- C. Latex Sealants: Single-component latex formulations that after cure do not re-emulsify during exposure to moisture.
- D. Firestopping Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
- E. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized steel sheet.
- F. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.
- G. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
- H. Mortars: Prepackaged, dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a non-shrinking, homogeneous mortar.
- I. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, non-shrinking foam.

- J. Silicone Sealants: Moisture-curing, single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated:
 - 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces and non-sag formulation for openings in vertical and other surfaces requiring a nonslumping, gunnable sealant, unless indicated firestopping system limits use to non-sag grade for both opening conditions.
 - 2. Grade for Horizontal Surfaces: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces.
 - 3. Grade for Vertical Surfaces: Non-sag formulation for openings in vertical and other surfaces.

2.4 MIXING

- A. For those products requiring mixing before application, comply with firestopping system manufacturer's written instructions for accurate proportioning of materials, type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Clean out openings immediately before installing firestopping systems to comply with written recommendations of firestopping system manufacturer and the following requirements:
 - 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of firestopping systems.
 - 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with firestopping systems. Remove loose particles remaining from cleaning operation.
 - 3. Remove laitance and form-release agents from concrete.
- B. Priming: Prime substrates where recommended in writing by firestopping system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking: Apply masking to prevent firestopping systems from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be

permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestopping system materials. Remove tape as soon as possible without disturbing firestopping system's seal with substrates.

3.3 FIRESTOPPING SYSTEM INSTALLATION

- A. General: Install firestopping systems to comply with this Specification and manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
 - 1. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of firestopping systems.
- C. Install fill materials for firestopping systems by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required achieving fire-resistance ratings indicated.
 - 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 - 3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

- A. Identify firestopping systems with pressure-sensitive, self-adhesive, preprinted vinyl labels. Attach labels permanently to surfaces of penetrated construction on both sides of each firestopping system installation where labels will be visible to anyone seeking to remove penetrating items or firestopping systems. Include the following information on labels:
 - 1. The words: "Warning-- Firestopping System--Do Not Disturb. Notify Building Management of Any Damage."
 - 2. Contractor's name, address, and phone number.
 - 3. Firestopping system designation of applicable testing agency.
 - 4. Date of installation.
 - 5. Firestopping system manufacturer's name.

3.5 CLEANING AND PROTECTION

- A. Clean off excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials approved in writing by firestopping system manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure firestopping systems are without damage or deterioration at time of Substantial

Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated firestopping systems immediately and install new materials to produce firestopping systems complying with Specifications.

END OF SECTION 078400

SECTION 079200 - JOINT SEALERS

PART 1 – GENERAL

1.1 SUMMARY

- A. This section includes:
 - 1. Work to render building envelope air and watertight.
 - 2. Preparing substrate surfaces.
 - 3. Sealant and joint backing.

1.2 RELATED SECTIONS

- A. Section 033000 – Cast-In-Place Concrete.
- B. Section 074113 – Preformed Metal Roofing.
- C. Section 074600 – Fiber Cement Vertical Panel System.
- D. Section 081113 - Hollow Metal Doors and Frames.
- E. Section 081673 – Fiberglass Sliding Doors
- F. Section 092900 – Gypsum Drywall Systems.
- G. Section 099000 - Painting.
- H. Section 102800 - Toilet and Bath Accessories.

1.3 REFERENCES

- A. ASTM C804 Use of Solvent Release Type Sealants.
- B. ASTM C919 Use of Sealants in Acoustical Applications.
- C. ASTM C920 Elastomeric Joint Sealants.
- D. ASTM D1056 Flexible Cellular Materials Sponge or Expanded Rubber.
- E. ASTM D1565 Flexible Cellular Materials Vinyl Chloride Polymers and Copolymers (Open Cell Foam).
- F. SWRI (Sealant, Waterproofing and Restoration Institute) Sealant and Caulking Guide Specification.

1.4 SUBMITTALS

- A. Product Data: Provide data indicating sealant chemical characteristics, performance criteria, substrate preparation, limitations, color, and adjacent surfaces to be caulked.

- B. Samples: Submit 2 samples illustrating sealant colors for selection.
- C. Manufacturer's Installation Instructions: Indicate special procedures, surface preparation, perimeter conditions requiring special attention.

1.5 QUALITY ASSURANCE

- A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. Maintain one copy of each document on site.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum five years' experience.
- B. Applicator: Company specializing in performing the work of this section with minimum five years' experience.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1.8 COORDINATION

- A. Coordinate the work with all sections referencing this section.

1.9 WARRANTY

- A. Provide five-year warranty under provisions of Div. 1.
- B. Warranty: Include coverage for installed sealants and accessories which fail to achieve watertight seal, exhibit loss of adhesion or cohesion, or do not cure.

PART 2 – PRODUCTS

2.1 SEALANT MATERIALS

- A. Exterior: One-part, non-sag, moisture-cure, high-performance polyurethane sealant:
 - 1. Product: Equal of **Master Builders MasterSeal NP 1** ASTM C 920, Type S, Grade NS, Class 35, Use NT, M A, and I.
 - 2. Performance Requirements:
 - a. Durometer Hardness: ASTM C-661, Shore A: 25-30
 - b. Ultimate Tensile Strength: ASTM D-412: 350 psi
 - c. Ultimate Elongation: ASTM D-412: 800 percent elongation

- d. Movement Capability: ASTM C-719: +/-35% sustained through weathering
- e. Peel Strength: ASTM C-794: 30 pli
- f. Staining: ASTM C-1248: Passes with no staining indicated for granite, limestone, brick, or concrete
- B. Interior: Silicone-modified acrylic latex caulking compound, movement 7-1/2% in expansion and compression. Paintable. Equal of **Pecora AC-20 + Silicone**.
- C. Sanitary Sealant: Mold and mildew resistant. Equal **GE SCS1700 Silicone**.
- E. Horizontal Sealant: Multi-component, self-leveling, elastomeric polyurethane sealant that is mixed and poured in place. When cured, it forms a tough, resilient joint seal that resists penetration and abrasion and remains flexible when exposed to weather and aging. **Equal Masterseal SL 100**. Use for joints in exterior flatwork.
- F. Small/Little Movement Joints/Bedding: Butyl rubber adhesive sealant. Equal **Devan 515.11**. Use for dampening, sound deadening, bedding thresholds, general adhesion.
- G. Expanding Foam Sealant: Expanding polyurethane foam insulating sealant, good to solidly fill holes and gaps up to 3" wide. Equal **Loctite TITEFOAM**. Use for sealing miscellaneous holes above ceilings, in utility spaces, gaps around pipes and conduit, etc.

2.2 ACCESSORIES

- A. Primer: Non staining type, recommended by sealant manufacturer to suit application.
- B. Joint Cleaner: Noncorrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.
- C. Joint Backing: ASTM D1056 D1565; round, closed cell polyethylene foam rod; oversized 30 to 50 percent larger than joint width.
- D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Verify that substrate surfaces and joint openings are ready to receive work.
- B. Verify that joint backing and release tapes are compatible with sealant.

3.2 PREPARATION

- A. Remove loose materials and foreign matter which might impair adhesion of sealant.
- B. Clean and prime joints in accordance with manufacturer's instructions.
- C. Perform preparation in accordance with manufacturer's instructions.

- D. Protect elements surrounding the work of this section from damage or disfiguration.

3.3 INSTALLATION

- A. Install sealant in accordance with manufacturer's instructions.
- B. Install sealant to be straight and non-waving in joints.
- C. Install bond breaker where joint backing is not used.
- D. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
- E. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- F. Tool joints concave, dense and consistent.
- G. Expanding Foam: Fill gaps and holes, and after initial cure cut back neatly flush with adjacent surfaces.

3.4 CLEANING

- A. Clean adjacent soiled surfaces and remove all sealant from adjacent surfaces.

3.5 PROTECTION OF FINISHED WORK

- A. Protect sealants until cured.

END OF SECTION 079200

SECTION 081113 STEEL (HOLLOW METAL) DOORS AND FRAMES

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes the following products manufactured in accordance with SDI Recommended Standards:
 - 1. Doors: Standard steel doors for interior and exterior locations.
 - 2. Frames: Hollow metal frames for doors, sidelights, borrowed lights, windows, and other interior and exterior openings of following type:
 - a. Welded unit type.
 - 3. Provide factory primed doors and frames to be field painted.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.3 RELATED SECTIONS

- A. Joint sealers are specified in Section 079200.
- B. Fiberglass Entry Doors are specified in Section 081444.
- C. Door hardware is specified in Section 087100.

1.4 SUBMITTALS

- A. Product data for each type of door and frame specified, including details of construction, materials, dimensions, hardware preparation, core, label compliance, profiles, and finishes.
- B. Shop drawings showing fabrication and installation of standard steel doors and frames. Include details of each frame type, elevations of door design types, conditions at openings, details of construction, location and installation requirements of door and frame hardware and reinforcements, and details of joints and connections. Show anchorage and accessory items.
 - 1. Provide schedule of doors and frames using same reference numbers for details and openings as those on contract drawings.
 - 2. Indicate coordinate of glazing frames and stops with glass and glazing requirements.

1.5 QUALITY ASSURANCE

- A. Provide doors and frames complying with Steel Door Institute "Recommended Specifications Standard Steel Doors and Frames" ANSI/SDI 100 and as herein specified.

1.6 REGULATORY REQUIREMENTS

- A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings and temperature-rise limits indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
 - 1. Smoke- and Draft-Control Assemblies: Provide an assembly with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.
- B. Fire-Rated, Borrowed-Light Assemblies: Complying with NFPA 80 and listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver doors and frames cardboard wrapped or crated to provide protection during transit and job storage. Provide additional protection to prevent damage to finish of factory finished doors and frames.
- B. Inspect doors and frames upon delivery for damage. Minor damages may be repaired provided refinished items are equal in all respects to new work and acceptable to Architect; otherwise, remove and replace damaged items as directed.
- C. Store doors and frames at building site under cover. Place units on minimum 4 inches high wood blocking. Avoid use of non-vented plastic or canvas shelters which could create humidity chamber. If cardboard wrapper on door becomes wet, remove carton immediately. Provide 1/4" spaces between stacked doors to promote air circulation.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Hot Rolled Steel Sheets and Strip: Commercial quality carbon steel, pickled and oiled, complying with ASTM A 569 and ASTM A 568.
- B. Cold Rolled Steel Sheets: Commercial quality carbon steel, complying with ASTM A 366 and ASTM A 568.
 - 1. Exterior Doors, Frames and Framing: Provide with metallic coating conforming to ASTM A924 for hot dip galvanization.
- C. Supports and Anchors: Fabricate of not less than 18 gage sheet steel. For anchorage to steel stud partitions provide anchors welded to frame.

- D. Inserts, Bolts, and Fasteners: Manufacturer's standard units. Where items are to be built into exterior walls, hot dip galvanize in compliance with ASTM A 153, Class C or D as applicable.
- E. Shop Applied Paint: Apply after fabrication.
 - 1. Primer: Rust inhibitive enamel or paint, either air drying or baking, suitable as a base for specified finish paints complying with ANSI A224.1, "Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames."

2.2 DOORS

- A. Provide metal doors of SDI grades and models specified below:
 - 1. ANSI/SDI 100
 - a. Exterior Doors: Grade III, extra heavy duty, minimum 18-gage cold rolled sheet steel faces. Provide seamless faces with edge seams welded and ground. Exterior doors shall have expanded polystyrene foam infill and shall be additionally reinforced for all applied hardware. Minimum 7" top rail with seamless top channel caps.
 - b. Interior Doors: Grade II, heavy-duty, minimum 18 ga. cold-rolled steel faces. Provide seamless faces with edge seams welded and ground. Interior doors shall have resin-impregnated honeycomb core and shall be additionally reinforced for all applied hardware.
 - c. Reinforce vertical edges with minimum 16 ga. x 1.75" channels with 1" returns.
 - i. Glass stops shall be 16 ga. steel channels, factory installed and through-fastened with countersunk flathead machine screws.
 - d. Provide inverted bottom closure channel for all doors.
 - e. Lock and hinge stiles shall be accurately mortised and reinforced to receive scheduled hardware. Reinforcement shall be not less than 3/16" thick steel drilled and tapped to receive hinges and locks. From the top edge of all doors and located 3" from the top, install a 16" x 14 ga. channel to separate the faces of the door, and two reinforcing plates 22" x 4.5" x 12 ga. to suit closers. Install spreaders for panic hardware which requires through-bolts. Reinforce for push plates, escutcheons, and similar items with 14 ga. sheet.

2.3 FRAMES

- A. Provide metal frames for wood and steel doors, sidelights, borrowed lights, interior, and exterior openings, of types and styles as shown on drawings and schedules. Conceal fastenings, unless otherwise indicated.
 - 1. Fabricate frames with mitered or coped corners, welded construction for all applications.

2. Form all exterior door frames from 14 gage steel and all interior frames from 16 ga. steel, except all pairs shall be 14 ga.
 3. Provide 4 wall anchors per jamb, plus a floor anchor, with mortar boxes for all hardware, 16 ga.
 4. All rabbets shall be sized, and hinge preparations performed to accommodate seals and gaskets to allow doors to close properly.
- B. Door Silencers: Except on weather-stripped frames or frames with smoke or sound seals, drill stops to receive 3 silencers on strike jambs of single door frames and 2 silencers on heads of double door frames.

2.4 FABRICATION

- A. Fabricate steel door and frame units to be rigid, neat in appearance and free from defects, warp, or buckle. Wherever practicable, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at project site. Comply with ANSI/SDI 100 requirements.
1. Clearances: Not more than 1/4 inch at jambs and heads; 3/4" at sill to allow for 1/2" threshold and door shoe.
- B. Fabricate exposed faces of doors and panels from only cold rolled steel.
- C. Tolerances: Comply with SDI 117 "Manufacturing Tolerances for Standard Steel Doors and Frames."
- D. Fabricate frames, concealed stiffeners, reinforcement, edge channels, louvers and moldings from either cold rolled or hot rolled steel.
- E. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat or oval heads for exposed screws and bolts.
- F. Hardware Preparation: Prepare doors and frames to receive mortised and concealed hardware in accordance with final Door Hardware Schedule and templates provided by hardware supplier. Comply with applicable requirements of ANSI A115 Series Specifications for door and frame preparation for hardware.
- G. Reinforce doors and frames to receive surface applied hardware. Drilling and tapping for surface applied hardware may be done at project site.
- H. Locate hardware as indicated on final shop drawings or, if not indicated, in accordance with "Recommended Locations for Builder's Hardware on Standard Steel Doors and Frames," published by Door and Hardware Institute.
- I. Shop Painting: Clean, treat, and paint exposed surfaces of steel door and frame units.
1. Clean steel surfaces of mill scale, rust, oil, grease, dirt, and other foreign materials before application of paint.
 2. Apply shop coat of prime paint of even consistency to provide a uniformly finished surface ready to receive finish paint.

PART 3 EXECUTION

3.1 INSTALLATION

- A. General: Install steel doors, frames, and accessories in accordance with final shop drawings, manufacturer's data, and as herein specified.
- B. Placing Frames: Comply with provisions of SDI 105 "Recommended Erection Instructions for Steel Frames," unless otherwise indicated.
 - 1. In metal-stud partitions, provide at least three wall anchors per jamb; install adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Attach wall anchors to studs with screws.
 - 2. Masonry Walls: Coordinate installation of frames to anchor into masonry as it goes up and to allow for solidly filling space between frames and masonry with grout.
 - a. If, for some reason, use of post-installed "punched and dimpled" frames are utilized, all anchorage points shall be filled, sanded, and primed ready for paint to be invisible in the final work.
- C. Door Installation: Fit hollow metal doors accurately in frames, within clearances specified in ANSI/SDI 100.
- D. Light Stops: Install toward exterior side of exterior frames. Use tamper-proof screws.

3.2 ADJUST AND CLEAN

- A. Prime Coat Touch up: Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touch up of compatible air-drying primer.
- B. Final Adjustments: Check and readjust operating hardware items, leaving steel doors and frames undamaged and in complete and proper operating condition.

END OF SECTION 081113

SECTION 081433 – INTERIOR STILE AND RAIL WOOD DOORS – SINGLE SWING, BI-FOLD, AND SLIDING

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. Interior stile and rail wood doors and wood casings and transom, all for painting in the field.
- 2. Fitting stile and rail wood doors to frames and machining for hardware.

B. Related Sections:

- 1. Section 081444, Fiberglass Entry Doors.
- 2. Section 087100, Finish Hardware and Hardware Schedule. Tracks and accessories for sliding closet doors are specified in this section.
- 3. Section 099000, Painting for painting interior and exterior sides of doors.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

- 1. Include details of construction.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Comply with manufacturer's written instructions and requirements of quality standard referenced in Part 2.
- B. Package doors individually to protect from moisture and dirt pickup.
- C. Mark each door on top and bottom edge with opening number used on Shop Drawings.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship, or have warped (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
 - 1. Warranty shall be in effect during the following period of time from date of Substantial Completion:
 - a. Interior Doors: Lifetime

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Use only materials that comply with referenced standards and other requirements specified.
- B. Panel Products: Any of the following:
 - 1. Hardboard, complying with AHA A135.4.
 - 2. Veneer core plywood, made with adhesive containing no urea-formaldehyde resin.

2.2 INTERIOR STILE AND RAIL WOOD DOORS: WD-1

- A. Interior Stile and Rail Wood Doors: Stock interior doors complying with WDMA I.S.6, "Industry Standard for Wood Stile and Rail Doors," and with other requirements specified. Products by of the following or an equal by another manufacturer:
 - a. Basis of Design: **Simpson Door Company "160" Interior panel door**
 - b. **Jeld-Wen, Inc.**
 - c. **Karona, Inc.**
 - 1. Finish and Grade: Opaque and Standard.
 - 2. Wood Species: Manufacturer's standard softwood species and cut.
 - 3. Stile and Rail Construction: Edge-glued solid lumber or veneered, structural composite lumber or veneered edge- and end-glued lumber.
Thickness: 1-3/8"
 - 4. Raised-Panel Construction: Edge-glued solid lumber.
 - 5. Raised-Panel Thickness:
 - Single Swing 3/4" thickness double hipped raised panel.
 - Bifold and Sliding: 3/8" flat panel.
 - 6. Molding Profile (Sticking): Ovolo sticking.
 - 7. WDMA Design Group: 1-3/8 Interior Panel Doors.
 - a. Panel Design Single Swing and Sliding Doors: **160 3 panel** as shown on door elevations.
 - b. Panel Design Bifold Doors: **60 3 panel**.

- 2.3 Mark, label, or otherwise identify stile and rail wood doors as complying with WDMA I.S.6 and grade specified. Include panel design number if applicable.

2.4 SHOP PRIMING

- A. Doors for Opaque Finish: Shop prime doors with one coat of wood primer specified in Section 099000, Painting. Seal all four edges, edges of cutouts, and mortises with primer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and substrates, with Installer present, for suitable conditions where wood stile and rail doors will be installed.
1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
 2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Hardware: For installation, see Section 087100, Door Hardware.
- B. Install wood doors to comply with manufacturer's written instructions, WDMA I.S.6, "Industry Standard for Wood Stile and Rail Doors" and other requirements specified.
- C. Field-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted with fire-rated doors. Machine doors for hardware. Seal cut surfaces after fitting and machining.

3.3 ADJUSTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Cleaning: Leave clean and free of grease, dirt, and ready for painting.

END OF SECTION 081433

SECTION 081444 – FIBERGLASS ENTRY DOORS

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. Exterior two panel fiberglass entry doors for painting in the field.
 - 2. Fitting stile and rail wood doors to frames and machining for hardware (providing prehung is an option if frame configurations are similar to architectural details).
- B. Related Sections:
 - 1. Section 081113, Hollow Metal Doors and Frames.
 - 2. Section 081433, Interior Stile and Rail Doors.
 - 3. Section 087100, Finish Hardware and Hardware Schedule.
 - 4. Section 099000, Painting for painting interior and exterior sides of doors.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
 - 1. Include details of construction.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Comply with manufacturer's written instructions and requirements of quality standard referenced in Part 2.
- B. Package doors individually to protect from moisture and dirt pickup.
- C. Mark each door on top and bottom edge with opening number used on Shop Drawings.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship, or have warped (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.

1. Warranty shall be in effect during the following period of time from date of Substantial Completion:
 - a. Exterior Doors: 3 years from date of shipment to supplier.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Use only materials that comply with referenced standards and other requirements specified.

2.2 EXTERIOR FIBERGLASS ENTRY DOORS

- A. Faces: 3/32" minimum thickness proprietary fiberglass reinforced thermoset composite, smooth, paintable.
- B. Edges: Machinable, kiln-dried hardwood, flush and square with door faces, lock edge reinforced with full-length integrated 3-1/2-inch-wide engineered lumber core. Door bottom edge: moisture and decay-resistant composite.
- C. Core: Foamed-in-place polyurethane core, density 1.9 psf minimum.
- D. Frames:
 1. Basis of design: **Therma-Tru Tru-Guard Composite Door Frame.**
 2. Material: Composite
- E. Door Configuration: 2 panel as shown, with glazed upper (transom) panel.
 - a. Basis of Design: **Therma-Tru Smooth Star Craftsman Lite Two-Panel S601.**
 - b. Provide equal by another manufacturer.
 - c. Glass: 1/2" insulating with Low-E No. 2 coating; SHGC .25.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and substrates, with Installer present, for suitable conditions where wood stile and rail doors will be installed.
 1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
 2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Hardware: For installation, see Section 087100 - Door Hardware.
- B. Install doors to comply with manufacturer's written instructions, WDMA I.S.6, "Industry Standard for Wood Stile and Rail Doors" and other requirements specified.
- C. Field-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted with fire-rated doors. Machine doors for hardware. Seal cut surfaces after fitting and machining.

3.3 ADJUSTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Cleaning: Leave clean and free of grease, dirt, and ready for painting.

END OF SECTION 081444

SECTION 081673 - FIBERGLASS SLIDING DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Fiberglass sliding doors.

1.2 RELATED SECTIONS

- A. Section 072700 - Air Barriers: Water-resistant barrier.
- B. Section 079200 - Joint Sealants: Sealants and caulking.
- C. Section 085413 – Fiberglass Picture and Casement Windows

1.3 REFERENCES

- A. American Architectural Manufacturers Association (AAMA):
 - 1. AAMA 502 - Voluntary Specification for Field Testing of Windows and Sliding Doors.
 - 2. AAMA 623 - Voluntary Performance Requirements and Test Procedures for Organic Coatings on Fiber Reinforced Thermoset Profiles.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM C 1036 - Flat Glass.
 - 2. ASTM C 1048 - Heat-Treated Flat Glass--Kind HS, Kind FT Coated and Uncoated Glass.
 - 3. ASTM D 3656 - Insect Screening and Louver Cloth Woven from Vinyl-Coated Glass Yarns.
 - 4. ASTM E 283 - Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors Under Specified Pressure Difference Across the Specimen.
 - 5. ASTM E 547 - Water Penetration of Exterior Windows, Curtain Walls and Doors by Cyclic Static Air Pressure Differential.
- C. Screen Manufacturers Association (SMA):
 - 1. SMA 1201 - Specifications for Insect Screens for Windows, Sliding Doors and Swinging Doors.

1.4 SUBMITTALS

- A. Submit in accordance with Division 1 requirements.
- B. Product Data: Submit manufacturer's product data, including installation instructions.
- C. Shop Drawings: Submit manufacturer's shop drawings, indicating dimensions, construction, component connections and locations, anchorage methods and locations, hardware locations, and installation details.

1.5 PERFORMANCE REQUIREMENTS

- A. Doors shall meet Rating SGD-LC-PG - 25 specifications in accordance with ANSI/AAMA/NWWDA 101/I.S.2/A440-08.
- B. Door Air Leakage, ASTM E 283: Door air leakage when tested at 1.57 psf (25 mph) shall be 0.10 cfm/ft² of frame or less.

- C. Door Water Penetration, ASTM E 547: No water penetration through door when tested under static pressure of 6.75 psf (51 mph) after 4 cycles of 5 minutes each, with water being applied at a rate of 5 gallons per hour per square foot.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver materials to site undamaged in manufacturer's original, unopened containers and packaging, with labels clearly identifying manufacturer and product name.
- B. Storage:
 - 1. Store materials in accordance with manufacturer's instructions.
 - 2. Store materials off ground and under cover.
 - 3. Protect materials from weather, direct sunlight, and construction activities.
- C. Handling: Protect materials and finish during handling and installation to prevent damage.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Basis of Design: **Pella Corporation**: Toll Free (800) 54-PELLA. Phone (641) 621-1000. Website www.pella.com. Equal by **Jeld-Wen**, **Milgard**, or another manufacturer who can supply products meeting specified criteria.

2.2 FIBERGLASS SLIDING DOORS

- A. Sliding Doors: **BOD Pella Impervia**.
 - 1. Factory-assembled door with sash installed in frame.
 - 2. Frame and Sash Material: **Duracast**. 5-layer, pultruded-fiberglass material, reinforced with interlocking mat.
- B. Frame:
 - 1. Type: Block frame.
 - 2. Interior and Exterior Frame: Pultruded, fiberglass composite with foam inserts.
 - 3. Overall Frame Depth: 4-3/4 inches.
 - 4. Nominal Wall Thickness of Fiberglass Members: 0.070 inch to 0.115 inch.
 - 5. Frame Corners:
 - a. Mitered.
 - b. Joined and bonded with thermoset polyurethane adhesive, nylon corner lock, and mechanically fastened.
 - 6. Head and Jambs: Factory-drilled, counter-bored, installation screw holes.
- C. Door Panels:
 - 1. Interior and Exterior Panel: Pultruded, fiberglass composite [with foam inserts].
 - 2. Vent Panel: Removable for cleaning exterior glass.
 - 3. Panel Corners:
 - a. Mitered.
 - b. Bonded and sealed with injected thermoset polyurethane adhesive.

- D. Glazing:
 - 1. Float Glass: ASTM C 1036, Quality 1.
 - a. Tempered Glass: ASTM C 1048.
 - 2. Type: Polyurethane reactive (PUR) hot-melt glazed, 11/16-inch thick, insulating glass, clear, tempered with multi-layer Low-E coated with argon fill.
- E. Weather Stripping:
 - 1. Frame: Welded gasket on frame.

2.3 OPTIONS

- A. Sliding Insect Screens: Standard.
 - 1. Compliance: ASTM D 3656 and SMA 1201.
 - 2. Screen Cloth: Vinyl-coated fiberglass, 18/16 mesh.
 - 3. Extruded-Aluminum Frame: Brown.
 - 4. Rollers: Top hung on 2 adjustable nylon rollers, room side of door panels.
 - 5. Strike: Frame-mounted strike.
 - 6. Hardware: Complete with necessary hardware.
 - 7. Interior and Exterior Handle Finish: Match interior door handle finish.

2.4 HARDWARE

- A. Handles:
 - 1. Interior Handle and Thumb Lock:
 - a. Finish: Satin nickel.
 - 2. Latch: Inside locking on screens.
 - a. Color: Brown.
- B. Locking System:
 - 1. Multiple-Point Lock Hardware: Electroplated steel with adjustable strike.
- C. Vent Panel Rollers:
 - 1. Two adjustable, permanently sealed, electroplated steel with organic coating, ball-bearing rollers, set on stainless steel track.

2.5 TOLERANCES

- A. Doors shall accommodate the following opening tolerances:
 - 1. Horizontal Dimensions Between High and Low Points: Plus 1/4-inch, minus 0 inch.
 - 2. Width Dimensions: Plus 1/4-inch, minus 0 inch.
 - 3. Building Columns or Masonry Openings: Plus or minus 1/4-inch from plumb.

2.6 FINISH

- A. Exterior and Interior **Duracast Finish**: Factory-applied powder-coat paint, comply with AAMA 623.
 - 1. Dual-color: Exterior to be selected with White interior.

2.7 INSTALLATION ACCESSORIES

- A. Flashing/Sealant Tape: Equal Pella **SmartFlash**.
 - 1. Aluminum-foil-backed butyl window and door flashing tape.
 - 2. Maximum Total Thickness: 0.013 inch.
 - 3. UV resistant.
 - 4. Verify sealant compatibility with sealant manufacturer.
- B. Interior Insulating-Foam Sealant: Low-expansion, low-pressure polyurethane insulating window and door foam sealant.
- C. Exterior Perimeter Sealant: High quality, multi-purpose sealant as specified in the 079200 Joint Sealers section.
- D. Block Frame Installation Accessories: Installation clips.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive doors. Notify Architect of conditions that would adversely affect installation or subsequent use. Do not proceed with installation until unsatisfactory conditions are corrected.

3.2 INSTALLATION

- A. Install doors in accordance with manufacturer's instructions.
- B. Install doors to be weather-tight and freely operating.
- C. Maintain alignment with adjacent work.
- D. Secure assembly to framed openings, plumb and square, without distortion.
- E. Integrate door system installation with exterior water-resistant barrier using flashing/sealant tape. Apply and integrate flashing/sealant tape with water-resistant barrier using watershed principles in accordance with door manufacturer's instructions.
- F. Place interior seal around door perimeter to maintain continuity of building thermal and air barrier using insulating-foam sealant.
- G. Seal door to exterior wall cladding with sealant and related backing materials at perimeter of assembly.
- H. Leave doors closed and locked.

3.3 CLEANING

- A. Clean door frames and glass in accordance with Division 1 requirements.
- B. Do not use harsh cleaning materials or methods that would damage finish or glass.
- C. Remove labels and visible markings.

3.4 PROTECTION

- A. Protect installed doors to ensure that, except for normal weathering, doors will be without damage or deterioration at time of substantial completion.

END OF SECTION 081673

SECTION 083113 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Wall access doors and frames.
 - 2. Ceiling access doors and frames.

1.2 RELATED DOCUMENTS

- A. Drawing and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.3. RELATED SECTIONS

- A. Painting for primed metal access doors is specified in Section 099000 – Painting.
- B. Divisions 22 and 23 for plumbing, and heating and air-conditioning duct or equipment access doors.

1.4 SUBMITTALS

- A. Product Data: For each type of door and frame indicated. Include construction details relative to materials, individual components and profiles, finishes, and fire ratings (if required) for access doors and frames.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain doors and frames through one source from a single manufacturer.
- B. Size Variations: Obtain Architect's acceptance of manufacturer's standard-size units, which may vary slightly from sizes indicated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Access Doors:
 - a. **Karp**

- b. J. L. Industries, Inc.
- c. Larsen's Manufacturing Company.
- d. Milcor Limited Partnership.
- e. Nystrom Building Products Co.

2.2 MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Hot-Rolled Steel Sheets: ASTM A 569/A 569M, Commercial Steel (CS), Type B; free of scale, pitting, and surface defects; pickled and oiled; with minimum thickness indicated representing specified nominal thickness according to ASTM A 568/A 568M.
- C. Cold-Rolled Steel Sheets: ASTM A 366/A 366M, Commercial Steel (CS), or ASTM A 620/A 620M, Drawing Steel (DS), Type B; stretcher-leveled standard of flatness; with minimum thickness indicated representing specified nominal thickness according to ASTM A 568/A 568M. Electrolytic zinc-coated steel sheet, complying with ASTM A 591/A 591M, Class C coating, may be substituted at fabricator's option.
- D. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304 with minimum sheet thickness indicated representing specified thickness according to ASTM A 480/A 480M.
- E. Basis of Design: **Karp Universal Flush Access Door Model DSC-214M.**
 - 1. Provide prime for painted at drywall walls and ceilings.
 - 2. Provide stainless steel at tile.

2.3 PAINT

- A. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements in FS TT-P-664; selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.

2.4 ACCESS DOORS AND FRAMES

- A. Flush Access Doors and Frames with Exposed Trim: Fabricated from stainless-steel sheet or primed sheet metal:
 - 1. Locations: Stainless Steel: Ceramic-tile wall surfaces.
 - 2. Drywall Walls and Ceilings: Primed for painting.
 - 3. Door: Minimum 14 ga. sheet metal, set flush with exposed face flange of frame.
 - 4. Frame: Minimum 16ga. sheet metal with 1-inch-wide, surface-mounted trim.
 - 5. Hinges: Spring-loaded concealed pin type.

6. Latch: Spanner head screwdriver-operated cam latch.

2.5 FABRICATION

- A. General: Provide access door assemblies manufactured as integral units ready for installation.
- B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- C. Steel Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.
 1. Exposed Flanges: As indicated
 2. Provide mounting holes in frames to attach frames to metal framing in drywall construction and to attach masonry anchors in masonry construction. Furnish adjustable metal masonry anchors.

2.6 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

2.7 STEEL FINISHES

- A. Surface Preparation: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface-preparation specifications and environmental exposure conditions of installed metal fabrications:
 1. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."
- B. Apply shop primer to uncoated surfaces of metal fabrications. Comply with SSPC-PA 1, "Paint Application Specification No. 1," for shop painting.

2.8 STAINLESS-STEEL FINISHES

- A. Remove tool and die marks and stretch lines or blend into finish.
- B. Bright, Directional Polish: No. 4 finish.
 1. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Advise installers of other work about specific requirements relating to access door and floor door installation, including sizes of openings to receive access door and frame, as well as locations of supports, inserts, and anchoring devices.

3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing access doors and frames.
- B. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finish surfaces.
- C. Install access doors with trimless frames flush with adjacent finish surfaces or recessed to receive finish material.
- D. Install stainless steel access doors in ceramic tile walls and gypsum board ceilings of shower areas.

3.3 ADJUSTING AND CLEANING

- A. Adjust doors and hardware after installation for proper operation.
- B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION 083113

SECTION 085413 – FIBERGLASS PICTURE AND CASEMENT WINDOWS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Fiberglass picture and casement windows.

1.2 RELATED SECTIONS

- A. Section 072700 - Air Barriers: Water-resistant barrier (building wrap).
- B. Section 079200 - Joint Sealants: Sealants and caulking.
- C. Section 081673 – Fiberglass Sliding Doors.

1.3 SUBMITTALS

- A. Submit in accordance with Division 1 requirements.
- B. Product Data: Submit manufacturer's product data, including installation instructions.
- C. Shop Drawings: Submit manufacturer's shop drawings, indicating dimensions, construction, component connections and locations, anchorage methods and locations, hardware locations, and installation details.

1.4 REFERENCES

- A. American Architectural Manufacturers Association (AAMA):
 - 1. AAMA 502 - Voluntary Specification for Field Testing of Windows and Sliding Doors.
 - 2. AAMA 623 - Voluntary Performance Requirements and Test Procedures for Organic Coatings on Fiber Reinforced Thermoset Profiles.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM C 1036 - Flat Glass.
 - 2. ASTM C 1048 - Heat-Treated Flat Glass--Kind HS, Kind FT Coated and Uncoated Glass.
 - 3. ASTM D 3656 - Insect Screening and Louver Cloth Woven from Vinyl-Coated Glass Yarns.
 - 4. ASTM E 283 - Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors Under Specified Pressure Difference Across the Specimen.
 - 5. ASTM E 547 - Water Penetration of Exterior Windows, Curtain Walls and Doors by Cyclic Static Air Pressure Differential.
- C. Screen Manufacturers Association (SMA):
 - 1. SMA 1201 - Specifications for Insect Screens for Windows, Sliding Doors and Swinging Doors.

1.5 PERFORMANCE REQUIREMENTS

- A. Windows shall meet Rating H-LC-PG 25 specifications in accordance with ANSI/AAMA/NWWDA 101/I.S.2/A440-08.
- B. Window Air Leakage, ASTM E 283: Window air leakage when tested at 1.57 psf (25 mph) shall be 0.25 cfm/ft² of frame or less.

- C. Window Water Penetration, ASTM E 547: No water penetration through window when tested under static pressure of 6.0 psf (48 mph) after 4 cycles of 5 minutes each, with water being applied at a rate of 5 gallons per hour per square foot.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver materials to site undamaged in manufacturer's or sales branch's original, unopened containers and packaging, with labels clearly identifying manufacturer and product name. Include installation instructions.
- B. Storage:
 - 1. Store materials in accordance with manufacturer's instructions.
 - 2. Store materials off ground and under cover.
 - 3. Protect materials from weather, direct sunlight, and construction activities.
- C. Handling: Protect materials and finish during handling and installation to prevent damage.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Basis of Design: **Pella Corporation**, Toll Free (800) 54-PELLA. Phone (641) 621-1000. Website www.pella.com. Provide products by this manufacturer, **Jeld-Wen**, **Milgard**, or another manufacturer who can supply products meeting criteria specified.

2.2 FIBERGLASS PICTURE AND CASEMENT WINDOWS

- A. Picture and Casement Windows: **Pella Impervia**.
 - 1. Factory-assembled window, fixed, or with sash opening out installed in frame.
 - 2. Frame and Sash Material: **Duracast**. 5-layer, pultruded-fiberglass material, reinforced with interlocking mat.
- B. Frame:
 - 1. Type: Nail fin or block frame (as needed).
 - 2. Interior and Exterior Frame: Pultruded, fiberglass composite with foam inserts.
 - 3. Overall Frame Depth: 3-1/4 inches.
 - 4. Nominal Wall Thickness of Fiberglass Members: 0.050 inch to 0.070 inch.
 - 5. Frame Corners:
 - a. Mitered.
 - b. Joined and bonded with thermoset polyurethane adhesive, nylon corner lock, and mechanically fastened.
 - 6. Sill: Fitted with weep valve assemblies.
 - 7. Jamb: Factory-drilled, counter-bored, installation screw holes.
- C. Sash:
 - 1. Interior and Exterior Sash: Pultruded, fiberglass composite with foam inserts.
 - 2. Sash Corners:
 - a. Mitered.
 - b. Bonded and sealed with injected thermoset polyurethane adhesive.
- D. Glazing:
 - 1. Float Glass: ASTM C 1036, Quality 1.
 - a. Tempered Glass: ASTM C 1048.

2. Type: Polyurethane reactive (PUR) hot-melt glazed 11/16-inch thick, insulating glass, clear tempered multi-layer Low-E coated with argon.

- a. U-Factor: See Thermal Envelope Assembly Requirements on drawings.
- b. SHGC: See Thermal Envelope Assembly Requirements on drawings.

E. Weather Stripping:

1. Vent Sash: Dual weather-stripped around perimeter with fin-type, dual-pile, weather stripping.

2.3 OPTIONS

A. Insect Screens:

1. Compliance: ASTM D 3656 and SMA 1201.
2. Screen Cloth: Half-size with fiberglass screen cloth set in aluminum frame fitted to outside of window.
3. Complete with necessary hardware.
4. Screen Frame Finish: Baked enamel.
 - a. Color: Match window exterior.

2.4 HARDWARE

A. Balances: Galvanized steel block-and-tackle balances.

B. Operator: Steel worm-gear with hardened gears. Linkage, hinge slide, and arms all stainless steel.

1. Crank Handle Finish: Integrated folding type, painted finish as selected.
2. Locking: Single-handle locking system, that operate positive-acting arms that pull sash into locked position. Lock handle finish painted as selected.

2.5 TOLERANCES

A. Windows shall accommodate the following opening tolerances:

1. Vertical Dimensions Between High and Low Points: Plus 1/4-inch, minus 0 inch.
2. Width Dimensions: Plus 1/4-inch, minus 0 inch.
3. Building Columns or Masonry Openings: Plus or minus 1/4-inch from plumb.

2.6 FINISH

A. Exterior and Interior **Duracast Finish**: Factory-applied powder-coat paint, comply with AAMA 623.

1. Color: Exterior as selected with White interior.

2.7 INSTALLATION ACCESSORIES

A. Flashing/Sealant Tape: Equal **Pella SmartFlash**.

1. Aluminum-foil-backed butyl window and door flashing tape.
2. Maximum Total Thickness: 0.013 inch.
3. UV resistant.
4. Verify sealant compatibility with sealant manufacturer.

B. Interior Insulating-Foam Sealant: Low-expansion, low-pressure polyurethane insulating window and door foam sealant.

- C. Exterior Perimeter Sealant: High quality, multi-purpose sealant as specified in the 079200b Joint Sealers section.
 - D. Block Frame Installation Accessories if needed: Installation clips.
- 2.8 SOURCE QUALITY CONTROL

- A. Factory Testing: Factory test individual standard operable windows for air infiltration in accordance with ASTM E 283, to ensure compliance with this specification.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive windows. Notify Architect of conditions that would adversely affect installation or subsequent use. Do not proceed with installation until unsatisfactory conditions are corrected.

3.2 INSTALLATION

- A. Install windows in accordance with manufacturer's instructions.
- B. Install windows to be weather-tight and freely operating.
- C. Maintain alignment with adjacent work.
- D. Secure assembly to framed openings, plumb and square, without distortion.
- E. Integrate window system installation with exterior water-resistant barrier using flashing/sealant tape. Apply and integrate flashing/sealant tape with water-resistant barrier using watershed principles in accordance with window manufacturer's instructions.
- F. Place interior seal around window perimeter to maintain continuity of building thermal and air barrier using insulating-foam sealant.
- G. Seal window to exterior wall cladding with sealant and related backing materials at perimeter of assembly.
- H. Leave windows closed and locked.

3.3 CLEANING

- A. Clean window frames and glass in accordance with Division 1 requirements.
- B. Do not use harsh cleaning materials or methods that would damage finish or glass.
- C. Remove labels and visible markings.

3.4 PROTECTION

- A. Protect installed windows to ensure that, except for normal weathering, windows will be without damage or deterioration at time of substantial completion.

END OF SECTION 085413

SECTION 086200 – TUBULAR SKYLIGHTS

PART 1: GENERAL

1.01 WORK INCLUDED

- A. Provide all labor, materials, tools, and services to install curb-mounted tubular skylight systems and related components as shown on drawings and specified herein. Skylight diffusers will terminate in exposed structure ceiling.
- B. Section 061000 – Rough Carpentry for preservative treated wood for roof curbs.
- C. Section 074113 - Preformed Metal Roofing.

1.02 REFERENCES

- A. ASTM B209 Specification for Aluminum and Aluminum Alloy Sheet and Plate
- B. ASTM A653 Steel Sheet, Zinc-Coated Or Zinc-Iron Alloy-Coated, By The Hot-Dip Process
- C. ASTM A463 Steel-Sheet, Aluminum-Coated, By The Hot-Dip Process
- D. ATSM A1008 Steel Sheet, Cold-Rolled, Carbon And Structural, High-Strength, Low-Alloy Sheet Products
- E. ICBO-ES AC-16 Acceptance Criteria for Plastic Skylights
- F. U.B.C. Standard 26-5 (ASTM D2843) Chamber Method of Test for Measuring the Density of Smoke from the Burning or Decomposition of Plastic Materials
- G. U.B.C. Standard 26-6 (ASTM D1929) Ignition Properties of Plastics
- H. U.B.C. Standard 26-7 (ASTM D635) Method of Test for Determining Classification of Approved Light-Transmitting Plastics
- I. U.B.C. Standard 8-1 (ASTM E-84) Test Method for Surface Burning Characteristics of Building Materials
- J. ASTM E330- Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference
- K. ASTM E331- Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference

1.03 QUALITY ASSURANCE

A. General

- 1) Provide certified independent laboratory test reports in full accord with Section 1.03, Paragraph C.

- 2) Provide tubular skylight system, which has been evaluated and approved by ICBO (and where appropriate, Dade County¹) and maintains a current Evaluation Report.

B. Test Units: Perform all tests unless otherwise noted per reference standards on unit size(s), which will be incorporated into the project.

C. Test Procedures

Air Infiltration Test

- a) Air Infiltration maximum 0.10 cfm per foot of crack length at 6.24 psf pressure differential when tested in accordance with ASTM E283.

3) Water Resistance Test

- a) No uncontrolled water leakage at 6.00 psf pressure differential with water rate of 5 gallons/hours/sf when tested in accordance with ASTM E331.

3) Uniform Load Deflection Test

- a) No breakage, permanent damage to fasteners, hardware parts, or damage to make tubular skylight inoperable at both a positive and a negative load of 146.8 psf.
- b) All tests shall be in accordance with ASTM E330.

Reference note: Design wind pressures are obtained from ANSI A58.1, local building codes or specified boundary layer wind tunnel data.

4) Uniform Load Structural Test

- a) Unit to be tested at 3x positive wind pressure and 2x negative wind pressure, acting normal to plane of roof in accordance with ASTM E330.
- b) No breakage, permanent damage to fasteners, hardware parts, or damage to make tubular skylight inoperable or permanent deflection of any section in excess of 0.2 % of its span.

1.04 SUBMITTALS

A. Shop Drawings/Samples

- 1) Shop drawings complete and full scale (where practical) showing construction of all components, dimensions, and details.
- 2) Samples of product as requested by the Architect.

B. Test Reports/Calculations

- 1) Certified independent laboratory test reports verifying compliance with all test requirements of Section 1.03.

1.05 WARRANTY

A. Tubular Skylight and Related Materials

- 1) Ten-year warranty on materials and workmanship from the Manufacturer. One-year warranty from the installer for materials and labor.

PART 2: PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. **Velux Suntunnel TCR**, installed locally by Sky Design Concepts or Tucson Window and Door.
- B. **Brighten Up by Solatube.**
- C. See drawings for size.

2.02 MATERIALS

- A. Roof Dome
 - 1) Injection-molded acrylic classified as CC2 material. Thickness shall not be less than 0.143 inches. Visible light transmission shall be 90% at 0.125 inches. Load carrying capacity should be 100psf (with a safety factor of 3) or greater. Provide dome ring to prevent thermal bridging between flashing and tubing material.
 - 2) Light Intercepting Transfer Device: Internal reflector housed inside dome cavity. Made in the same material as the main tube. Optimized shape to capture low angle sunlight.
- B. Roof Base/Flashing:
 - 1) Curb cap assembly for installation on wood curb.
- C. Main Tube:
 - 1) Fabricate substrate material from Aluminum sheet (0.015 inches – 0.020 inches thick) meeting the requirements of ASTM B209. Alloy and temper as required by the manufacturer to suit forming operations and finish requirements.
 - 2) Finish- Provide interior exposed reflective surface with high reflectance specular finish meeting AAMA designation M21C31A31. Reflective surface to have a specular reflectance of 92% and total reflectance of 95%.
 - a. Exterior Surface of Tube Exposed to Room: Matte white painted finish.
- D. Ceiling Ring and Dress Ring: Prevent thermal bridging and air infiltration from tube and from above-ceiling spaces. Provide for seating into drywall panel ceiling.
- E. Ceiling Diffuser: Acrylic plastic CC2 or polycarbonate CC1, 0.038" thick. Provide with visible transmission of 90% or greater.
- F. Fasteners shall be same as metals being fastened or non-magnetic stainless steel or other non-corrosive metal as recommended by the manufacturer.

2.03 FABRICATION

- A. General
 - 1) Finish, fabricate and shop prepare all assemblies under responsibility of one manufacturer.
 - 2) Fabricate to allow for thermal movement of materials when subject to a temperature differential from -30 degrees F to +180 degrees F.
 - 3) Provide transition pieces to allow tube to compensate for an offset from roof surface to ceiling surface. From roof surface to ceiling bottom surface is 4' vertically and 2' horizontally.
 - 4) Provision shall be made to ensure that water will not accumulate and remain in contact within system components.

PART 3: EXECUTION

3.01 INSTALLATION

- A. Install tubular skylights in accordance with manufacturer's printed installation instructions.
- B. After installation of first unit, conduct field check to determine compliance with specified requirements. Water test in presence of Owners Representative or Architect or Contractor Representative. Correct any deficiencies prior to commencing with subsequent units.

END OF SECTION 086200

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes commercial door hardware for the following:
 - 1. Swinging doors.
 - 2. Sliding doors.
 - 3. Other doors to the extent indicated.
- B. Door hardware includes, but is not necessarily limited to, the following:
 - 1. Mechanical door hardware.
 - 2. Cylinders specified for doors in other sections.
- C. Related Sections:
 - 1. Division 08 Section "Hollow Metal Doors and Frames".
 - 2. Division 08 Section "Flush Wood Doors".
- D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
 - 1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
 - 2. ICC/IBC - International Building Code.
 - 3. NFPA 70 - National Electrical Code.
 - 4. NFPA 80 - Fire Doors and Windows.
 - 5. NFPA 101 - Life Safety Code.
 - 6. NFPA 105 - Installation of Smoke Door Assemblies.
 - 7. State Building Codes, Local Amendments.
- E. Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:
 - 1. ANSI/BHMA Certified Product Standards - A156 Series.
 - 2. UL10C - Positive Pressure Fire Tests of Door Assemblies.

1.3 SUBMITTALS

- A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.
- B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 - 1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
 - 2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
 - 3. Content: Include the following information:
 - a. Type, style, function, size, label, hand, and finish of each door hardware item.
 - b. Manufacturer of each item.
 - c. Fastenings and other pertinent information.
 - d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
 - e. Explanation of abbreviations, symbols, and codes contained in schedule.
 - f. Mounting locations for door hardware.
 - g. Door and frame sizes and materials.
 - h. Warranty information for each product.
 - 4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
- C. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.
- D. Informational Submittals:
 - 1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.
- E. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.

1.4 QUALITY ASSURANCE

- A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.
- B. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).
- C. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- D. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.
- E. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.
 - 1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
- F. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.
- G. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:
 - 1. Function of building, purpose of each area and degree of security required.
 - 2. Plans for existing and future key system expansion.
 - 3. Requirements for key control storage and software.
 - 4. Installation of permanent keys, cylinder cores and software.
 - 5. Address and requirements for delivery of keys.
- H. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.
 - 1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
 - 2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.

3. Review sequence of operation narratives for each unique access controlled opening.
 4. Review and finalize construction schedule and verify availability of materials.
 5. Review the required inspecting, testing, commissioning, and demonstration procedures
- I. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedule.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.
- B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.
- C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.6 COORDINATION

- A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.
- B. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.7 WARRANTY

- A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:
1. Structural failures including excessive deflection, cracking, or breakage.
 2. Faulty operation of the hardware.
 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 4. Electrical component defects and failures within the systems operation.
- C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.

- D. Special Warranty Periods:

1.8 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.
- B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:
1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.
- C. Products furnished, but not installed, under this Section include the following. Coordinating, purchasing, delivering, and scheduling remain requirements of this Section.
1. Permanent cylinders, cores, and keys to be installed by Owner.
- D. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 HANGING DEVICES

- A. Hinges: ANSI/BHMA A156.1 certified butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.
1. Quantity: Provide the following hinge quantity:
 - a. Two Hinges: For doors with heights up to 60 inches.
 - b. Three Hinges: For doors with heights 61 to 90 inches.
 - c. Four Hinges: For doors with heights 91 to 120 inches.
 - d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.
 2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:

- a. Widths up to 3'0": 4-1/2" standard or heavy weight as specified.
 - b. Sizes from 3'1" to 4'0": 5" standard or heavy weight as specified.
 3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:
 - a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
 - b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.
 4. Hinge Options: Comply with the following:
 - a. Non-removable Pins: With the exception of electric through wire hinges, provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.
 5. Manufacturers:
 - a. **McKinney (MK).**
- B. Sliding and Folding Door Hardware: Hardware is to be of type and design as specified and should comply with ANSI/BHMA A156.14.
1. Sliding Bi-Passing Pocket Door Hardware: Provide complete sets consisting of track, hangers, stops, bumpers, floor channel, guides, and accessories indicated.
 2. Manufacturers:
 - a. **Hafele Manufacturing (HF).**
 - b. **Johnson Hardware (JO).**
 - c. **Pemko (PE).**

2.3 DOOR OPERATING TRIM

- A. Flush Bolts and Surface Bolts: ANSI/BHMA A156.3 and A156.16, Grade 1, certified.
1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
 2. Furnish dust proof strikes for bottom bolts.
 3. Surface bolts to be minimum 8" in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
 4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.
5. Manufacturers:
 - a. **Rockwood (RO).**
 - b. **Trimco (TC).**

2.4 CYLINDERS AND KEYING

- A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.
- B. Source Limitations: Obtain each type of keyed cylinder and keys from the same source manufacturer as locksets and exit devices, unless otherwise indicated.
 - 1. Manufacturers:
 - a. **dormakaba Best (BE).**
- C. Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:
 - 1. Threaded mortise cylinders with rings and cams to suit hardware application.
 - 2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
 - 3. Bored or cylindrical lock cylinders with tailpieces as required to suit locks.
 - 4. Tubular deadlocks and other auxiliary locks.
 - 5. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
 - 6. Keyway: Manufacturer's Standard.
- D. Interchangeable Cores: Provide small format interchangeable cores as specified, core insert, removable by use of a special key; usable with other manufacturers' cylinders.
- E. Keying System: Each type of lock and cylinders to be factory keyed.
 - 1. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.
 - 2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
 - 3. New System: Key locks to a new key system as directed by the Owner.
- F. Key Quantity: Provide the following minimum number of keys:
 - 1. Construction Keys (where required): Ten (10).
 - 2. Construction Control Keys (where required): Two (2).
- G. Construction Keying: Provide construction master keyed cylinders.
- H. Construction Keying: Provide temporary keyed construction cores.
- I. Key Registration List (Bitting List):
 - 1. Furnish a list of opening numbers with locking devices, showing cylinder types and quantities required when cylinders or cores are to be owner furnished.

2.5 MECHANICAL LOCKS AND LATCHING DEVICES

- A. Cylindrical Locksets, Grade 1 (Commercial Duty): ANSI/BHMA A156.2, **Series 4000**, Operational Grade 1 Certified Products Directory (CPD) listed.

1. Locks are to be non-handed and fully field reversible.
2. Manufacturers:
 - a. **Arrow Locks (AW) - QL Series.**

2.6 LOCK AND LATCH STRIKES

- A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:
 1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
 2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
 3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
 4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.
- B. Standards: Comply with the following:
 1. Strikes for Mortise Locks and Latches: BHMA A156.13.
 2. Strikes for Bored Locks and Latches: BHMA A156.2.
 3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
 4. Dustproof Strikes: BHMA A156.16.

2.7 DOOR STOPS AND HOLDERS

- A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.
- B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 certified door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.
 1. Manufacturers:
 - a. **Rockwood (RO).**

2.8 ARCHITECTURAL SEALS

- A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.

- B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.
 - 1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.
- C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.
 - 1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NPFA 252, Standard Methods of Fire Tests of Door Assemblies.
- D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.
- E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.
- F. Manufacturers:
 - 1. **Pemko (PE).**

2.9 FABRICATION

- A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.10 FINISHES

- A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.
- B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware
- C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

- A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.
- B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

- A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.
 - 1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.
- B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
 - 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
 - 2. DHI TDH-007-20: Installation Guide for Doors and Hardware.
 - 3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
 - 4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.
- C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
- D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

- E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

- A. Field Inspection (Punch Report): Reference Division 01 Sections "Closeout Procedures". Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.
 - 1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

3.5 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

- A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.
- B. Clean adjacent surfaces soiled by door hardware installation.
- C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

- A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SETS

- A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

**Indian Health Services
Parker Duplex Quarters
CONSTRUCTION DOCUMENTS**

**IHS PH21CR03Q3
BWS 1818.900**

1. Quantities listed are for each pair of doors, or for each single door.
2. The supplier is responsible for handing and sizing all products.
3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.

B. Manufacturer's Abbreviations:

1. **MK - McKinney**
2. **OT - Other**
3. **JO - Johnson Hardware**
4. **RO - Rockwood**
5. **AW - Arrow Lock**
6. **BE - BEST Access & Door Closers**
7. **PE - Pemko**

Hardware Sets

Set: 1.0

Doors: 101, 103, 201, 203

1 Entrance Lock	QL81 SB IC	US26D	AW
1 Construction Core	1CC7A2	Green	BE
1 Final Keyed Core	By Owner		OT
1 Door Stop	441H	US26D	RO
1 Balance of Hardware	By Door Mfg.		OT

Set: 2.0

Doors: 112, 113, 213

6 Hinge	TA2314 NRP	US32D	MK
1 Surface Bolt	580	US26D	RO
1 Storeroom Lock	QL82 SB IC	US26D	AW
1 Construction Core	1CC7A2	Green	BE
1 Final Keyed Core	By Owner		OT
2 Door Stop	441H	US26D	RO
1 Threshold	171A		PE
1 Gasketing	303AS		PE
2 Sweep	315CN		PE
1 Astragal	355CS		PE

Set: 2.1

Doors: 212A, 212B

3 Hinge	TA2314 NRP	US32D	MK
1 Storeroom Lock	QL82 SB IC	US26D	AW

**Indian Health Services
Parker Duplex Quarters
CONSTRUCTION DOCUMENTS**

**IHS PH21CR03Q3
BWS 1818.900**

1 Construction Core	1CC7A2	Green	BE
1 Final Keyed Core	By Owner		OT
1 Door Stop	441H	US26D	RO
1 Threshold	171A		PE
1 Gasketing	303AS		PE
1 Sweep	315CN		PE

Set: 3.0

Doors: 105, 106, 107, 108, 205, 206, 207, 208

3 Hinge	By Pre-hung Door Mfg.		OT
1 Privacy Lock	QL72 SB	US26D	AW
1 Wall Stop	409	US32D	RO

Set: 4.0

Doors: 106A, 206A

1 Bypass Hardware Set	2200 Series		JO
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Set: 4.5

Doors: 105A, 205A

1 Bypass Hardware Set	2200 Series		JO
2 Wire Pull	852	US26D	RO

Set: 5.0

Doors: 106B, 206B

1 Hardware	By Door Mfg.		OT
1 Final Keyed Core	By Owner		OT

Set: 5.5

Doors: 109, 110, 209, 210

1 Wire Pull	852	US26D	RO
1 Hardware	By Door Mfg.		OT

Set: 6.0

Doors: 111, 211

2 Wire Pull	852	US26D	RO
1 Hardware	By Door Mfg.		OT

END OF SECTION 087100

SECTION 088300 – FRAMELESS MIRRORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes the following types of silvered flat glass mirrors:

1. Frameless glass mirrors for toilets.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1. Mirrors. Include description of materials and process used to produce each type of silvered flat glass mirror specified that indicates sources of glass, glass coating components, edge sealer, and quality-control provisions.

B. Samples: For each type of mirror hardware; mirror corner with edge treatment, 2 each, 6" x 6".

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of mirror and mirror mastic, from manufacturer.

B. Warranty: Sample of special warranty.

1.5 QUALITY ASSURANCE

A. Glazing Publications: Comply with the following published recommendations:

1. GANA's "Glazing Manual" unless more stringent requirements are indicated. Refer to this publication for definitions of glass and glazing terms not otherwise defined in this Section or in referenced standards.
2. GANA Mirror Division's "Mirrors, Handle with Extreme Care: Tips for the Professional on the Care and Handling of Mirrors."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect mirrors according to mirror manufacturer's written instructions and as needed to prevent damage to mirrors from moisture, condensation, temperature changes, direct exposure to sun, or other causes.

- B. Comply with mirror manufacturer's written instructions for shipping, storing, and handling mirrors as needed to prevent deterioration of silvering, damage to edges, and abrasion of glass surfaces and applied coatings. Store indoors.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install mirrors until ambient temperature and humidity conditions are maintained at levels indicated for final occupancy.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which mirror manufacturer agrees to replace mirrors that deteriorate within specified warranty period. Deterioration of mirrors is defined as defects developed from normal use that are not attributed to mirror breakage or to maintaining and cleaning mirrors contrary to manufacturer's written instructions. Defects include discoloration, black spots, and clouding of the silver film.

- 1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SILVERED FLAT GLASS MIRRORS

- A. Glass Mirrors, General: ASTM C 1503.
- B. Clear Glass: Mirror Select Quality.
 - 1. Nominal Thickness: 6.0 mm.

2.2 MISCELLANEOUS MATERIALS

- A. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- B. Edge Sealer: Coating compatible with glass coating and approved by mirror manufacturer for use in protecting against silver deterioration at mirrored glass edges.
- C. Mirror Mastic: An adhesive setting compound, asbestos-free, produced specifically for setting mirrors and certified by both mirror manufacturer and mastic manufacturer as compatible with glass coating and substrates on which mirrors will be installed.
 - 1. Adhesive shall have a VOC content of not more than 70 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 2. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.3 MIRROR HARDWARE

- A. Top and Bottom Aluminum J-Channels: Aluminum extrusions with a return deep enough to produce a glazing channel to accommodate mirrors of thickness indicated and in lengths required to cover bottom and top edges of each mirror in a single piece.
 - 1. Bottom Trim: J-channels formed with front leg and back leg not less than 3/8 and 7/8 inch in height, respectively, and a thickness of not less than 0.04 inch.
 - 2. Top Trim: J-channels formed with front leg and back leg not less than 5/8 and 1 inch in height, respectively, and a thickness of not less than 0.04 inch.
 - 3. Finish: Clear bright anodized.
- B. Fasteners: Fabricated of same basic metal and alloy as fastened metal and matching it in finished color and texture where fasteners are exposed.
- C. Anchors and Inserts: Provide devices as required for mirror hardware installation. Provide toothed or lead-shield expansion-bolt devices for drilled-in-place anchors. Provide galvanized anchors and inserts for applications on inside face of exterior walls and where indicated.

2.4 FABRICATION

- A. Mirror Sizes: Cut mirrors to final sizes and shapes to suit Project conditions.
- B. Mirror Edge Treatment: Rounded polished.
 - 1. Seal edges of mirrors with edge sealer after edge treatment to prevent chemical or atmospheric penetration of glass coating.
 - 2. Mirror manufacturer to perform edge treatment and sealing in factory immediately after cutting to final sizes.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, over which mirrors are to be mounted, with Installer present, for compliance with installation tolerances, substrate preparation, and other conditions affecting performance of the Work.
- B. Verify compatibility with and suitability of substrates, including compatibility of mirror mastic with existing finishes or primers.
- C. Proceed with installation only after unsatisfactory conditions have been corrected and surfaces are dry.

3.2 PREPARATION

- A. Comply with mastic manufacturer's written installation instructions for preparation of substrates, including coating substrates with mastic manufacturer's special bond coating where applicable.

3.3 INSTALLATION

- A. General: Install mirrors to comply with mirror manufacturer's written instructions and with referenced GANA publications. Mount mirrors accurately in place in a manner that avoids distorting reflected images.
- B. Provide a minimum air space of 1/8 inch between back of mirrors and mounting surface for air circulation between back of mirrors and face of mounting surface.
- C. Wall-Mounted Mirrors: Install mirrors with mastic and mirror hardware. Attach mirror hardware securely to mounting surfaces with mechanical fasteners installed with anchors or inserts as applicable. Install fasteners so heads do not impose point loads on backs of mirrors.
 - 1. Top and Bottom Aluminum J-Channels: Provide setting blocks at quarter points. To prevent trapping water, provide, between setting blocks, two slotted at bottom channel.
 - 2. Install mastic as follows:
 - a. Apply mastic to comply with mastic manufacturer's written instructions for coverage and to allow air circulation between back of mirrors and face of mounting surface.
 - b. After mastic is applied, align mirrors and press into place while maintaining a minimum air space of 1/8 inch between back of mirrors and mounting surface.

3.4 CLEANING AND PROTECTION

- A. Protect mirrors from breakage and contaminating substances resulting from construction operations.
- B. Do not permit edges of mirrors to be exposed to standing water.
- C. Maintain environmental conditions that will prevent mirrors from being exposed to moisture from condensation or other sources for continuous periods of time.
- D. Wash exposed surface of mirrors not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash mirrors as recommended in writing by mirror manufacturer.

END OF SECTION 088300

SECTION 092900 - GYPSUM DRYWALL SYSTEMS

PART 1 - GENERAL

- A. **RELATED DOCUMENTS:** Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. **DESCRIPTION OF WORK:**
1. **Types of work include:**

Gypsum drywall including screw-type metal support system for perimeter wall furring and interior partitions. Sound attenuation blankets for partitions as shown.

Backing boards for application of other finishes, including tile at non-wet areas, and exterior tile over cement board.

Drywall finishing, including trim, priming and texturing.
 3. Section 072100 – Insulation for in-partition insulation, rigid insulation. Sound insulation is specified in this drywall section.
 4. Joint Sealers are specified in Section 079200.
 5. Painting of drywall is specified in Section 099000.
- C. **QUALITY ASSURANCE:**
1. Gypsum Board Standard: Comply with applicable requirements of ANSI/ASTM C 840 for application and finishing of gypsum board, unless otherwise indicated.
 2. Steel Framing Standard: Comply with applicable requirements of ASTM C 754 for installation of steel framing for gypsum board.
 3. Using Gypsum Board for Walls and Ceilings: Comply with requirements of GA-201.
 4. Gypsum Board Terminology Standard: GA-505 by Gypsum Association.
 5. Gypsum Construction Handbook: Proprietary publication of United States Gypsum.
 6. ASTM E580 Standard Practice for Installation of Ceiling Suspension Systems in Areas Subject to Earthquake Ground Movement.
- D. **SUBMITTALS:**
1. **Product Data:** Submit manufacturer's product specifications and installation instructions for each gypsum drywall component.
 2. **Samples:** Submit 3 - 1' x 2' samples of drywall with variations of specified texture for Architect's approval.

E. DELIVERY, STORAGE AND HANDLING:

1. Deliver materials in original packages, containers or bundles bearing brand name and identification of manufacturer or supplier.
2. Store materials inside under cover and in manner to keep them dry, protected from weather, direct sunlight, surface contamination, corrosion and damage from construction traffic and other causes. Neatly stack gypsum boards flat and support to prevent sagging.
3. Handle gypsum boards to prevent damage to edges, ends or surfaces. Protect metal corner beads and trim from being bent or damaged.

F. PROJECT CONDITIONS:

1. Environmental Requirements, General: Comply with requirements of referenced gypsum board application standards and recommendations of gypsum board manufacturer, for environmental conditions before, during and after application of gypsum board.
2. Cold Weather Protection: When ambient outdoor temperatures are below 55 deg F maintain continuous, uniform, comfortable building working temperatures of not less than 55 deg F for a minimum period of 48 hours prior to, during and following application of gypsum board and joint treatment materials or bonding of adhesives.
3. Ventilation: Ventilate building spaces as required to remove water in excess of that required for drying of joint treatment material immediately after its application. Avoid drafts during dry, hot weather to prevent too rapid drying.

PART 2 - PRODUCTS

A. METAL SUPPORT MATERIALS:

1. Ceiling Support Materials and Systems:
 - a) General: Size ceiling support components to comply with ASTM C 754 unless otherwise indicated.
 - b) Main Runners: Steel channels with rust inhibitive paint finish, hot or cold-rolled.
 - c) Hanger Wire: ASTM A 641, soft, Class 1 galvanized, 8 ga.
 - d) Metal Studs for Ceilings and Soffits: 20 ga, depth as indicated.
 - e) Hanger Anchorage Devices: Screws, clips, bolts, or other devices applicable to the indicated method of structural anchorage for ceiling hangers and whose suitability for use intended has been proven through standard construction practices or by certified test data. Size devices for 3x calculated load supported.
2. Wall/Partition Support Materials:
 - a) Studs: ASTM C 645. Manufacturers are encouraged to use post-industrial or post-consumer recycled materials in the fabrication of metal framing members; submit statement as specified above.

Depth of Section: 3-5/8", 6" or as otherwise indicated.

Thickness: 20 ga. typical for partition framing.
25 ga. for perimeter framing over rigid insulation.

Furring: Small furring such as 1-5/8" shall be 25 ga.

- b) Runners: Match studs; type recommended by stud manufacturer for floor and ceiling support of studs, and for vertical abutment of drywall work at other work.
- c) Partition Bridging: As shown on drawings.
- d) Hat Channels: Metal furring channels, 25 ga. corrosion-resistant steel.
- e) Allowable Wall Heights: Heights are for non-load bearing steel studs used in interior partitions with both flanges of studs continuously braced with gypsum board or flat straps:

STUD	DESIGNATION	MAXIMUM HEIGHT
3-5/8" 20 GA.	362DS20	16" O.C. – 15'-7"
6" 20 GA.	600DS20	16" O.C. – 22'-10"

3. PARTITION MATERIALS:

- a) GYPSUM WALLBOARD: ASTM C 36, of types, edge configuration and thickness indicated below; in maximum lengths available to minimize end-to-end butt joints.
 - i. Type: **Regular or Type X, as needed.**
 - ii. Thickness:
 - 1) At partitions and perimeter framing: thickness as shown on drawings.
 - 2) Above perimeter partitions as needed over rigid insulation: 1/2 inch
- b) TILE BACKING – NON-WET AREAS and INTERMITTENTLY WET AREAS: Abuse-, water-, mold-, and fire-resistant. Provide at all thinset tile applications, and at all toilets and Janitor Closets with painted drywall partitions. Provide at all kitchen walls, including those to receive stainless steel wall flashing; and behind shower inserts.
 - 1) Equal **USG Fiberock Interior Panel – Aqua Tough**
Thickness: 5/8 inch
- c) CEILINGS: Standard 5/8-inch gypsum panels. Equal **USG Sheetrock Interior Ceiling Panel Sag-Resistant.**
- d) BACKERBOARD FOR WET AREAS (SHOWERS) TO RECEIVE TILE: Coated glass-mat water-resistant gypsum backing panels meeting or exceeding ASTM C1178. Treated water-resistant gypsum core covered with a coated fiberglass mat facer and water-resistant surface coating. Equal **USG Durock – Glass-Mat Tile Backerboard.**

4. TRIM ACCESSORIES: Provide manufacturer's standard trim accessories, formed of galvanized steel (no plastic), with either knurled and perforated or expanded flanges for nailing or stapling, and beaded for concealment of flanges in joint compound. Provide corner beads, J-trim, L-type edge trim-beads, U-type edge trim-beads, special L-kerf-type edge trim-beads, and one-piece control joint beads.
5. JOINT TREATMENT MATERIALS:
 - a) General: ASTM C 475; type recommended by the manufacturer for the application indicated, except as otherwise indicated.
 - b) Joint Tape for Drywall: Perforated paper type.
 - c) Joint Compound: Provide chemical-hardening-type for bedding and filling, ready-mixed vinyl-type or vinyl-type powder type for topping, meeting ASTM C 475. Provide type suitable for use at moisture resistant partitions, as required.
 - d) Texturing Compound for walls, soffits, and ceilings: A ready-mixed joint compound/topping compound or **USG Ready-Mixed Texture Finish**, or equal by **Hamilton, Murco**.

Texture: Light hock and trowel approved from samples.
 - e) Surface Primer: Latex primer for preparation of drywall surface prior to application of texture as acceptable to drywall and texture material manufacturer, low V.O.C.
6. MISCELLANEOUS MATERIALS: Sealants and adhesives shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 23).
 - a) General: Provide auxiliary materials for gypsum drywall work of the type and grade recommended by the manufacturer of the gypsum board.
 - b) Gypsum Board Screws: Comply with ASTM C 646. Provide recommended corrosion resistant type for fastening moisture resistant and cement board.
 - c) Adhesive: Construction adhesive, complying with ASTM C557, VOC-compliant.
 - d) Sound Attenuation/Insulation Batts: Mineral wool lightweight sound attenuating batts. Equal of **Johns Manville Sound and Fire Block Batts, 3" thickness**.
7. ACOUSTICAL SEALANT
 - a) Acoustical sealant shall be non-skinning, non-hardening, flexible sealant specifically designed for sealing gypsum wallboard. Sealant shall be capable of spanning 1/2-inch wide by 3/8-inch deep gaps. Synthetic rubber based products comply with ASTM Standard D-217 and acrylic latex based products comply with ASTM Standard C-834 and shall be VOC-compliant.

Acceptable Products: **Tremco** (800-321-7906), **USG** acoustical sealant, **Pecora AC-20 FTR** (800-523-6688), or approved equivalent.

PART 3 - EXECUTION

A. PREPARATION FOR METAL SUPPORT SYSTEMS:

1. Ceiling Anchorages: Coordinate work with structural ceiling work to ensure that structural anchorage provisions have been installed to receive ceiling hangers.
2. Isolate steel framing from building structure to prevent transfer of loading imposed by structural movement as follows:
 - a) Where partition and wall framing abuts overhead structure or structural walls:
 - i.) Provide slip or cushioned type joints to attain lateral support and avoid axial loading.
 - b) See drawings for related requirements.

B. INSTALLATION OF METAL SUPPORT SYSTEMS:

1. General: Metal Support Installation Standard: Comply with ASTM C 754 and E580 (for seismic bracing).
 - a) Ceiling Support Suspension Systems: Secure hangers to structural support by connecting directly to structure where possible, otherwise connect to studs, clips, rods, channels, or other anchorage devices or fasteners as required or indicated.
 - b) Space main runners 4'-0" o.c. and space hangers 4'-0" o.c. along runners, except as otherwise shown.
 - c) Level main runners to a tolerance of 1/4" in 12'-0", measured both lengthwise on each runner and transversely between parallel runners.
 - d) Wire-tie or clip furring members to main runners and to other structural supports as indicated.
 - e) Space furring members as indicated or recommended in handbook.
 - f) Stud Ceilings/Soffits: Attach runners to ceilings and sidewalls, spaced as indicated, placing fasteners close to outside flange of runner. On stud walls, space fasteners to engage studs. Provide bracing members in accordance with handbook. Fasten at intervals and using fasteners in accordance with Gypsum Construction Handbook and drawings for a braced soffit.
 - g) Install auxiliary framing or blocking at termination of drywall work, and at openings for light fixtures and similar work, as required for support of both the drywall construction and other work indicated for support thereon.
- 2) Wall/Partition Support Systems:
 - a) Install supplementary framing, blocking and bracing at terminations in the work and for support of fixtures and casework, equipment, services, wall-mounted door stops, heavy trim, grab bars, toilet accessories, furnishings and similar work to comply with details indicated or if not otherwise indicated, to comply with applicable published recommendations of gypsum board manufacturer, or if not available, of "Gypsum Construction Handbook".

- b) Install runner tracks at floors, ceilings and structural walls and columns where gypsum drywall stud system abuts other work, except as otherwise indicated.
 - i.) Perimeter wall furring: Coordinate with installation of 1' rigid insulation directly against the wall prior to installing steel stud furring.
- c) Extend partition stud system as indicated to the structural support and substrate above the ceiling except where partitions are indicated to terminate at suspended ceilings. Cut studs 3/4" short of full height. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.
 - i.) For fire-resistive-rated partitions requiring partitions to extend to the underside of floor/roof decks or other continuous solid structural surfaces to obtain ratings, install framing around structural and other members extending below floor/roof slabs and decks, as needed, to support gypsum board closures needed to make partitions continuous from floor to underside of solid structure.
- d) Stud Spacing:

Interior Partitions and Perimeter Furring: Space studs for interior partitions and perimeter furring 16" o.c., unless otherwise indicated.
- e) Bridging: Provide bridging at mid-height of typical partitions, and at third points in full-height partitions.
- f) Frame door openings with double 20 ga. studs to comply with details indicated or if not otherwise indicated, to comply with "Gypsum Construction Handbook". Attach vertical studs at jambs with screws either directly to frames or to jamb anchor clips on door frames; install runner track section (for jack studs) at head and secure to jamb studs.
 - i.) Provide 3 studs at all corners.
- g) Extend vertical jamb studs through suspended ceilings and attach to underside of floor or roof structure above, unless otherwise indicated.
- h) Frame openings other than door openings in same manner as required for door openings; and install framing below sills of openings to match framing required above door heads.
- i) Install sound batts in framing at indicated locations. Fit between framing members and trim neatly around penetrations and obstructions. Fill gaps with insulation.

C. GENERAL GYPSUM BOARD INSTALLATION REQUIREMENTS:

1. Gypsum Board Application and Finishing Standards: ASTM C 840 and GA 216.
2. Install wall boards to minimize joints requiring treatment, as well as to minimize end butt joints. Locate exposed end-butt joints as far from center of walls and ceilings as possible.

3. Install ceiling boards in the direction and manner which will minimize the number of end-butt joints, and which will avoid end joints in the central area of each ceiling. Stagger end joints at least 1'-0".
4. Install exposed gypsum board with face side out. Do not install imperfect, damaged or damp boards. Butt boards together for a light contact at edges and ends with not more than 1/16" open space between boards. Do not force into place.
5. Locate either edge or end joints over supports, except in horizontal applications or where intermediate supports or gypsum board back-blocking is provided behind end joints. Position boards so that like edges abut, tapered edges against tapered edges and mill-cut or field-cut ends against mill-cut or field cut ends. Do not place tapered edges against cut edges or ends. Stagger vertical joints over different studs on opposite sides of partitions.
6. Attach gypsum board to supplementary framing and blocking provided for additional support at openings and cutouts.
7. Form control joints and expansion joints with space between edges of boards, prepared to receive trim accessories.
8. Cover both faces of steel stud partition framing with gypsum board in concealed spaces (above ceilings, etc.), except in chase walls which are braced internally.
9. Except where concealed application is required for sound, fire, air or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. area, and may be limited to not less than 75% of full coverage. Cut and fit gypsum board around pipes, ducts, conduits, and structural members projecting below underside of floor/roof decks.
10. Isolate perimeter of non-load-bearing drywall partitions at structural abutments. Provide 1/4" space and trim edge with U bead edge trim. Seal joints with acoustical sealant.
11. Space fasteners in gypsum boards in accordance with referenced standards and manufacturer's recommendations, except as otherwise indicated.
12. **ACOUSTICAL SEALANT USAGE** Sound Attenuating Construction: Where partitions are indicated to receive sound insulation, coordinate for installation of sound batts. Seal the work at perimeters, control and expansion joints, openings and penetrations with a continuous bead of acoustical sealant. Comply with acoustical construction details, and manufacturer's recommendations for location of beads, and close off sound-flanking paths around or through the work, including sealing of partitions above acoustical ceilings and the sealing of all penetrations through partitions.
 - 1) Use acoustical sealant to form an airtight seal at all penetrations and perimeter of sound-rated partitions, floors and ceilings. Comply with ASTM C919. Use backer-rod where gaps to be sealed exceed 3/8-inch.
 - 2) Apply acoustical sealant as a continuous bead along gypsum board face layer at all head and sill conditions of sound-rated partitions and around the perimeter of resilient ceilings.
 - 3) Apply expanding foam sealant where multiple pipes or conduits penetrate sound-rated construction.
 - 4) Apply mildew-resistant elastomeric sealant around all penetrations in tile-backing board. See Section 079200 – Joint Sealers.

D. GYPSUM DRYWALL APPLICATION:

- 1) Ceilings: Apply ceiling boards prior to installation of wall boards if at all possible.
- 2) Fastening Methods: Apply single layer gypsum boards to supports with screws.

E. INSTALLATION OF DRYWALL TRIM ACCESSORIES:

- 1) General: Apply trim as shown and as specified herein. Where feasible, use the same fasteners to anchor trim accessory flanges as required to fasten gypsum board to the supports. Otherwise, fasten flanges by nailing or stapling in accordance with manufacturer's instructions and recommendations.
- 2) Install metal corner beads at external corners of drywall work.
- 3) Install metal edge trim whenever edge of gypsum board would be exposed or semi-exposed. Provide type with face flange to receive joint compound. Install L-type trim where work is tightly abutted to other work, and install special kerf-type where other work is kerfed to receive long leg of L-type trim. Install U-type trim where edge is exposed, revealed, gasketed, or sealant-filled (including expansion joints).
- 4) Install control joints as follows:

Partition - interior	max. 30' o.c.
Ceiling - interior	
with perimeter relief	max. 50' o.c.
without perimeter relief	max. 30' o.c.

Installation of control joints will be reviewed and if quantity or placement is not according to specification, work shall be removed and replaced as directed.

F. FINISHING OF DRYWALL:

- 1) General: Apply treatment at gypsum board joints (both directions), flanges of trim accessories, penetrations, fastener heads, surface defects and elsewhere as required to prepare work for final finish. Prefill open joints and rounded or beveled edges as recommended by manufacturer.
- 2) Apply joint tape at joints between gypsum boards, except where trim accessories are indicated.
- 3) Levels of Gypsum Board Finish: Provide the following levels of gypsum board finish per GA-214.
 - a. Level 1 for ceiling plenum areas, concealed areas, and where indicated, unless a higher level of finish is required for fire-resistive-rated assemblies and sound-rated assemblies.
 - b. Level 2 where water-resistant gypsum backing board panels form substrates for tile.
 - c. Level 4 for all remaining gypsum board surfaces unless otherwise indicated.

- i.) For level 4 gypsum board finish, embed tape in joint compound and apply three separate coats of joint compound over joints, angles, fastener heads, and accessories. Touch up and sand between coats and after last coat as needed to produce a surface free of visual defects ready for decoration.
- d. Seal and treat joints in tile backing board by embedding joint tape in same mortar as being used for setting tile.

G. APPLICATION OF PRIMER AND TEXTURE FINISH:

- 1) Primer Application: Mix in accordance with manufacturer's instructions. Apply a full coverage coat with roller or preferably spray gun. Allow to dry before proceeding with texturing application.
- 2) Texture Finish Application: Mix and apply texture finish to drywall wall, soffits, and ceilings, and other surfaces indicated to receive finish in strict accordance with manufacturer's instructions to produce a uniform texture without starved spots or other evidence of thin application, and free of application patterns. Final texture application shall be match that selected by Architect from submitted texture samples.
- 3) Remove any texture droppings or overspray from door frames, windows and other adjoining work.

H. PROTECTION OF WORK:

- 1) Provide final protection and maintain conditions, in a manner suitable to Installer, which ensures gypsum drywall work being without damage or deterioration at time of substantial completion.

END OF SECTION 092900

SECTION 093000 TILE

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Glazed ceramic wall tile and trim.
 - 2. Porcelain tile at floors, with trim.
- B. Interior tile backer boards for tiled walls at intermittently wet areas are specified in Section 092900 - Gypsum Drywall.

1.3 SUBMITTALS

- A. General: Submit product data for each type of product specified.
- B. Samples of each type and color of tile and grout to be provided for Architects review.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirement of ANSI A137.1 for labeling sealed tile packages.
- B. Prevent damage or contamination to materials by water, freezing, foreign matter, and other causes.

1.5 EXTRA MATERIALS

- A. Deliver extra materials to Owner. Furnish extra materials that match products installed as described below, packaged with protective covering for storage and identified with labels clearly describing contents.
 - 1. New Tile and Trim Units: Furnish 5% maintenance stock of each type and color of tile installed.

PART 2 PRODUCTS

2.1 PRODUCTS, GENERAL

- A. ANSI Standard for Ceramic Tile: Comply with ANSI A137.1 "American National Standard Specifications for Ceramic Tile".

- B. ANSI Standard for Tile Installation Materials: Comply with ANSI standard referenced with products and materials indicated for setting and grouting.
- C. FLOOR TILE
 - 1. See drawings.
- D. WALL BASE
 - 1. 4" tile equal to **DalTile**. See drawings for further details.
- E. WALL TILE
 - 1. See drawings.
 - 2. Tile Wall Base: As selected from manufacturer's standard base and colors. Equal to **DalTile**.
 - 3. Top of tile on wall: Bullnose trim. Equal of **Daltile**.

2.2 SETTING MATERIALS:

- A. Typical Mortar for Interior Walls and Floors: Single component polymer-modified thin-set mortar, needing only the addition of water in the field. Suitable for large format tile at floors. Exceeds ANSI A118.4 for shear bond strength and A118.11.

Equal of **Mapei Kerabond T/Keralastic**.

2.3 GROUTING MATERIALS

- A. Polymer modified cement grout: Premium grade, pre-blended, polymer-modified Portland cement grout requiring only water.
 - a. Product: Equal **Mapei Keracolor S grout** cement grout.

2.4 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with requirements of referenced standards and manufacturers including those for accurate proportioning of materials and water; type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other procedures needed to produce mortars and grouts of uniform quality with optimum performance characteristics for application indicated.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates and areas where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
 - 1. Verify that substrates for setting tile are firm, dry, clean, and free from oil or waxy films and curing compounds.
 - 2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed before installing tile.
- B. Do not proceed with installation until unsatisfactory conditions have been corrected.
- C. Tile Protection: Test tile to determine if it can be stained by grout installation and take measures to protect the tile as needed.

3.2 INSTALLATION, GENERAL

- A. ANSI Tile Installation Standard: Comply with parts of ANSI 108 series of tile installation standards included under "American National Standard Specifications for the Installation of Ceramic Tile" that apply to type of setting and grouting materials and methods indicated.
- B. TCA Installation Guidelines: TCA "Handbook for Ceramic Tile Installation"; comply with TCA installation methods specified.
- C. Trim: Set floor trim at transitions prior to laying of tile. Install straight and level.
- D. Extend tile work into recesses and under or behind equipment and fixtures to form a complete covering without interruptions except as otherwise shown. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- E. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so that plates, collars, or covers overlap tile.
- F. Jointing Pattern: Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Extend wainscots to full tile height. Provide uniform joint widths, nominal width 1/8" for glazed wall tiles and nominal 1/8" – 3/16" for rectified floor tiles.
- G. Expansion Joints: Locate expansion joints and other sealant filled joints, including control, contraction, and isolation joints, where joints occur in substrate behind tile. Do not saw cut joints after installation of tiles.
- H. Grouting: Follow manufacturer's instructions closely. Fill all joints solidly and consistently, without gaps and beeholes.

3.3 WALL TILE INSTALLATION

- A. Install wall tile to comply with requirements indicated below for setting bed methods, TCA installation methods related to subsurface wall conditions, and grout types:
 - 1. Walls and Base Tile at Gypsum Drywall: W243.
 - 2. Grout: Cement grout.

3.4 FLOOR TILE INSTALLATION METHODS:

- A. Install floor tile to comply with requirements indicated below for setting bed methods, TCA installation methods related to subsurface wall conditions, and grout types:
 - 1. Typical Ceramic Tile on Concrete: F113A.
 - 2. Grout: Cement with anti-hydro admixture.

3.5 CLEANING AND PROTECTION

- A. Cleaning: Upon completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
 - 1. Remove grout residue from tile as soon as possible. Keep traffic off floor for period recommended by manufacturer, or at least 72 hours, whichever is greater.
 - 2. Leave finished installation clean and free of cracked, chipped, broken, loose, and otherwise defective tile work.
- B. Provide final protection and maintain conditions in a manner acceptable to manufacturer and installer that ensures that tile is without damage or deterioration at time of Substantial Completion. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear.
- C. Before final inspection, remove protective coverings and clean tile using a neutral cleaner.

END OF SECTION 093000

SECTION 099000 - PAINTING

PART 1 - GENERAL

- 1.1 DESCRIPTION OF WORK: All interior and exterior work, except as noted.
- A. Work also includes:
 - 1. Painting exterior hollow metal doors and frames, new and existing; new and existing stucco (plaster), and miscellaneous metal trim.
 - 2. Painting interior drywall partitions and ceilings, steel door and window frames, miscellaneous steel trim.
 - B. Fiber Cement Panel Systems are specified in Section 074600.
 - C. Joint Sealers are specified in Section 079200.
 - D. Steel (hollow metal) doors and frames are specified in Section 081113.
 - E. Interior Stile and Rail Wood Doors – Section 081433.
 - F. Fiberglass Entry Doors – Section 081444.
 - G. Access Doors and Frames – Section 083113.
 - H. Gypsum drywall is specified in Section 092900.
- 1.2 Particular paint colors and their areas of use are indicated on the drawings in the Finish Schedule. Types of paint and coating finishes for various substrates are specified in this section.
- 1.3 "Paint" as used herein means all coating systems materials including primers, emulsions, enamels, stains, sealers and fillers, and other applied materials whether used as prime, intermediate or finish coats.
- 1.4 Paint exposed surfaces whether or not colors are designated in "schedules", except where natural finish of material is specifically noted as a surface not to be painted. Where items or surfaces are not specifically mentioned, paint same as adjacent similar materials or areas.
- 1.5 Paint mechanical, electrical, or plumbing equipment that is exposed to public view. If equipment is on the rooftop or in a mechanical/electrical room, painting is not required.
- 1.6 Following categories of work are not included as part of field-applied finish work or are included in other sections of these specifications.
- A. Shop Priming: Unless otherwise specified, shop priming of ferrous metal items is included under various sections for structural steel, miscellaneous metal, hollow metal work, and similar items.
 - B. Pre-Finished Items: Unless otherwise indicated, do not include painting when factory-finishing or installer finishing is specified for such typical items as (but not limited to) wood doors, casework, metal roofing, and light fixtures.

- C. Concealed Surfaces: Unless otherwise indicated, painting is not required on surfaces such as walls or ceilings in concealed areas and generally inaccessible areas, furred areas, pipe spaces and duct shafts.
- D. Finished Metal Surfaces: Metal surfaces of stainless steel, galvanized, those with factory applied finish, and similar finished materials will not require finish painting, unless otherwise indicated.
- E. Operating Parts and Labels: Moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sinkages, sensing devices, motor and fan shafts will not require finish painting, unless otherwise indicated.
- F. Do not paint over any code-required labels, such as Underwriters' Laboratories and Factory Mutual, or any equipment identification, performance rating, name, or nomenclature plates.

1.7 SUBMITTALS:

- A. Product Data: Submit manufacturer's technical information including paint label analysis and application instructions for each material proposed for use. Provide certification of VOC content for each type of coating material.
- B. Submit a list of specific paint items (type, manufacturer, formulation, and catalog number) for the Architect's review.
- C. The Contractor shall submit 2 - 8-1/2 x 11 samples of each paint finish in the specified sheens. Identify samples with color name and number and location on the job.

1.8 DELIVERY AND STORAGE:

- A. Deliver materials to job site in original, new and unopened packages and containers bearing manufacturer's name and label, and following information:
 - 1. Name or title of material.
 - 2. Manufacturer's stock number and date of manufacture.
 - 3. Manufacturer's name.
 - 4. Chemical composition.
 - 5. Supplier's name and address.
 - 6. Color name and number.
 - 7. Application instructions.
 - 8. Material Safety Data Sheets.
- B. Maintenance Stock: Contractor shall supply, new and unopened, 2 gallons of each type and color of each finish used on the project as maintenance stock for Owner. Label as indicated above and deliver for Owner's storage.

1.9 JOB CONDITIONS:

- A. Apply water-base paints only when temperature of surfaces to be painted and surrounding air temperatures are between 50 degrees F. and 90 degrees F., unless otherwise permitted by paint manufacturer's printed instructions.
- B. Do not apply paint in rain, or when relative humidity exceeds 85%; or to damp or wet surfaces; unless otherwise permitted by paint manufacturer's printed instructions.
- C. Painting may be continued during inclement weather if areas and surfaces to be painted are enclosed and heated within temperature limits specified by paint manufacturer during application and drying periods.

PART 2 - PRODUCTS

2.1 COLORS AND FINISHES:

- A. Colors are indicated on the color schedule and are typically non-stock tints, specified by a manufacturer's color numbers. The particular manufacturer who supplies paint for project shall match these colors, subject to approval of Architect.
- B. Color Pigments: Pure, non-fading, applicable types to suit substrates and service indicated.
- C. Paint Coordination: Provide finish coats which are compatible with prime paints used. Review other sections of these specifications in which prime paints are to be provided to ensure compatibility of total coatings system for various substrates. Upon request from other trades, furnish information on characteristics of finish materials proposed for use, to ensure compatible prime coats are used. Provide barrier coats over incompatible primers/finishes or remove and reprime as required. Notify Architect in writing of any anticipated problems using specified coating systems with substrates primed by others.

2.2 MATERIAL QUALITY:

- A. The following manufacturers' premium products have been used to set a standard of quality for the project. Products have been selected around the **Dunn Edwards** product line to establish a standard of quality, unless otherwise noted. All paints shall be at least VOC compliant, if not better.
 - 1. Other acceptable paint manufacturers include: **Sherwin Williams, Frazee, Glidden, Dunn Edwards, Pittsburg**

2.3 EXTERIOR PAINT SCHEDULE:

- A. Provide paint system over exterior pre-primed steel doors/frame surfaces and pre-primed cement fiberboard:
 - 1. Primer: Touch up as needed with material recommended by paint manufacturer.
 - 2. Second and Third Coats: Semigloss, exterior, acrylic-latex enamel applied at spreading rate recommended by manufacturer to achieve total dry film thickness of 2.6 mils.

- a) **D-E Spartashield Exterior (SSHL50)**
- b) **GP 2406 Dulux Semi-Gloss**
- c) **S-W B13 Series**

2.4 INTERIOR PAINT SCHEDULE

1. Provide paint system over interior gypsum board surfaces:
 - a. Primer: Latex-based, interior primer applied at spreading rate recommended by manufacturer to achieve total dry film thickness of 1.2 mils.
 - 1) **D-E Proseal (W102)**
 - 2) **GP 1030 Prep & Prime PVA**
 - 3) **S-W PrepRite 200 Latex Primer**
 - b. Second and Third Coats: Low-luster (eggshell), acrylic-latex, interior enamel applied at spreading rate recommended by manufacturer to achieve total dry film thickness of 2.8 mils.
 - 1) **D-E Spartasheen (W7300)**
 - 2) **GP 1402 Dulux Pro Eggshell**
 - 3) **S-W ProMar 200 Interior Eg-Shel**
2. Provide finish systems over interior ferrous metal:
 - a. Primer: Quick-drying, rust-inhibitive, alkyd-based or epoxy-metal primer, as recommended by manufacturer, applied at spreading rate recommended by manufacturer to achieve a total dry film thickness of 1.5 mils.
 - 1) **D-E Corrobar (43-5)**
 - 2) **GP 4160 Multi-Purpose Tank and Structural Primer**
 - 3) **S-W Kem Kromik Uninversal B50Z Series**
 - b. Second Coat: Alkyd, interior enamel undercoat or semigloss, acrylic-latex, interior enamel, as recommended by manufacturer for this substrate, applied at spreading rate recommended by manufacturer to achieve total dry film thickness of 1.3 mils.
 - 1) **D-E Spartaglo (W7500)**
 - 2) **GP1406 Dulux Pro Premium S/G**
 - 3) **S-W B66 Series**

- c. Third Coat: Semigloss, acrylic-latex, interior enamel applied at spreading rate recommended by manufacturer to achieve total dry film thickness of 1.3 mils.
 - 1) **D-E Spartaglo (W7500)**
 - 2) **GP 1406 Dulux Pro Premium S/G**
 - 3) **S-W B66-200 Series**
- 3. Provide paint system over interior gypsum board surfaces at toilets, mechanical and electrical rooms, and other utilitarian spaces as noted:
 - a. Primer: Latex-based, interior primer applied at spreading rate recommended by manufacturer to achieve total dry film thickness of 1.2 mils.
 - 1) **D-E Proseal (W102)**
 - 2) **GP 1030 Prep & Prime PVA**
 - 3) **S-W PrepRite 200 Latex Primer**
 - b. Second and Third Coats: Semi-gloss, acrylic-latex, interior enamel applied at spreading rate recommended by manufacturer to achieve total dry film thickness of 2.8 mils.
 - 1) **D-E Spartawall Interior (SSLL50)**
 - 2) **GP Speedwall Semi-Gloss**
 - 3) **S-W ProMar 200 Interior Semi-Gloss**

PART 3 - EXECUTION

3.1 INSPECTION

- A. Applicator must examine areas and conditions under which painting work is to be applied and notify Contractor in writing of conditions detrimental to proper and timely completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Applicator.
 - 1. Starting of painting work will be construed as Applicator's acceptance of surfaces and conditions within any particular area.
 - 2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, loose materials, or other conditions detrimental to formation of a durable paint film.

3.2 SURFACE PREPARATION:

- A. General: Perform preparation and cleaning procedures in accordance with paint manufacturer's instructions and as herein specified, for each particular substrate condition.

- B. Remove hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and similar items in place and not to be finish-painted or provide surface-applied protection prior to surface preparation and painting operations. Remove, if necessary, for complete painting of items and adjacent surfaces. Following completion of painting of each space or area, reinstall removed items.
- C. Clean surfaces to be painted before applying paint or surface treatments. Remove oil and grease prior to mechanical cleaning. Program cleaning and painting so that contaminants from cleaning process will not fall onto wet, newly painted surfaces.
 - 1. Ferrous Metals: Clean ferrous surfaces, which are not galvanized or shop-coated, of oil, grease, dirt, loose mill scale and other foreign substances by solvent or mechanical cleaning.
 - a. Touch-up shop-applied prime coats on structural steel, doors, and frames, wherever damaged or bare, where required by other sections of these specifications. Clean and touch-up with same type shop primer.
 - 2. Galvanized Surfaces: Clean free of oil and surface contaminants with non-petroleum-based solvent. Etch or otherwise prepare surface as recommended by paint manufacturer.
 - 3. Plaster: Stucco (exterior plaster) shall have no loose materials, dust, dirt, and other materials that might inhibit adhesion. Power wash all to remove surface contaminants and allow to dry before painting. Seal all cracks.
 - 4. Cleaning Painted Brick Masonry: Power wash to remove all dust, dirt, oils, and all loose material. Reprime bare spots as needed.
 - 5. Plywood: Remove dust, oils and sawdust.

3.3 MATERIALS PREPARATION:

- A. Mix and prepare painting materials in accordance with manufacturer's directions.
- B. Store materials not in actual use in tightly covered containers. Maintain containers used in storage, mixing and application of paint in a clean condition, free of foreign materials and residue.
- C. Stir materials before application to produce a mixture of uniform density and stir as required during application. Do not stir surface film into material.

3.4 APPLICATION:

- A. General: Apply all coatings in accordance with manufacturer's directions, using only recommended materials and methods. Use type of applicators and techniques best suited for substrate and type of material being applied.
- B. All interior areas to be painted shall be dust-free and illuminated to no less than 1 watt per square foot.

- C. Final paint thickness recommended by manufacturer is only a minimum; all paint systems shall totally cover and consistently hide the substrate upon which they are applied. Apply additional coats when undercoats, stains or other conditions show through final coat of paint, until paint film is of uniform finish, color, and appearance. Give special attention to ensure that surfaces, including edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
- D. Paint surfaces behind movable equipment same as similar exposed surfaces. Paint surfaces behind permanently fixed equipment or cabinetry with prime coat only before final installation of equipment.
- E. Paint exposed-to-view mechanical, electrical, or plumbing equipment to match adjacent surfaces. Do not paint mechanical or electrical equipment on roofs or in mechanical rooms or yards.
- F. Omit first coat (primer) on metal surfaces which have been shop-primed, touch-up painted or prefinished, unless otherwise indicated.
- G. Scheduling Painting: Apply first-coat material to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
 - 1. Allow sufficient time between successive coatings to permit proper drying. Do not recoat until paint has dried to where it feels firm, does not deform, or feel sticky under moderate thumb pressure, and application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.
 - 2. Coordinate for application of radiant barrier to the underside of all roof decks prior to beginning of insulation.
- H. Minimum Coating Thickness: Apply materials at not less than manufacturer's recommended spreading rate, to establish a total dry film thickness as recommended by coating manufacturer, and to totally and consistently cover surface to which it is applied without gaps, skips, runs, and holidays.
- I. Prime Coats: Apply prime coat of material, which is required to be painted or finished, and which has not been prime coated by others.
 - 1. Touch up previously primed surfaces that have been damaged prior to painting.
- J. Recoat primed and sealed surfaces where there is evidence of suction spots or unsealed areas in first coat, to assure a finish coat with no burn-through or other defects due to insufficient sealing.
- K. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.
- L. Completed Work: Match approved samples for color, texture and coverage. Remove, refinish, or repaint work not in compliance with specified requirements.

3.5 CLEAN-UP AND PROTECTION:

- A. Clean-Up: During progress of work, remove from site discarded paint materials, rubbish, cans and rags at end of each workday and dispose of properly.

- B. Upon completion of painting work, clean window glass, pre-finished window frames, and other paint-spattered surfaces. Remove spattered paint by proper methods of cleaning and scraping, using care not to scratch or otherwise damage finished surfaces.
- C. Protection: Protect work of other trades, whether to be painted or not, against damage by painting and finishing work. Correct any damage by cleaning, repairing, or replacing, and repainting, as acceptable to the Architect.
 - 1. Protect concrete floors or walks to remain exposed during overhead painting work.
- D. Provide "Wet Paint" signs as required to protect newly-painted finishes. Remove temporary protective wrappings provided by others for protection of their work, after completion of painting operations.
- E. Disposal of Waste Materials: Recycle waste paint and empty containers if possible. Do not dump paint or clean brushes in building drains or on the site.

END OF SECTION 099000

SECTION 102800 – TOILET ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY

- A. Accessory items for the toilet room.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.3 RELATED SECTIONS

- A. Section 061000, Rough Carpentry for in-wall blocking and supports.
- B. Section 079200 – Joint Sealers
- C. Section 088300 – Mirrors for frameless mirrors.

1.4 SUBMITTALS

- A. General: Submit product data for each toilet accessory item specified, including construction details relative to materials, dimensions, gages, profiles, mounting method, specified options, and finishes.

1.5 QUALITY ASSURANCE

- A. Inserts and Anchorages: Furnish accessory manufacturers' standard inserts and anchoring devices that must be set in concrete or built into masonry. Coordinate delivery with other work to avoid delay.

1.6 WARRANTY

- A. Submit a written warranty executed by mirror manufacturer, agreeing to replace any mirrors that develop visible silver spoilage defects within warranty period.
- B. Warranty Period: 15 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Bobrick numbers are used for specification purposes. Other manufacturers' products that are acceptable include:
 - 1. **American Specialties, Inc.**
 - 2. **A & J Washroom Accessories.**

3. **Bradley Corporation.**

4. **McKinney/Parker.**

2.2 MATERIALS, GENERAL

- A. Stainless Steel: AISI Type 302/304, with polished No. 4 finish, 0.034 inch (22 gage) minimum thickness.
- B. Brass: Leaded and unleaded, flat products, ASTM B 19; rods, shapes, forgings, and flat products with finished edges, ASTM B 16; Castings, ASTM B 30.
- C. Sheet Steel: Cold rolled, commercial quality ASTM A 366, 0.04 inch (20 gage) minimum. Surface preparation and metal pretreatment as required for applied finish.
- D. Galvanized Steel Sheet: ASTM A 527, G60.
- E. Chromium Plating: Nickel and chromium electro deposited on base metal, ASTM B 456, Type SC 2.
- F. Galvanized Steel Mounting Devices: ASTM A 153, hot dip galvanized after fabrication.
- G. Fasteners: Screws, bolts, and other devices of galvanized steel where concealed.

2.3 GRAB BARS

- A. 18 ga. stainless steel, concealed mounting with snap flange, 1-1/4" diameter with peened or other abrasive finish.
- B. Equal of **ASI 3700 series** of lengths and configurations as shown on the drawings.

2.4. SHOWER CURTAIN ROD

- A. Heavy duty 1" stainless steel pipe, 20 ga. with concealed mounting brackets. 60" long.
- B. **B-207**

2.5 TOWEL RACK

- A. Stainless steel with bright polish, 3/4" square 18 ga. tube. Concealed mounting brackets.
- B. **B673-24**

2.6 MEDICINE CABINET

- A. Recessed stainless steel, 22 ga. all-welded construction, 1" mirror on piano hinge with magnetic hold. 4 stainless steel shelves. Reversible. 3-7/16" D x 17" W x 27" H.
- B. **B-398**

2.7 TOILET TISSUE DISPENSERS

- A. Bright polish stainless steel brackets with chrome-plated plastic spindle. Holds one standard roll.
- B. Equal **Bobrick B-685**.

2.8 FABRICATION

- A. Surface Mounted Toilet Accessories, General: Except where otherwise indicated, fabricate units with tight seams and joints, exposed edges rolled. Hang doors or access panels with continuous stainless steel piano hinge. Provide concealed anchorage wherever possible.
- B. Recessed Toilet Accessories, General: Except where otherwise indicated, fabricate units of all welded construction, without mitered corners. Hang doors or access panels with full length, stainless steel piano hinge. Provide anchorage that is fully concealed when unit is closed.
- C. Keys: Provide universal keys for access to toilet accessory units requiring internal access for servicing, resupply, etc. Provide minimum of six keys to Owner's representative.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install toilet accessory units according to manufacturers' instructions, using fasteners appropriate to substrate as recommended by unit manufacturer. Install units plumb and level, firmly anchored in locations and at heights indicated.
- B. Install grab bars to withstand a downward load of at least 250 lbf, complying with ASTM F 446. Coordinate for support/blocking in walls.
- C. Provide sanitary sealant, as specified in Section 079200 - Joint Sealers, concealed under surface flanges against walls.

3.2 ADJUSTING AND CLEANING

- A. Adjust toilet accessories for proper operation and verify that mechanisms function smoothly. Replace damaged or defective items.
- B. Clean and polish all exposed surfaces strictly according to manufacturer's recommendations after removing temporary labels and protective coatings.

END OF SECTION 102800

SECTION 104400 – PORTABLE FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fire extinguishers

1.2 SUBMITTALS

A. Product Data:

1. General:
 - a. Construction details, material descriptions, dimensions of individual components, profiles, and finishes.
2. Fire Extinguishers:
 - a. Include ratings and classifications.

1.3 QUALITY ASSURANCE

A. Source Limitations:

1. Obtain fire extinguishers and cabinets through one source from single manufacturer.

B. NFPA Compliance:

1. Fabricate and label fire extinguishers to comply with NFPA 10, "Standard for Portable Fire Extinguishers."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with Specifications, products by these manufacturers may be submitted:

1. Portable Fire Extinguishers:
 - a. **Amerex (amerex-fire.com)**
 - b. **J. L. Industries (jlindustries.com)**
 - c. **Larsen's (larsensmfg.com)**
 - d. **Potter-Roemer (potterroemer.com)**

2.2 PORTABLE FIRE EXTINGUISHERS

- A. Provide fire extinguishers of type, size, and capacity for each cabinet and other locations indicated.
 - 1. Multipurpose Dry Chemical Type: UL-rated 2A-10BC, five-pound nominal capacity, in enameled steel container.

2.3 FINISHES

- A. Surface Preparation: Solvent clean surfaces complying with SSPS SP 1 to remove dirt, oil, grease, and other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC SP 5 (white metal blast cleaning) or SSPC SP 8 (pickling).
- B. Factory Priming for Field Painted Finish: Apply shop primer immediately following surface preparation and pretreatment.
- C. Baked Enamel Finish: Immediately after cleaning and pretreatment, apply manufacturer's standard two coat baked enamel finish consisting of prime coat and thermosetting topcoat. Comply with paint manufacturer's instructions for applying and baking to achieve a minimum dry film thickness of 2.0 mils.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine fire extinguishers for proper charging and tagging.
 - 1. Remove and replace damaged, defective, or undercharged units.
- B. Place as shown on drawings.

END OF SECTION 104400

SECTION 123530 - RESIDENTIAL CASEWORK

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Kitchen cabinets.
 - 2. Vanity cabinets.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.3. RELATED SECTIONS

- 1. Division 23 for plumbing fixtures and fittings.
- 2. Section 123640: Stone Countertops.

1.4 DEFINITIONS

- A. Exposed Surfaces of Cabinets: Surfaces visible when doors and drawers are closed, including visible surfaces in open cabinets or behind glass doors.
- B. Semi exposed Surfaces of Cabinets: Surfaces behind opaque doors or drawer fronts, including interior faces of doors and interiors and sides of drawers, and bottoms of wall cabinets.
- C. Concealed Surfaces of Cabinets: Surfaces not usually visible after installation, including sleepers, web frames, dust panels, bottoms of drawers, ends of cabinets installed directly against and completely concealed by walls or other cabinets, and tops of wall cabinets and utility cabinets.

1.5 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Cabinets.
 - 2. Cabinet hardware.
- B. Shop Drawings: For cabinets and countertops. Include plans, elevations, details, and attachments to other work. Show materials, finishes, filler panels, hardware, edge and backsplash profiles, methods of joining countertops, and cutouts for plumbing fixtures.
- C. Samples for Initial Selection:
 - 1. Solid wood trim with transparent finish, 8 inches long.
 - 2. Exposed hardware, for each type of item.

1.5 QUALITY ASSURANCE

- A. Source Limitations for Cabinets: Obtain cabinets from single source from single manufacturer.
- B. Product Options: Drawings indicate size, configurations, and finish material of cabinets by referencing designated manufacturer's catalog numbers. Other manufacturers' cabinets of similar sizes and door and drawer configurations, same finish material, and complying with the Specifications may be considered.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install casework until building is enclosed, wet work is complete and dry, and temporary HVAC system is operating and maintaining temperature and humidity conditions at occupancy levels during the remainder of the construction period.
- B. Established Dimensions: Where casework is indicated to fit to other construction, establish dimensions for areas where casework is to fit. Coordinate construction to ensure that actual dimensions correspond to established dimensions. Provide fillers and scribes to allow for trimming and fitting.

1.7 COORDINATION

- A. Coordinate layout and installation of blocking and reinforcement in partitions for support of casework.
- B. Coordinate locations of utilities that will penetrate countertops or backsplashes.

PART 2 - PRODUCTS

2.1 CABINETS

- A. Review 2.1 PRODUCT SELECTION PROCEDURES in Section 016000, Product Requirements.
- B. Basis of Design Product:
 - 1. Cabinets: See drawings. Subject to compliance with requirements, provide the named product or a comparable product by another manufacturer.
 - 2. Countertop: See drawings and Section 123640 Stone Countertops.
- C. Quality Standard: Provide cabinets that comply with KCMA A161.1.
 - 1. KCMA Certification: Provide cabinets with KCMA's "Certified Cabinet" seal affixed in a semi exposed location of each unit and showing compliance with the above standard.
- D. Face Style: Full overlay.
- E. Face Style: Reveal overlay; door and drawer faces partially cover cabinet fronts.

- F. Cabinet Style: Face frame.
- G. Door and Drawer Fronts: Solid-wood stiles and rails, with 3/4-inch-thick, solid-wood center panels.
- H. Face Frames: 3/4-by-1-5/8-inch solid wood with glued mortise and tenon or doweled joints.
- I. Exposed Cabinet End Finish: Wood veneer on plywood.
- J. Cabinet Tops and Bottoms: 1/2-inch-thick plywood, fully supported by and secured in rabbets in end panels front frame, and back rail.
- K. Back, Top, and Bottom Rails: 3/4-by-2-1/2-inch solid wood, interlocking with end panels and rabbeted to receive top and bottom panels. Back rails secured under pressure with glue and with mechanical fasteners.
- L. Wall-Hung-Unit Back Panels: 3/16-inch-thick plywood fastened to rear edge of end panels and to top and bottom rails.
- M. Base-Unit Back Panels: 3/8-inch-thick plywood fastened to rear edge of end panels and to top and bottom rails.
- N. Front Frame Drawer Rails: 3/4-by-1-1/4-inch solid wood mortised and fastened into face frame.
- O. Drawers: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.
 - 1. Join subfronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners or glued dovetail joints.
 - 2. Subfronts, Backs, and Sides: 1/2-inch-thick solid wood or 3/8-inch-thick plywood.
 - 3. Bottoms: 1/4-inch-thick plywood.
- P. Shelves:
 - 1. Medium Density Fiberboard: ANSI A208.2 made with binder containing no urea formaldehyde.
 - 2. Thermoset Decorative Overlay: Surface of thermally fused melamine-impregnated web, bonded to medium density particle board and complying with ALA 1992. Color as selected by Architect from manufacturer's standard colors.
- Q. Joinery: Rabbet backs flush into end panels and secure with concealed mechanical fasteners. Connect tops and bottoms of wall cabinets and bottoms and stretchers of base cabinets to ends and dividers with mechanical fasteners. Rabbet tops, bottoms, and backs into end panels.
- R. Factory Finishing: Finish cabinets at factory. Defer final touchup until after installation.

2.2 CABINET MATERIALS

A. General:

1. Hardwood Lumber: Kiln dried to 7 percent moisture content.
2. Softwood Lumber: Kiln dried to 10 percent moisture content.
3. Hardwood Plywood: HPVA HP-1, made with adhesive containing no urea formaldehyde.

B. Exposed Materials:

1. Exposed Wood Species: Cherry.
 - a. Select materials for compatible color and grain. Do not use two adjacent exposed surfaces that are noticeably dissimilar in color, grain, figure, or natural character markings.
 - b. Staining and Finish: Transparent finish, low sheen, color as selected.
2. Solid Wood: Clear hardwood lumber of species indicated, free of defects.
3. Plywood: Hardwood plywood with face veneer of species indicated, with Grade A faces and Grade C backs of same species as faces.
 - a. Edge band exposed edges with minimum 1/8-inch-thick, solid-wood edging of same species as face veneer.

C. Semi exposed Materials: Unless otherwise indicated, provide the following:

1. Solid Wood: Sound hardwood lumber, selected to eliminate appearance defects. Same species as exposed surfaces.
2. Plywood: Hardwood plywood with Grade C faces and not less than Grade 3 backs of same species as faces. Face veneers of same species as exposed surfaces.

D. Concealed Materials: Solid wood or plywood, of any hardwood or softwood species, with no defects affecting strength or utility; particleboard; medium-density fiberboard; or hardboard.

2.3 CABINET HARDWARE

A. General: Manufacturer's standard units complying with BHMA A156.9, of type, size, style, material, and finish as selected by Architect from manufacturer's full range.

B. Includes:

- a. Pulls – ADA compliant surface mounted decorative pulls, equal South Main Euro
- b. Style Bar, Satin Nickel.
- c. Hinges – Concealed European-style mortised self-closing hinges, 120 deg.

- d. Drawer Guides: Epoxy-coated-metal, self-closing drawer guides; designed to prevent rebound when drawers are closed; with nylon-tired, ball-bearing rollers; and complying with BHMA A156.9, Type B05011 or B05091.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install cabinets with no variations in flushness of adjoining surfaces; use concealed shims. Where cabinets abut other finished work, scribe and cut for accurate fit. Provide filler strips, scribe strips, and moldings in finish to match cabinet face.
- B. Install cabinets without distortion so doors and drawers fit openings, are aligned, and are uniformly spaced. Complete installation of hardware and accessories as indicated.
- C. Install cabinets and countertop level and plumb to a tolerance of 1/8 inch in 8 feet.
- D. Fasten cabinets to adjacent units and to backing.
 - 1. Fasten wall cabinets through back, near top and bottom, at ends and not less than 24 inches o.c. with No. 10 wafer-head screws sized for 1-inch penetration into wood framing, blocking, or hanging strips.

3.2 ADJUSTING AND CLEANING

- A. Adjust cabinets and hardware so doors and drawers are centered in openings and operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.
- B. Clean casework on exposed and semi exposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.

END OF SECTION 123530

SECTION 123640 - STONE COUNTERTOPS

PART 1 – GENERAL

1.1 SUMMARY

- A. Section includes stone countertops.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.3 ACTION SUBMITTALS

- A. Product Data: For each countertop, stone accessory, and manufactured product.
- B. Shop Drawings:
 - 1. Include plans, sections, details, and attachments to other work.
 - 2. Show locations and details of joints.
 - 3. Show direction of veining, grain, or other directional pattern.
- C. Samples for Verification: For each stone type indicated, in sets of Samples not less than 12 inches square.
 - 1. Include three or more Samples in each set and show the full range of variations in appearance characteristics expected in the completed Work.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.
- B. Material Test Reports:
 - 1. Stone Test Reports: For stone variety proposed for use on Project, by a qualified testing agency, indicating compliance with required physical properties, according to referenced ASTM standards. Base reports on testing done within previous three years.
 - 2. Sealant Compatibility and Adhesion Test Report: From sealant manufacturer indicating that sealants will not stain or damage stone.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For stone countertops to include in maintenance manuals. Include product data for stone-care products used or recommended by Installer, and names, addresses, and telephone numbers of local sources for products.

1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate stone countertops similar to that required for this Project, and whose products have a record of successful in-service performance.
- B. Installer Qualifications: Fabricator of stone countertops.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store and handle stone and related materials to prevent deterioration or damage due to moisture, temperature changes, contaminants, corrosion, breaking, chipping, and other causes.

1.8 FIELD CONDITIONS

- A. Field Measurements: Verify dimensions of construction to receive stone countertops by field measurements before fabrication.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Stone: Obtain stone, from a single quarry with resources to provide materials of consistent quality in appearance and physical properties.
 - 1. For stone types that include same list of varieties and sources, provide same variety from same source for each.

2.2 GRANITE GR-1

- A. Material Standard: Comply with ASTM C615/C615M.
- B. Description: Uniform, medium-grained, gray stone.
- C. Finish: Polished
 - 1. Basis of Design: See drawings.
- D. Cut: Vein or Fleuri

2.3 ADHESIVES, GROUT, SEALANTS, AND STONE ACCESSORIES

- A. General: Use only adhesives formulated for stone and ceramic tile and that are recommended by their manufacturer for the application indicated.
 - 1. Low VOC no urea formaldehyde
- B. Water-Cleanable Epoxy Adhesive: ANSI A118.3.
- C. 100% Silicone Adhesive.

- D. Water-Cleanable Epoxy Grout: ANSI A118.3, chemical-resistant, water-cleanable, tile-setting and -grouting epoxy.
- E. Sealant for Countertops: Manufacturer's standard sealant that complies with applicable requirements in Section 079200 - Joint Sealants and that will not stain the stone it is applied to.
- F. Medium Density Fiberboard: ANSI A208.2 made with binder containing no added urea formaldehyde.
- G. Plywood Subtops: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.
- H. Stone Cleaner: Specifically formulated for stone types, finishes, and applications indicated, as recommended by stone producer. Do not use cleaning compounds containing acids, caustics, harsh fillers, or abrasives.
- I. Stone Sealer: Colorless, stain-resistant sealer that does not affect color or physical properties of stone surfaces, as recommended by stone producer for application indicated.

2.4 STONE FABRICATION, GENERAL

- A. Select stone for intended use to prevent fabricated units from containing cracks, seams, and starts that may impair structural integrity, function, or appearance.
 - 1. Repairs that are characteristic of the varieties specified are acceptable provided they do not impair structural integrity or function and are not aesthetically unpleasing, as judged by Architect.
- B. Grade and mark stone for final locations to produce assembled countertop units with an overall uniform appearance.
- C. Fabricate stone countertops in sizes and shapes required to comply with requirements indicated.
 - 1. Clean sawed backs of stones to remove rust stains and iron particles.
 - 2. Dress joints straight and at right angle to face unless otherwise indicated.
 - 3. Cut and drill sinkages and holes in stone for anchors, supports, and attachments.
 - 4. Provide openings, reveals, and similar features as needed to accommodate adjacent work.
 - 5. Finish exposed faces of stone to comply with requirements indicated for finish of each stone type required and to match approved Samples and mockups. Provide matching finish on exposed edges of countertops, splashes, and cutouts.
- D. Carefully inspect finished stone units at fabrication plant for compliance with requirements for appearance, material, and fabrication. Replace defective units.

2.5 STONE COUNTERTOPS

- A. General: Comply with recommendations in MIA's "Dimension Stone - Design Manual VII."
- B. Nominal Thickness: Provide thickness indicated, but not less than 3/4 inch (20 mm). Gage backs to provide units of identical thickness.
- C. Edge Detail: Straight, slightly eased on top. See drawings.
- D. Splashes: Provide 3/4-inch- (20-mm-) thick backsplashes.
 - 1. Height: 4 inches
 - 2. Top-Edge Detail: 3/4-inch radius
- E. Joints: Fabricate countertops without joints.
- F. Cutouts and Holes:
 - 1. Undercounter Fixtures: Make cutouts for undercounter fixtures in shop using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves as directed.
 - a. Vertical edges
 - 2. Counter-Mounted Fixtures: Prepare countertops in shop for field cutting openings for counter-mounted fixtures. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.
 - 3. Fittings: Drill countertops in shop for plumbing fittings, undercounter soap dispensers, and similar items.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates to receive stone countertops and conditions under which stone countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of stone countertops.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of stone countertops.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Advise installers of other work about specific requirements for placement of inserts and similar items to be used by stone countertop Installer for anchoring stone countertops. Furnish installers of other work with Drawings or templates showing locations of these items.

- B. Before installing stone countertops, clean dirty or stained stone surfaces by removing soil, stains, and foreign materials. Use only mild cleaning compounds that contain no caustic or harsh materials or abrasives and rinse with clear water. Allow stone to dry before installing.

3.3 INSTALLATION OF COUNTERTOPS

- A. Fasten subtops to cabinets by screwing through subtops into cornerblocks of base cabinets. Shim as needed to align subtops in a level plane.
- B. Install countertops over subtops with full spread of water-cleanable epoxy adhesive.
- C. Install countertops by adhering to supports with water-cleanable epoxy adhesive.
- D. Do necessary field cutting as stone is set. Use power saws with diamond blades to cut stone. Cut lines straight, true, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.
- E. Set stone to comply with requirements indicated. Shim and adjust stone to locations indicated, with uniform joints of widths indicated and with edges and faces aligned according to established relationships and indicated tolerances.
- F. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Use power saws with diamond blades to cut stone. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.
- G. Install backsplashes and end splashes by adhering to wall with 100% silicone adhesive, clear or to match. Leave 1/16-inch (1.5-mm) gap between countertop and splashes for filling with sealant. Use temporary shims to ensure uniform spacing.
- H. Grout joints to comply with ANSI A108.10. Remove temporary shims before grouting. Tool grout uniformly and smoothly with plastic tool.
- J. Apply sealant to joints and gaps specified for filling with sealant; comply with Section 079200 - Joint Sealants. Remove temporary shims before applying sealant.

3.4 ADJUSTING AND CLEANING

- A. In-Progress Cleaning: Clean countertops as work progresses. Remove adhesive, grout, mortar, and sealant smears immediately.
- B. Remove and replace stone countertops of the following description:
 - 1. Broken, chipped, stained, or otherwise damaged stone. Stone may be repaired if methods and results are approved by Architect.
 - 2. Defective countertops.
 - 3. Defective joints, including misaligned joints.
 - 4. Interior stone countertops and joints not matching approved Samples and mockups.
 - 5. Interior stone countertops not complying with other requirements indicated.

- C. Replace in a manner that results in stone countertops matching approved, complying with other requirements, and showing no evidence of replacement.
- D. Clean stone countertops no fewer than the minimum time needed for curing sealants or adhesives after completion of installation, using clean water and soft rags. Do not use wire brushes, acid-type cleaning agents, cleaning compounds with caustic or harsh fillers, or other materials or methods that may damage stone.
- E. Sealer Application: Apply stone sealer to comply with stone producer's and sealer manufacturer's written instructions.

END OF SECTION 123640

SECTION 211100 - FIRE PROTECTION

PART 1 – GENERAL

1.1 GENERAL

- A. This section covers water based fire protection systems, materials, and equipment.

1.2 SECTION INCLUDES

- A. Fire Protection Piping
- B. Fire Protection Fittings
- C. Fire Protection Specialties
- D. System Drains

1.3 WET-PIPE FIRE SPRINKLER SYSTEM

- A. Design, furnish and install a complete, fully automatic wet pipe sprinkler system throughout all areas of new construction as indicated on the drawings. The work shall begin at a point 5'-0" outside the exterior wall of the building as indicated in the drawings.
- B. The fire sprinkler system shall include all items of a minor nature necessary to complete the installation.
- C. The following items are depicted in the drawings:
 - 1. Design criteria.
 - 2. Location of the sprinkler riser.
 - 3. Location of the fire department connection.
 - 4. Location of the exterior alarm bell.
 - 5. Location of main piping for coordination purposes.
 - 6. Location of underground piping including connection to public utility.
- D. The design shall be based on hydraulic calculations for the hazard occupancies noted on the drawings or as determined by local authorities. The hydraulic calculations shall provide a minimum of 5 psi or 10 percent (whichever is greater) "cushion" between the system demand and the available water supply.
- E. Use the drawings for reference only. Any items such as coverage of the building, pipe sizes, head spacing and any other requirements of the authorities having jurisdiction shall be included, whether specifically shown on the drawings or mentioned in the specifications or not.
- F. The design of the sprinkler system shall comply with NFPA-13R, 2016 Edition, 2015 IBC Chapter 9, and the requirements specified hereinafter.

1.4 RELATED SECTIONS

- A. Section 230500 - Basic Mechanical Materials and Methods

1.5 REFERENCES

- A. National Fire Protection Association (NFPA):
 - 1. NFPA-13R Installation of Sprinkler Systems, 2022.
 - 2. NFPA-25 Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems, 2020.

3. NFPA-291 Recommended Practice for Fire Flow Testing and Marking of Fire Hydrants, 2022.

B. Factory Mutual Research Corporation (FM):

1. Loss Prevention Data for the Fire Service
2. FM Approval Guide, Latest Edition

C. Underwriters Laboratories Inc. (UL):

1. UL Fire Protection Equipment Directory, Latest Edition

D. International Fire Code, 2021.

E. International Building Code, 2021.

1.6 PERMITS AND FEES

- A. The Fire Protection Contractor shall secure and pay for, as part of this Contract, any permits, fees, changes, taxes, or inspections required for the installation of the sprinkler system over and above the permit required for the entire building project.

1.7 PROJECT/SITE CONDITIONS

- A. In addition to the requirements in Section 23 05 00, take pressure readings at or near the site to verify the results of the flow test included in the design criteria. Any discrepancy observed in water pressures shall be reported immediately to the architect prior to the preparation of shop drawings.

1.8 SUBMITTALS

A. Material Data:

1. Submit one electronic copy of equipment literature in portable document format (PDF) in accordance with Section 23 05 00 on the following items:
 - a. Sprinkler heads - all types and escutcheons
 - b. Valves (control, alarm, check, drain, test)
 - c. Flow switch
 - d. Tamper switch
 - e. Pipe
 - f. Fittings
 - g. Hangers and bracing materials
 - h. Fire Department Connection
 - i. Alarm bell

B. Shop Drawings:

1. Prior to fabrication of material, submit one electronic copy of full size shop drawings and hydraulic calculations in PDF to the IHS Contract Officer.
2. Shop drawings and calculations shall be submitted to the authority having jurisdiction. Approved shop drawings shall be maintained at the construction site. Submit an additional copy of the approved shop drawings and hydraulic calculations in PDF to the IHS Contract Officer.

1.9 SPECIFICATIONS FOR OTHER DIVISIONS

- A. Some work performed by the Division 22 contractor is specified under Division 23. Division 22 contractor shall be responsible for complying with all Division 22 and 23 specifications.

PART 2 – PRODUCTS

2.1 GENERAL

- A. Materials and equipment shall conform to the requirements of the Underwriters Laboratories, Inc. (UL) or the Factory Mutual Research Corporation (FM) for systems of the type indicated. The contractor shall submit proof that the items furnished under this specification conform to such requirements. The UL label or seal, or listing in the UL Fire Protection Equipment Directory will be acceptable evidence that the items conform to the requirements of UL. The FM label or seal, or listing in the FM Approval Guide will be acceptable evidence that the items conform to the requirements of the FM.
- B. All materials, equipment and system components shall be new and installed in accordance with the manufacturer's recommendations, the UL listing and/or FM approval guide.
- C. The naming of manufacturers in these specifications shall not be construed as eliminating the materials, products or services of other manufacturers and suppliers providing approved equivalent items.
- D. The dimensions and ratings of equipment herein specified, or indicated on drawings, are intended to establish the desired outlines and characteristics of such equipment. Minor deviations will be permitted to allow manufacturers' equipment accommodation. Deviations of physical dimensions of equipment, which impact upon space allocated to work areas of other equipment, shall not be permitted.

2.2 FIRE PROTECTION PIPING

- A. Fire riser piping shall be new black or galvanized steel, designed for 175 psi working pressure, conforming to the ASTM specifications, and have the manufacturer's name and brand, along with the applicable ASTM standard, marked on each length of pipe
 - 1. Standard Wall: Overhead pipe shall be black steel and must comply with ASTM A 795 for black pipe, and hot dipped zinc coated galvanized welded and seamless steel pipe. Galvanized pipe shall be used for any exposed canopies or construction. Dimensions for all overhead pipe must be in accordance with the American Standard for Wrought Steel and Wrought Iron Pipe ANSI B36.10 for pressure up to 300 psi. Schedule 40 pipe is considered "standard wall" pipe. Schedule 30 pipe is acceptable in 8-inch sizes and larger. Pipe ends shall be welded, threaded or cut grooved.
 - 2. Thin Wall: Overhead pipe may be UL listed, FM approved, and compliant with NFPA-13, thin wall pipe approved for pressures up to 300 psi. Pipe shall meet ASTM A795, Type E, Grade A, and/or ASTM A-135, Grade A. Allied Dyna-Flow and Dyna-Thread are approved. Allied Dyna-Flow ends shall be roll grooved or welded in accordance with NFPA 13. Allied Dyna-Thread ends shall be joined by screwed joints in accordance with ANSI B 2.1 (ANSI b 1.20.1 - 1983) per NFPA 13, or welded joints in accordance with ANSI 31.1 as amended by NFPA 13 or approved mechanical fittings.
 - 3. Pipe less than Schedule 40 shall not be threaded or cut grooved.

4. All sprinkler drain and test piping, fire department connection piping, etc., exposed to weather, shall be galvanized.
 5. Steel pipe shall have a corrosion resistance ratio (C.R.R.) equal to or greater than that of Schedule 40 pipe (1.00).
- B. All overhead piping within the building shall be new corrosion resistant CPVC fire sprinkler pipe, listed by Underwriters Laboratory for wet pipe systems with rated working pressure of 175 psi at 150°F. Piping shall meet or exceed ASTM F442 specifications and shall meet all applicable standards for pressure rated applications as required in ANSI-NSF Standard 14 and comply with ANSI-NSF Standard 61 for health effects. All piping shall have the manufacturer's name and brand, along with the applicable ASTM standard, marked on each length of pipe.
- C. Underground piping from the building to 5'-0" outside the building shall be AWWA Class 51 cement lined ductile iron pipe with approved fittings.
- D. Underground piping inside the private property line to 5'-0" outside the building shall be C-900 PVC class 150 plastic pipe, meeting AWWA C-900, UL listed and FM approved. Underground pipe fittings shall be approved for use with the pipe utilized and shall be properly restrained per NFPA-24.
- E. Any piping installed within the attic where temperatures may reach or exceed 150°F shall be insulated per the manufacturer's installation manual. Fire protection contractor shall reference Section 230700 for insulation specifications.

2.3 FIRE PROTECTION FITTINGS

- A. Screwed fittings shall be cast iron, 125-pound class, black, and in accordance with ANSI B 16.4 or malleable iron, 150 pound class, black and in accordance with ANSI B 16.3.
- B. Flanged fittings shall be cast iron, short body, Class 125, black and in accordance with ANSI B 16.1. Gaskets shall be full-face of 1/8-inch minimum thickness red sheet rubber. Flange bolts shall be hexagon head machine bolts with heavy semi-finished hexagon head nuts, cadmium plated, having dimensions in accordance with ANSI B 18.3.
- C. Weld fittings shall be steel, standard weights, black, and in accordance with ANSI B 16.9, ANSI B 16.25, ANSI B 16.5, ANSI B 16.11, and ASTM A 234.
- D. Grooved couplings and mechanical fittings shall be ductile iron in accordance with ASTM A-536, 350 psi working pressure. The couplings' gasket material shall be Grade "E" EPDM. Grooved couplings and mechanical fittings shall be listed by UL and approved by FM for wet and dry (oil free air) sprinkler systems. Victaulic FireLock or equivalent.
- E. Fittings shall be suitable for use in sprinkler systems and defined in NFPA 13. Fittings exposed to outside atmosphere shall be galvanized. Bushings shall not be used.
- F. Plain end fittings with ductile iron or malleable iron housing, pressure responsive gasket, and hardened steel locking lugs with retainers; Victaulic FIT, Gruvlok or approved equal.
- G. Push-on or "roustabout" fittings shall not be used.
- H. Grooved fittings, valves and pipe shall be joined using rubber gasketed couplings produced by the manufacturer of the fitting and/or valves. Gaskets shall be listed for use for the appropriate application. Rigid grooved couplings shall be used where horizontal piping runs require more than two couplings per run.

- I. Couplings may be of the rolled groove type or the mechanical locking type, and they shall be dimensionally compatible with the pipe. Pipe end preparation for the mechanical locking type couplings shall be in accordance with the manufacturer's recommendations
- J. CPVC fittings shall be of the same manufacturer as the sprinkler piping. Fittings shall conform to the requirements of ASTM F438 (Schedule 40), ASTM F439 (Schedule 80) and ASTM F1970 (Transition Fittings). Female threaded adapters for sprinkler connections shall contain brass inserts. Fittings shall carry the NSF International (NSF-pw) mark for use in potable water systems.
- K. CPVC fittings shall be made using TFP-401 or TFP-500 One Step Solvent Cement that meets the ASTM F493 and NSF requirements. Only primers and cements approved for use with the piping and fitting manufacturer shall be used to make joints. The installing contractor shall confirm installation steps with piping and fitting manufacturers installation instructions.

2.4 FIRE PROTECTION SPECIALTIES

A. Sprinkler Heads:

- 1. Automatic sprinklers shall be standard or quick response automatic closed type with a minimum ½ inch nominal size orifice. Temperature ratings of fusible elements shall be in accordance with NFPA-13R. In areas of above normal temperatures, high temperature sprinklers suitable for the temperature conditions involved shall be provided.
- 2. Sprinklers shall be Viking, Grinnell, Star, Reliable, Central or approved equal, upright, pendent, or sidewall.
- 3. In areas with finished ceilings, recessed pendent type glass bulb sprinkler heads with satin chrome finish including (2) piece adjustable escutcheons with matching finish shall be provided.
- 4. Unless otherwise indicated in the drawings, all unfinished spaces and spaces without ceilings shall be protected with upright sprinkler heads with brass finish.
- 5. Provide protective wire guards for all heads which might be subject to physical damage, including all heads which are seven (7) feet or less above the floor.
- 6. Furnish spare automatic sprinklers, representative of and in proportion to the number of each type and temperature rating of the sprinklers installed. They shall be packed in a suitable metal cabinet in accordance with NFPA-13R. The contractor shall furnish at least one special sprinkler head wrench for each spare head cabinet or for each sprinkler type, whichever is greater.
- 7. When used, sidewall sprinkler heads shall be provided with satin chrome finish including 2-piece recessed, adjustable escutcheons with matching finish.

B. Flow Switch:

- 1. Provide and install, in locations shown on the drawings, U.L. listed, two pole, paddle type flow alarm switches with instantly recycling pneumatic retard, adjustable from 10 to 90 seconds, for actuation of alarm circuit. The water flow switch shall close contacts when flow is detected. Locate flow switch minimum of 12 inches from a fitting that changes the direction of flow and not less than 24

inches from a drain connection, or 10 pipe diameters from a gate, check or alarm valve. Wiring connections shall be coordinated with and provided by Division 28.

C. Tamper Switches:

1. Provide and install, in locations shown on the drawings, UL listed tamper switches which will close contacts when valve tampering occurs. Wiring connections shall be coordinated with and provided by Division 28.

D. Alarm Bell:

1. Alarm bell shall be vibrating 120/1/60 U.L. FM approved. Wiring connections shall be coordinated with and provided by Division 28.

E. Fire Department Connection:

1. The fire department connection shall be equivalent to Potter Roemer #5021 flush mounted as indicated on the drawings. The connection shall be chrome with a matching identification plate, two 2-1/2-inch inlet connections threaded to match those of local fire department, and equipped with matching plugs and chains. Identification plate shall have integral raised letters "Automatic Sprinkler". The fire department connection shall be provided with a UL listed check valve.

F. Valves:

1. All valves to be UL and FM approved 175 psig WWP.
2. Provide identification sign, enamel on metal, on all valves in accordance with NFPA-13R. Each sign shall have the area served specified on the back of the sign.
3. All test and drain valves must be installed within seven feet of the floor in accessible locations (chases, pipe shafts, etc.) as required by code and to provide economical maintenance services. When provided within walls, access panels shall be provided. Access panels shall have equivalent fire ratings. Ceiling area locations shall not be used for valve locations unless approved by the architect.

G. Hangers:

1. Support sprinkler piping from building structure with hangers and supports in accordance with NFPA-13R. The placement and number of hangers shall be adequate to maintain the piping in a level position without sags or low points. Vertical sections of piping shall be supported at each floor level and shall be plumb with the structure. Power driven studs shall not be used.

H. System Drains:

1. Provide drain valves on system risers, valved sections, and at any other locations where 5 gallons or more trapped water occurs. Provide with brass hose connection and brass cap.
2. All drain valves shall be globe style, slow close, of appropriate size per NFPA-13R. All drains shall be connected to main drain or shall spill outside building, at grade, over splash block at a 45 degree angle. Discharge shall be located where water drained will not damage stock, equipment, vehicles, planted areas, or

discharge onto public sidewalks. Drain terminations inside of the building are not acceptable except that auxiliary drains may terminate into a properly sized drain receptacle when approved by the IHS Contract Officer.

3. Automatic ball drips shall be UL or FM approved 3/4" cast brass in line with both ends threaded with iron pipe threads. Ball drips shall drain to outside per paragraph (2) above.

I. Inspector Test:

1. Test valve to be globe style, nominal 1", with a restriction equal to the smallest orifice sprinkler installed in the system.
2. Test valve to discharge to outside per specification 2.04-H.2. Test valve shall not exceed 7'-0" above floor

PART 3 – EXECUTION

3.1 GENERAL

- A. The fire protection system shall be designed, fabricated and installed by a fire sprinkler contractor licensed in any State and experienced in this type of system design and installation with a minimum five (5) years' experience.
- B. Where suspended ceilings are present, the sprinkler piping shall be concealed unless otherwise noted. Notify the IHS Contract Officer in writing if piping cannot be concealed. Exposed sprinkler piping will not be permitted without the IHS Contract Officer's written approval.
- C. Final head layout requires the IHS Contract Officer's approval.
- D. Sprinkler head locations shall be coordinated with light fixtures and HVAC. Unless noted otherwise, priority of location is given to light fixtures and HVAC. Cutting of structural members for the passage of sprinkler piping or for pipe hanger fastenings will not be permitted without the Architect's and Structural Engineer's approval.
- E. Arrange, phase, and perform work to assure adequate services for the owner at all times.
- F. Fire Protection Contractor shall:
 1. Carry on his work with sufficient manpower and supervision so as to not impede the work of other trades and accomplish the timely completion of the construction of the building.
 2. Provide a job foreman at the job at all times during its progress, with authority to act for and to supervise the installation of the work and to consult with other trades as to the proper execution and conduct of the work.
 3. Provide all necessary rigging, scaffolding, tools, tackle, and labor which may be necessary for the completion of the work.
 4. Install and connect all appliances and equipment with acceptable engineering practice and in accordance with the manufacturers' instructions and recommendations.
 5. Avoid cutting and/or drilling of the work of other trades, finished or otherwise. Avoid sprinkler lines from passing through grouped refrigeration lines and

conduit. Cutting or drilling of structural elements of the building or air handling ducts shall be approved by the Architect and Structural Engineer in writing. Patching, repairing, and painting of concrete, masonry, metal, tile, plaster, wood flooring, etc. as necessary to make good after such cutting or drilling is the responsibility of the Fire Protection Contractor.

- 6. Remove to the site dumpsters refuse materials or rubbish caused by this work. At the completion of the work, remove all surplus materials, tools, etc., and leave the premises clean.
- 7. Participate in all job site safety meetings and cause his workers to observe safety work rules established for the construction.
- G. In determining sprinkler location, special attention shall be given to sprinkler clearance to avoid obstruction of discharge patterns, particularly with respect to duct work, structural supports, light fixtures, refrigeration coils in coolers/freezers and grouped refrigeration piping or electrical conduits passing below sprinklers heads.

3.2 BRACING AND CLAMPING

- A. Piping above grade shall be braced as required in NFPA-13R.
- B. All sprinkler piping must be supported from building structure and only approved types of hangers shall be used.
- C. Below steel deck and joist construction, use beam clamps to hang piping from top chord of joist. Do not hang piping from bottom chord, or bridging.

3.3 SYSTEM FLUSHING

- A. Before connecting sprinkler system to underground supply connections, each supply connection shall be flushed out thoroughly in accordance with requirements of NFPA-13R.

3.4 SPRINKLER SYSTEM RISERS

- A. Each system riser shall be equipped with all necessary equipment such as drains, valves, pressure gauges, etc., properly installed and with suitable identification. Riser pressure gauges are to be piped to the riser with at least 6-inch vertical separation to the main drain and are not to be installed on the main drain piping under any condition.

3.5 CEILING AND WALL SLEEVES AND PLATES

- A. Sleeves are to be installed at all pipes passing through masonry floors or walls. Install chrome finished ceiling and wall plates wherever exposed sprinkler piping passes through finished ceilings or walls.

3.6 TESTS

- A. Perform hydrostatic tests as required by NFPA-13 and 24. Hydrostatically test piping system at 200 PSI for not less than two (2) hours. Upon completion of test and when satisfactory results have been obtained, certify in writing that all required tests have been performed and that approval of system has been obtained from authorities having jurisdiction over work. The tests shall be performed in the presence of fire department inspector, General Contractor and IHS Contract Officer. Furnish the IHS Contract Officer with 3 copies of the certificate.

3.7 DOCUMENTATION

- A. Furnish two copies of NFPA-25, 2020 Edition - Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems to the owner's service maintenance personnel as directed by the Architect/Engineer.
- B. Furnish a complete set of "as-built" drawings in a waterproof bag or container at the location of the spare sprinkler head box.
- C. Furnish a permanently marked weatherproof metal hydraulic calculation data information plate affixed to the sprinkler riser. The sign shall include the following information:
 - 1. Location of the design area or areas.
 - 2. Discharge densities of the design area or areas.
 - 3. Required flow and residual pressure demand at the base of riser.
 - 4. Hose stream demand included in addition to the sprinkler demand.

3.8 MATERIALS DELIVERY

- A. The Fire Protection Contractor shall be responsible for the safe and secure storage of materials on job site, including furnishing of any storage facilities or structures required.
- B. The Fire Protection Contractor shall be responsible for on-site handling of materials and equipment.

3.9 JOB CONDITIONS

- A. Protect all unfinished work to prevent damage and furnish protection of all surrounding areas, where necessary.
- B. All Fire Protection Work shall be protected against damage by frost, dirt, water, chemicals, and mechanical means during the course of construction.
- C. Leak Damage: The Contractor shall be responsible during the installation and testing periods of the sprinkler system for any damage to the work of others, to the building or its contents caused by leaks in any equipment, by unplugged or disconnected pipes or fittings, or by overflow, and shall pay for the necessary replacements or repairs to work of others damage by such leakage. Water shall not be introduced into the system during conditions where there is danger of freezing.

3.10 GUARANTEE

- A. The Fire Protection Contractor shall guarantee to repair or replace any defect in material, equipment or workmanship for a period of one (1) year beginning with the date of final acceptance by the Architect. Such date will be established by written communication of Architect. The Fire Protection Contractor shall be responsible during the design, installation, testing, and guarantee periods for any damage caused by the Fire Protection Contractor's work, materials, or equipment.
- B. The Fire Protection Contractor shall provide emergency repair service for the sprinkler system within four (4) hours of a request for such service by the Government during the warranty period. This service shall be available on a 24-hour per day, 7-day per week basis.

END OF SECTION

SECTION 224000 – PLUMBING

PART 1 – GENERAL

1.1 WORK INCLUDED

- A. Plumbing Fixtures
- B. Plumbing Specialties
- C. Plumbing Equipment

1.2 RELATED SECTIONS

- A. Section 230500 - Basic Mechanical Materials and Methods
- B. Section 230700 - Mechanical Insulation
- C. Section 232000 - Building Services Piping
- D. Section 211100 - Fire Protection

1.3 QUALITY ASSURANCE

- A. The plumbing equipment schedules are shown on the drawings. The following is a list of additional equipment approved for use on this project:

- 1. LAVATORIES, WATER CLOSETS, BATHTUB/SHOWERS: Sloan, American Standard, Kohler, Crane/UR, Barrier Free Architecturals, Inc.
- 2. SHOWER VALVES: Symmons, Powers, Moen, Bradley
- 3. THERMOSTATIC MIXING VALVES: Symmons, Powers, Leonard, Lawler
- 4. SINK: Eljer, Kohler American Standard, Crane, Just, Elkay, Designers Choice
- 5. CLEANOUTS: Josam, J.R. Smith, Ancon, Rockford, Wade, Zurn, Watts
- 6. WATER HEATERS: Heat Transfer Products, Lochinvar, A.O. Smith, Precision, Teledyne Laars, Weben-Jarco, Bock, Bradford White, Rinnai, Hubbel
- 7. FAUCETS: Symmons, Delta, Chicago Faucet Co., T&S Brass and Bronze Works, Cambridge Brass, Powers, Bradley, Kohler, Sloan
- 8. PUMPS: Grundfos, Hydromatic, Paco, Bell & Gosset, Amtrol, Armstrong, Taco
- 9. TRAP AND SUPPLIES: McGuire, Brass Craft, Eastman, CS&B
- 10. WATER CLOSET SEATS: Church, JSC Comfort Seats, Bemis, Olsonite.
- 11. INSULATION KITS (for P-traps and supplies): Truebro, McGuire, Plumberex
- 12. HOSEBIBBS: Chicago, Woodford, Mifab, Nibco

1.4 SUBMITTALS (ALSO REFER TO SECTION 23 05 00)

- A. Before beginning work, provide shop drawings on the following items:
 - 1. Plumbing fixtures
 - 2. Drains
 - 3. Water heaters
 - 4. Plumbing Specialties
 - 5. Other items as directed by the Owner or Architect

1.5 SPECIFICATIONS FOR OTHER DIVISIONS

- A. Some work performed by the Division 22 contractor is specified under Division 23. Division 22 contractor shall be responsible for complying with all Division 22 and 23 specifications.

PART 2 – PRODUCTS

2.1 FIXTURES

- A. General:
 - 1. All fixtures shall be white and be of the same manufacturer unless otherwise noted. All fixtures to have accessible stops and all faucets shall have renewable seats, discs, and metal indexed handles. All fixture trim shall be chrome plated and by the same manufacturer unless otherwise noted.
- B. Cleanouts:
 - 1. Exterior cleanouts in non-traffic areas or pedestrian light-traffic areas shall be Wade W-6000-Z-179 series with nickel bronze cover and frame, adjustable top, tapered bronze plug, and vandal proof top. Set in an 18" cube of concrete.
 - 2. Provide membrane clamps for cleanouts installed in surfaces have waterproofing membranes installed.

PART 3 – EXECUTION

3.1 GENERAL

- A. All changes in the plumbing work made after letting of the contract, in order to comply with the applicable codes or requirements of the plumbing inspectors, Health inspectors, Utility Regulatory Agency and similar shall be made without additional cost to the IHS Contract Officer.
 - 1. Should the Plumbing Contractor or any of the Subcontractors perform any work that does not comply with the requirements of the applicable Building Codes, State Laws, Local Ordinances and Industry Standards, he shall bear all costs arising in correcting the deficiencies, as approved by the Engineer.

3.2 INSTALLATION

- A. Secure each water line where it penetrates partitions to serve fixtures, shower arms, hose bibbs and similar items. Wrap all piping in block walls or penetrating concrete with 10 mil polyethylene tape or covering with polysleeve.
- B. Set hose bibbs 18 inches above finished grade, unless otherwise indicated. Adjust height as required to line-up bottom or top edge of wall hydrants with masonry seams where applicable. Grout water-tight any wall penetrations with non-shrinking grout. Wall hydrants shall be installed level and square with face flush with finished wall face. Thoroughly clean after installation.
- C. Seal fixtures to walls, floors, and counters using a sanitary type, one part, mildew resistant white 100% silicone sealant.

- D. Cleanouts shall be installed in accessible locations. Wall cleanout access covers shall be installed above bottom course of tile when installed in tiled walls. Floor and ground cleanouts shall be installed with covers set flush to finished grade or floor.
- E. During construction, fixtures, and equipment shall be provided with adequate protection against damage and sealed against entrance of construction debris. Floors shall not be washed into floor drains as part of the construction clean-up process.

3.3 PLUMBING SPECIALTY INSTALLATION

- A. Provide a water hammer arrestor on all cold and hot water lines serving fixtures using flush valves, solenoid valves or quick closing devices, sized in accordance with P.D.I. Standard WH-201 for the total number of fixtures served. Provide access door as required.

3.4 FLASHINGS

- A. All vent stacks passing through the roof shall be flashed with 4 lb. per square foot lead sheets extending around the pipe 8" in all directions at the roof surface and turned down 2" into the pipe opening.

END OF SECTION

SECTION 230500 - BASIC MECHANICAL MATERIALS AND METHODS

PART 1 – GENERAL

1.1 GENERAL

- A. This section covers basic materials and methods which may be common to one or more subsequent sections.

1.2 WORK INCLUDED

- A. Mechanical Seismic Control
- B. Mechanical Identification
- C. Access Panels and Doors

1.3 RELATED SECTIONS

- A. Section 013300 – Submittals
- B. Section 017700 – Project Closeout
- C. Section 017823 – Operation and Maintenance Data
- D. Section 099000 – Painting (equipment and piping other than labels)

1.4 SYSTEM DESCRIPTION

- A. The work under this section of the specification shall include all systems as shown on drawings or specified herein. This shall include all items of a minor nature necessary to complete the installation whether specifically mentioned in the contract documents or not.
- B. Drawings are diagrammatic. Dimensions given in figure on the plans shall take precedence over scaled dimensions and all dimensions, whether given in figures or scaled, shall be verified in the field.
- C. No ductwork or piping shall be shop fabricated before clearances are field verified. Offsets and transitions required because of interferences encountered in the field shall be a part of this contract and shall be shown on record drawings.

1.5 PROJECT/SITE CONDITIONS

- A. Carefully study the Civil, Architectural, Structural, Electrical and Mechanical drawings. Make a careful examination of the premises and any existing work. Determine, in advance, the methods of installing and connecting the apparatus, the means to be provided for getting the equipment into place, and become thoroughly familiar with all of the requirements of the contract.

1.6 REFERENCES

- A. All work shall be performed in accordance with all codes, laws, rules and regulations of all National and Local authorities having jurisdiction over the premises. This shall include, but not be limited to, the latest editions of the 2021 International Plumbing Code, the 2021 International Mechanical Code, the 2021 International Building Code, State or local Board of Health, Federal Environmental protection regulations, 2021 International Energy Conservation Code, Utility Regulatory Agencies, Occupational Safety and Health Act, the American Gas Association, National Fire Protection Association, and the 2021 International Fire Code. In case of differences, between codes, ordinances, specifications, or plans, the most stringent shall apply. This does not delete requirements of plans and specifications which may be in excess of code requirements.

1.7 QUALITY ASSURANCE

- A. The mechanical systems have been designed around the makes and sizes of equipment named on the drawings or elsewhere in the specifications. Other makes of equipment named in the specifications, shown on the drawings, or approved by the IHS Contract Officer as outlined in Division 01, may be furnished at the contractor's option. Equipment furnished must have equivalent capacity, the same electrical characteristics, substantially the same physical dimensions, and can be installed in the space available with ample working space around it. Any extra costs resulting from equipment substitution shall be at no cost to the owner.
- B. Where possible, all items of the same type (i.e. pumps, fans, fixtures) shall be by the same manufacturer.
- C. Where instructions on installation are not included in these specifications or on the plans, the manufacturer's instructions shall be followed.

1.8 SUBMITTALS

- A. See Section 013300 for general submittal requirements. Refer to subsequent sections for other requirements.
- B. Before beginning work and prior to placing orders, submit one copy in pdf format of shop drawings or literature (separating groups of similar items) on fixtures, materials, and equipment to be furnished. Each cut-sheet or shop drawing shall have options and selections highlighted or otherwise clearly identified. Each cut-sheet or shop drawing shall include: mark indicated on drawings, manufacturer with address and phone number, model number, capacities, ratings, dimensions, electrical characteristics, trim, and accessories. Each cut sheet or shop drawing shall be an original from the manufacturer or a clean and clear color scan. Each submittal shall include a cover sheet indicating the project title, Architect, General Contractor's name, and contractor's name, address, and phone.
- C. Submittals not in the format of paragraph B or illegible will be returned. All submittals shall be complete, shall be submitted at one time and shall not be submitted in batches. Separate complete submittals for Plumbing, HVAC, and Fire Protection may be submitted.
- D. Resubmittals shall be issued in same format as above and shall be marked as "resubmittal" on each page.
- E. Before submitting any equipment for review, determine that such equipment will fit satisfactorily into the space allotted to it.
- F. When equipment or materials submitted differ from that specified or when local conditions necessitate an arrangement of equipment or materials different from that indicated on the drawings, submit for review shop drawings showing proposed rearrangement before installation. Any deviations from plans and specifications shall be called to the attention of the Architect in writing.
- G. Voltage and phase of motors furnished under this section shall be as indicated on the electrical drawings. Verify electrical characteristics with electrical drawings before final ordering of equipment.
- H. Submittals will be checked for general compliance only and should not be relied on for review of quantities, fabrication methods, safety precautions, or electrical or physical

coordination. Requirements of contract documents are not limited, waived, or superseded by submittal review.

1.9 FEES, PERMITS & INSPECTIONS

- A. The **mechanical, plumbing or fire protection contractors** shall secure and pay for all permits and fees including, but not limited to: water meters, fire line connection charges, sewer connection fees, and other mechanical connection charges required for the installation of the mechanical systems. The Contractor shall arrange for all inspections and secure all approvals required for work.

1.10 COOPERATION AND WORK PROGRESS:

- A. Perform work so that progress of project, including work of other Trades is not delayed.
- B. Coordinate work of this Section with work of other Sections to complete work as soon as conditions permit and to minimize interruptions of building functions. Assume additional costs incurred due to lack of or improper coordination with work of other Sections.
- C. Coordinate exact mounting arrangement and location of equipment shown on Drawings. Allow for proper space requirements for equipment access, operation and maintenance. Particular attention shall be given to group installations. If insufficient space or conflict with work of other Sections will prevent proper installation, access, operation, or maintenance of shown equipment, immediately notify Architect and do not proceed with this part of Contract work until directed by Architect.

PART 2 – PRODUCTS

2.1 MECHANICAL IDENTIFICATION

- A. Provide coiled plastic pipe markers for pipe identification of all exposed piping in mechanical rooms.
- B. Provide 2" x 3" or larger laminated black plastic nameplates with one-half inch engraved white numbers and letters for each piece of equipment. Nameplate materials mounted outside shall be resistant to UV degradation.
- C. Approved pipe identification and engraved plastic tag manufacturers: Seton, Brimar Industries, Marking Services Inc., MIFAB.
- D. Valves shall be provided with brass valve tags stamped with valve number and identification for service.

2.2 ACCESS PANELS AND DOORS

- A. Provide access panel for any concealed equipment or valve requiring access. Access panel shall be sized per plans and be of a type compatible with ceiling or wall construction.

PART 3 – EXECUTION

3.1 GENERAL

- A. All work shall be under the direct supervision of a competent foreman. All work shall be planned and carried out so as not to interfere with the progress of the work by other sections on the job.

- B. Locations indicated on the drawings show the arrangement desired for the principal apparatus and shall be followed as closely as possible. The work shall be laid out on the job to secure a neat arrangement, to secure the best conditions throughout, and to overcome local difficulties and interferences where encountered. Equipment shall be installed to permit access for service. All installations shall be made as recommended by the equipment manufacturers.
- C. Erect equipment and accessories in neat and workmanlike manner. All piping, ductwork, etc. shall be run parallel and at right angles to building. Align, level and adjust for satisfactory operation, install so that connecting and disconnecting of piping and accessories can be made readily and so that all parts are easily accessible for inspection, operation and maintenance.
- D. Be fully responsible for any and all damages to fixtures and equipment that results from improper handling or installation.
- E. Provide safety guards for any equipment that may present a hazard to personal safety.

3.2 TEMPORARY FACILITIES

- A. Staging and Scaffolding:
 - 1. All staging and scaffolding, exterior and interior, required to be over eight feet in height, shall be furnished, erected and maintained in safe condition for proper execution of the work.
 - 2. Staging, Scaffolding and other temporary construction shall be rigidly built in accordance with local and state requirements. Remove from premises upon completion of work.
- B. Provide temporary construction required for work as directed by Architect.
- C. Hoisting Equipment and Machinery:
 - 1. All hoisting equipment and machinery required for the placement of equipment shall be furnished, installed, operated, and maintained in safe condition.

3.3 PROTECTIVE MEASURES

- A. Protect all equipment, materials, and plumbing fixtures on the job site until project has been finished.
- B. All equipment shall be tightly covered and protected against dirt, water, chemical or mechanical injury, and theft. Insulation damaged by rain or water shall be replaced at no cost to owner. Plumbing fixtures shall be covered with heavy paper coverings after installation and shall be thoroughly cleaned after completion of the project.
- C. Any mechanical items damaged by exposure to the weather shall be replaced or refinished. Any damage or defect of work developed before final acceptance of work shall be replaced or repaired at no cost to the owner.
- D. All materials such as valves, fittings, piping, equipment, pumps, coils, etc., shall be properly protected. All duct and piping openings shall be temporarily closed at the end of each working day to prevent obstruction and damage. Open ended ducts or plenums shall not be used for storage of materials or for temporary staging during construction.

- E. At the completion of the work, equipment and materials shall be cleaned, polished thoroughly and turned over to the Owner in a condition satisfactory to the Architect.

3.4 MECHANICAL IDENTIFICATION

- A. Screw tags to equipment with pan head sheet metal screws or strap to equipment in obvious locations. Attachment methods shall be in accordance with manufacturer's recommendations. Engrave equipment designation and numbers as shown on plans and drawings on upper half of tag, leaving lower half of tag for future engraving. Tags for valves shall be attached using solid brass jack chain.
- B. Pipe markers shall indicate flow direction at every marker location (with arrows pointing away from text). Markers shall be installed per latest standards for markers. Markers shall not be required on painted piping.

3.5 PAINTING

- A. Touch-up damaged factory finishes with factory approved products in accordance with manufacturer's instructions.
- B. All surfaces to be painted shall be thoroughly cleaned of grease, dirt and oil before paint is applied. Painting materials, the application thereof, and protection of other work shall conform to the requirements of Section 099000.
- C. Paint all visible sheet metal ductwork behind grilles and registers flat black.

3.6 CUTTING & PATCHING

- A. Provide all openings through walls, floors and the roof necessary for the installation of the work under this Section. Openings shall be neatly cut with any damage to the building repaired and repainted.
- B. Layout all openings required, and furnish and set all sleeves for the installation of work under this Division.

3.7 TESTS AND ADJUSTMENTS

- A. Refer to Section 230593, Testing, Adjusting and Balancing, and to Section 232000, Building Services Piping for particular testing requirements.
- B. Notify the IHS Contract Officer of readiness to perform test at least 24 hours in advance and all tests shall be performed in the presence of the IHS Contract Officer's representative. Any defective material and/or equipment shall be repaired, adjusted and/or replaced by like new materials and/or equipment before acceptance.
- C. All items such as valves, gauges, traps, strainers, etc., which may be damaged by the test pressure shall be removed before the tests are made and shall not be replaced until the tests have been approved.
- D. Furnish all pumping equipment tools, instruments, equipment, and temporary connections required for tests.
- E. All defects which develop under tests shall be repaired promptly and the tests repeated. No caulking of screwed joints, cracks or holes will be permitted. Leaks in screwed joints shall be repaired by replacing the pipe or the fittings or both with new material. Leaks in

copper fittings shall be repaired by melting out the joint, thoroughly cleaning both parts and resoldering.

- F. Lubricate, start up, and operate all equipment and demonstrate its operation and compliance with the specifications. Any undue noise, vibration and/or other objectionable features shall be promptly repaired and/or the device replaced and the system retested.
- G. All systems shall be placed in service and be operating properly for a period of not less than seven consecutive 24-hour days before acceptance.
- H. A written report of all test results shall be submitted to the Architect for approval.

3.8 CLEANING-UP

- A. At all times keep the building and premises in a neat manner. All instructions issued by the Architect and indicated elsewhere in these specifications in regard to storage of materials, protective measures, cleaning of debris etc., shall be followed. Upon completion of the work, thoroughly clean all machinery, piping, etc., and leave areas directly affected by work broom clean.

3.9 RECORD DRAWINGS

- A. Maintain a clean, undamaged set of contract drawings on site. Record all changes from contract drawings including "found" conditions, addenda, change orders, or other instructions issued by the IHS Contract Officer and submit to the IHS Contract Officer as "record drawings" at close of project. Changes to contract documents shall be clouded and dated. Include dimensioned locations of underground piping from a clearly visible point on the building. Refer to Section 01 70 00.

3.10 CERTIFICATES

- A. Perform sterilization of the domestic water systems with a 50 ppm chlorine at each valved outlet to be held for twenty-four hours with tests every eight hours or 200 ppm and allowed to stand for 3 hours. Then flush all outlets to 0.2 ppm. Testing shall be provided by locally based, full time, full service water treatment company with a minimum of three years' experience in the water treatment business. Furnish all equipment and chemicals required. Provide appropriate tags on all outlets during testing to prevent accidental consumption or draining of the system. Give 24-hours notice to Owner's representative for start and finish inspections.
- B. Certify in writing, by the testing company, that the water lines have been sterilized and that approval of the installation was obtained from the authorities having jurisdiction over the work. Sterilization to be in accordance with requirements of local authorities. Give original to IHS Contract Officer and include one copy with each O&M submittal.

3.11 OPERATION AND MAINTENANCE MANUAL

- A. Furnish to the IHS Contract Officer, two hard copies and one electronic copy in PDF of operating and maintenance manuals – coordinate with Section 017823. Manuals shall be loose-leaf 8-1/2"x11" format, bound in three-ring binders with identifying tabs separating sections. Each shall contain manufacturer's spare parts list, care, operation, and installation instructions. Provide a sequence of operation and a preventative maintenance schedule identifying daily, weekly, monthly and seasonal maintenance procedures as required. Contractor shall provide this sequence of operation and schedule if not given by the manufacturer. Provide a list of suggested suppliers with names, addresses, and phone numbers for each product or product group. Information may be printed on both

sides of each page. Each binder shall include a cover sheet indicating the project title, architect, general contractor's name, and contractor's name, address, and phone.

- B. Instruct the maintenance personnel in the operation of the system and submit copies of a letter signed by the owner's representative attesting to such instructions listing names of Owner personnel who received these instructions. Include a copy with each operation and maintenance manual (O&M).
- C. Coordinate with "guarantees" and "certificates" for other inclusions.

3.12 GUARANTEES

- A. Guarantee work to be free from defects in workmanship and material for a period of **one** year from the date of final acceptance as determined by the IHS Contract Officer. Any material, equipment, or workmanship which proves defective within the guarantee period shall be promptly repaired or replaced at no cost to the Government. Repair any damage done to areas, materials, and other systems resulting from the failure or defect at no cost to the Government. Extend guarantee of replaced item a period of one year from date of replacement or to the end of the Guarantee period, whichever is longer. Replace materials or equipment that requires excessive maintenance during the guarantee period. Service calls, repairs, adjustments, and replacements during the guarantee period shall be made at no cost to the owner.
- B. Furnish a letter stating that the system has been installed in accordance with the contract documents and with any deviations detailed in full.
- C. Connections made to owner provided equipment shall be the responsibility of the contractor and shall be included in the guarantee.
- D. Service or replacement required as a result of faulty operation or neglect on the part of the Government shall be paid for by the Government at prevailing rates.
 - 1. However, if written instructions of the care and maintenance of equipment were not given to the IHS Contract Officer the neglect shall be on the Contractor's part and the cost of the service or replacements shall be at no cost to the owner.
- E. Standard factory warranties shall be provided on all equipment furnished and evidence of same shall be included in each O & M Manual.
 - 1. Provide an additional 4-year warranty on all air conditioning compressors, making a total five-year warranty.

END OF SECTION

SECTION 230593 - TESTING, ADJUSTING, AND BALANCING (TAB)

PART 1 - GENERAL

1.1 GENERAL

- A. An independent testing, adjusting, and balancing (TAB) agency shall test, adjust, and balance the mechanical systems.
- B. The work included in this section consists of furnishing labor, instruments, and tools required in testing, adjusting and balancing the HVAC systems, as described in these specifications or shown on accompanying drawings. Services shall include checking equipment performance, taking the specified measurements, and recording and reporting the results.

1.2 WORK INCLUDED

- A. Air Systems

1.3 RELATED SECTIONS

- A. Section 230500: Basic Mechanical Materials and Methods

1.4 DEFINITIONS, REFERENCES, STANDARDS

- A. All work shall be in accordance with the latest edition of the AABC National Standards. If these contract documents set forth more stringent requirements than the AABC National Standards, these contract documents shall prevail.

1.5 QUALIFICATIONS

- A. The TAB Agency shall be a current member of the Associated Air Balance Council (AABC).

1.6 SUBMITTALS (also refer to Section 230500)

- A. The TAB agency shall submit a company resume listing personnel and project experience in air and hydronic system balancing and a copy of the agency's test and balance engineer (TBE) certificate.
- B. Procedures and Agenda: The TAB agency shall submit the TAB procedures and agenda proposed to be used.
- C. The TAB agency shall submit sample forms, which shall include the minimum data required by the AABC National Standards.

1.7 TAB PREPARATION AND COORDINATION

- A. TAB agency shall obtain shop drawings, submittal data, up-to-date revisions, change orders, and other data required for planning, preparation, and execution of the TAB work no later than 30 days prior to the start of TAB work.
- B. System installation and equipment startup shall be complete prior to start of TAB agency's work.

- C. All test points, balancing devices, identification tags, etc. shall be accessible and clear of insulation and other obstructions that would impede TAB procedures.
- D. Qualified installation or startup personnel shall be readily available for the operation and adjustment of the systems. Assistance shall be provided as required for coordination and problem resolution.

1.8 REPORTS

- A. The TAB agency shall submit one electronic copy in PDF format of the final TAB report for review by the IHS Contract Officer. All outlets, devices, HVAC equipment, etc., shall be identified, along with a numbering system corresponding to report unit identification. The TAB agency shall submit an AABC "National Project Performance Guaranty" assuring that the project systems were tested, adjusted and balanced in accordance with the project specifications and AABC National Standards.

1.9 DEFICIENCIES

- A. Any deficiencies in the installation or performance of a system or component observed by the TAB agency shall be brought to the attention of the appropriate responsible person.
- B. The work necessary to correct items on the deficiency listing shall be performed and verified by the affected contractor before the TAB agency returns to retest. Unresolved deficiencies shall be noted in the final report.

PART 2 - PRODUCTS

2.1 INSTRUMENTS

- A. All instruments used for measurements shall be accurate and calibrated. Calibration and maintenance of all instruments shall be in accordance with the requirements of AABC National Standards.

PART 3 - EXECUTION

3.1 GENERAL

- A. The specified systems shall be reviewed and inspected for conformance to design documents. Testing, adjusting and balancing on each identified system shall be performed. The accuracy of measurements shall be in accordance with AABC National Standards. Adjustment tolerances shall be + 10% or - 5% unless otherwise stated.
- B. Equipment settings, including manual damper quadrant positions, manual valve indicators, fan speed control levers, and similar controls and devices shall be marked to show final settings.
- C. All information necessary to complete a proper TAB project and report shall be per AABC standards unless otherwise noted. The description for work required, as listed in this section, are a guide to the minimum information needed.
- D. Changes to pulleys, drives, etc. shall be part of the balance responsibility.

3.2 AIR SYSTEMS

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- A. The TAB agency shall verify that all ductwork, dampers, grilles, registers, and diffusers have been installed per design and set in the full open position. The TAB agency shall perform all TAB procedures in accordance with the AABC National Standards.
- B. Supply Fans:
 - 1. Fan speeds - Test and adjust fan RPM to achieve maximum or design CFM.
 - 2. Current and Voltage - Test and record motor voltage and amperage, and compare data with the nameplate limits to ensure fan motor is not in or above the service factor.
 - 3. Pitot-Tube Traverse - Perform a Pitot-tube traverse of main supply and return ducts, as applicable to obtain total CFM.
 - 4. Outside Air - Test and adjust the outside air on applicable equipment using a Pitot-tube traverse. If a traverse is not practical use the mixed-air temperature method if the inside and outside temperature differences is at least 20 degrees Fahrenheit or use the difference between Pitot-tube traverses of the supply and return air ducts.
 - 5. Static Pressure - Test and record system static profile of each supply fan. Variable frequency drive shall be tested in bypass mode to determine maximum static pressure capabilities.
- C. Exhaust Fans:
 - 1. Fan speeds - Test and adjust fan RPM to achieve maximum or design CFM.
 - 2. Current and Voltage - Test and record motor voltage and amperage, and compare data with the nameplate limits to ensure fan motor is not in or above the service factor.
 - 3. Pitot-Tube Traverse - Perform a Pitot-tube traverse of the main exhaust ducts to obtain total CFM.
 - 4. Static Pressure - Test and record system static profile of each exhaust fan.
- D. Main Ducts:
 - 1. Adjust ducts to within design CFM requirements.
- E. Diffusers, Registers and Grilles:
 - 1. Tolerances - Test, adjust, and balance each diffuser, grille, and register to within 10% of design requirements. Minimize drafts.
 - 2. Identification - Identify the type, location, and size of each grille, diffuser, and register. This information shall be recorded on air outlet data sheets.
 - 3. Adjust the louvers in all supply outlets to produce air distribution satisfactory to

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**IHS PH21CR03Q3
BWS 1818.900**

the occupants.

4. All measurements of air quantities delivered by grilles shall be made in a manner approved by the manufacturer of the grille.

F. Coils:

1. Air Temperature - Once air flows are set to acceptable limits, take wet bulb and dry bulb air temperatures on the entering and leaving side of each cooling coil. Dry-bulb temperature shall be taken on the entering and leaving side of each heating coil or furnace.

3.3 GUARANTEE

- A. All work shall be guaranteed for a period of ninety days. TAB contractor shall make adjustments during this period for comfort level adjustment, at direction of the IHS Contract Officer. TAB contractor shall meet with IHS Contract Officer during this period as may be required to verify any readings. Coordinate with Section 013300.

END OF SECTION

SECTION 230700 - MECHANICAL INSULATION

PART 1 – GENERAL

1.1 WORK INCLUDED

- A. Piping insulation
- B. Ductwork Insulation

1.2 RELATED SECTIONS

- A. Section 224000 – Plumbing
- B. Section 230500 – Basic Mechanical Materials and Methods
- C. Section 232000 – Building Services Piping
- D. Section 233000 – Air Distribution

1.3 QUALITY ASSURANCE

- A. The following is a list of additional manufacturers approved for use on this project:
 - 1. Insulation Products: Owens Corning, Johns Manville, CertainTeed, Schuller, Manson
 - 2. Closed Cell: Armstrong, Nomaco

1.4 SUBMITTALS

- A. Product Data: Provide product description, list of materials and thickness for each service or equipment scheduled, locations, and manufacturer's installation instructions.
- B. See Section 13300 for general submittal requirements.

1.5 ENVIRONMENTAL REQUIREMENTS

- A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

PART 2 – PRODUCTS

2.1 GENERAL

- A. Coverings and linings, including adhesives when used, shall have a flame spread index of not more than 25 and a smoke-developed index of not more than 50 when tested in accordance with ASTM E 84.
- B. Duct coverings and linings shall not flame, glow, smolder, or smoke when tested in accordance with ASTM C 411 at the temperature to which they are exposed in service. The test temperature shall not fall below 250°F (121°C).

2.2 PIPE INSULATIONS

- A. Glass Fiber insulation shall meet ASTM C547. Insulation shall be rigid, molded, and noncombustible.
 - 1. 'K' ('ksi') Value: 0.23 at 75°F (0.033 at 24°C).

2. Maximum Service Temperature: 850°F (454°C).
 3. Vapor Retarder Jacket: AP-T PLUS White kraft paper reinforced with glass fiber yarn and bonded to aluminum foil, secured with self sealing longitudinal laps and butt strips or AP Jacket with outward clinch expanding staples or vapor barrier mastic as needed.
- B. Elastomeric Foam (fire protection, refrigeration and condensate) shall meet ASTM C534 and be flexible, cellular elastomeric, molded or sheet.
1. 'K' ('ksi') Value: 0.28 at 75°F (0.04 at 24°C).
 2. Maximum Service Temperature: 220°F (104°C).
 3. Maximum Flame Spread: 25
 4. Maximum Smoke Developed: 50 (3/4" thick and below). 100 (above 3/4" thick).
 5. Connection: Waterproof vapor retarder adhesive as needed.
 6. UV-Protection: Outdoor protective coating.

2.3 DUCTWORK INSULATION

- A. Duct Liner shall be: Flexible duct liner made from strong, flame attenuated glass fibers bonded with a thermosetting resin.
1. 'K' ('ksi') Value: ASTM C 518, 0.24 at 75°F (0.036 at 24°C).
 - a. R-6.0 for 1-1/2" liner.
 2. Noise Reduction Coefficient based on Type "A" Mounting per ASTM C 423.
 - a. 0.80 NRC for 1-1/2" liner.
 3. Maximum Velocity on Mat or Coated Air Side: 6,000 ft/min (30.5 m/sec) per ASTM C 1071.
 4. Maximum operating temperature: 250°F (121°C) per ASTM C 411.
 5. Adhesive: UL listed waterproof type.
 6. Fasteners: Duct liner galvanized steel pins, welded or mechanically fastened.

PART 3 – EXECUTION

3.1 EXAMINATION AND PREPARATION

- A. Verify that ductwork has been tested for leakage in accordance with SMACNA standards before applying insulation materials.
- B. Verify that all surfaces are clean, dry and free of foreign material before applying insulation materials.

3.2 INSTALLATION

- A. Install materials in accordance with manufacturer's recommendations, building codes and industry standards.

- B. Insulation shall be continuous at pipe and duct hangars.
- C. Continue insulation, including vapor barrier, through wall and floor penetrations except where prohibited by code.
- D. Piping Insulation
 - 1. Locate insulation and cover seams in least visible locations.
 - 2. Neatly finish insulation at supports, protrusions, and interruptions.
 - 3. For piping 1 1/4" and larger, provide calcium silicate insert between support shield and piping.
- E. Duct Liner:
 - 1. Adhere insulation to sheet metal with full coverage of a UL listed adhesive.
 - 2. Secure insulation with mechanical liner fasteners as indicated by SMACNA or manufacturer. Pin length should be as recommended by the liner manufacturer.
 - 3. All exposed edges of the liner must be factory or field coated.
 - 4. Repair liner surface penetrations with UL listed adhesive

3.3 PIPING INSULATION SCHEDULE

	Pipe Size	Insulation Thickness
A. Fiber Glass Insulation		
Domestic Hot Water	Up to 1"	1"
Piping Subject to freezing	All Sizes	1"
B. Elastomeric Foam		
Fire Protection	All Sizes	3/4"
Refrigerant Suction	All Sizes	3/4"
Refrigerant Hot Gas	All Sizes	3/4"
Condensate	All Sizes	1/2"

- C. Domestic hot water branch lines down in walls up to 3/4" may be insulated with 1" elastomeric foam at contractor's option.

3.4 DUCTWORK INSULATION SCHEDULE

	Thickness	Finish
A. Duct Liner		
All Rectangular Supply and Return	1-1/2"	Mat Faced

END OF SECTION

SECTION 232000 - BUILDING SERVICES PIPING

PART 1 – GENERAL

1.1 GENERAL

- A. This section covers basic materials and methods which may be common to one or more subsequent sections.

1.2 WORK INCLUDED

- A. Valves
- B. Backflow Preventers
- C. Sanitary Waste and Vent Piping
- D. Domestic Water Piping
- E. Heating and Cooling Piping
- F. Piping Joints
- G. Hangers and Supports
- H. General Piping Specialties
- I. Chemical Water Treatment

1.3 RELATED SECTIONS

- A. Section 230500 for Basic Mechanical Materials and Methods
- B. Section 230700 for Mechanical Insulation

1.4 SUBMITTALS (Also refer to 013300)

- A. Prior to commencement of work, provide submittals on the following:
 - 1. Valves
 - 2. Piping Specialties (Heating and Cooling and General)
 - 3. Pipe Hangers

PART 2 – PRODUCTS

2.1 VALVES

- A. Provide isolation valves and either unions or flanges to isolate and to allow removal of all mechanical equipment.
- B. All isolation valves (SOVs) 2" and smaller shall be 1/4 turn ball valves. SOVs 2-1/2" and larger shall be butterfly valves.
- C. Valves shall be of an approved make, equivalent to Stockham company numbers listed as follows:

1. Bronze Ball Valves - 2" and under

600 psi CWP, 150 psi SWP, two piece construction, full port, blowout proof stem, ¼ turn, PTFE packing & seats, adjustable packing nut, bronze ball, threaded ends: Stockham S206BR-R-T, solder ends with extended solder cops: Stockham S206BR-R-S.

2. Bronze Check Valves - 2" and under

Class 125#, 200# WOG, swing check, bronze disc, threaded ends: Stockham B-319; Solder ends: Stockham B-309.

D. Valves in Insulated Piping: Valves shall have 2-inch stem extensions and the following features:

1. Ball Valves: Shall have extended operating handle of non-thermal-conductive material, protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation, and memory stops that are fully adjustable after insulation is applied.

E. All valves shall be of the same manufacturer equivalent of Stockham, Red and White, Nibco, Hammond, Henry, & SSI Equipment.

2.2 SANITARY WASTE AND VENT PIPING

- A. The building's vent and sanitary waste piping to a point five feet outside the building shall be solid wall Schedule 40 PVC DWV (ASTM D1784) (if contractor willingly accepts all responsibility for any associated future failure problems with all underslab waste pipe installation, ABS plastic pipe will be accepted, as an approved alternate. All underground ABS piping shall be installed per manufacturer's recommendation).
- B. Building sewer piping shall be the same as sanitary waste and vent piping.
NOTE: Building sewer piping materials specified by Civil Engineer shall take precedence.

2.3 DOMESTIC WATER PIPING (COPPER)

- A. Above ground domestic water piping shall be Type L seamless hard drawn copper tubing with cast brass or wrought copper fittings for piping up to 2" and wrought copper fittings for 2-1/2" and larger.
- B. Exterior underground domestic cold water piping may be Class 200 DR 14 PVC plastic pipe or as specified by the Civil Engineer whose specification will take precedence.

2.4 HEATING AND COOLING PIPING

- A. Condensate Drain Piping
 1. Air conditioning condensate piping shall be schedule 40 PVC plastic piping and fittings with plugged tees for cleanouts. Male threads on plugs shall be wrapped with Teflon® tape prior to threading into tees.
- B. Refrigerant Piping
 1. Air conditioning refrigerant piping shall be ACR refrigeration hard tempered tubing cleaned and capped with wrought copper fittings. Piping may be factory provided pre-insulated refrigeration tubing and fittings.

2. Refrigeration piping shall have a triple evacuation with dry nitrogen and a 12 hour holding tests inspected by IHS Contract Officer's representative. A written report of test results shall be submitted for approval signed by inspecting party.

2.5 PIPING JOINTS

A. Plastic Pipe:

1. Joints in plastic pipe shall be made using solvent cement per manufacturer's recommendations.
 - a. Solvent cement for PVC welding shall have maximum volatile organic compound (VOC) emissions of 510 g/L less water.
 - b. Solvent cement for CPVC welding shall have maximum volatile organic compound (VOC) concentration emissions of 490 g/L less water.
 - c. Solvent cement for ABS welding shall have maximum volatile organic compound (VOC) emissions of 325 g/L less water.

B. Copper Water Piping:

1. Joints in copper water piping 2" and smaller above grade shall be soldered with ENGELHARD "SILVABRITE 100", 100% LEAD FREE or other non-lead solder, minimum 4,000 psi tensile strength using nokorode solder paste applied with a brush to both the pipe and the inside of the fitting socket. No acid core solder nor flux containing acid shall be used. Pipe shall be cut square and reamed. The parts of the pipe and fittings to be soldered shall be thoroughly cleaned with sand cloth before applying flux.

C. Refrigerant Piping:

1. Joints in copper air conditioning refrigerant piping shall be made with silfos and flux as recommended by the brazing alloy manufacturer. During brazing the pipe and fittings shall be kept full of an inert gas, dry nitrogen, or CO2, to prevent formation of scale.

2.6 HANGERS AND SUPPORTS

A. Pipe Hangers:

1. Approved manufacturers: Elcen, Unistrut, B-Line.
2. All piping within the confines of the building shall be supported by means of adjustable steel clevis hangers spaced per ASHRAE recommendations and suspended from the building construction by all thread rods sized per ASHRAE. Strap, wire, or chair hangers are not permitted. Where suspended from steel structural members, appropriate clamps shall be used. Provide a sheet metal saddle, minimum 12" long by two times the diameter of the outside of the insulated pipe at all hangers for insulated pipe.
3. Clevis hangers shall be sized large enough to pass insulation on insulated pipe. Provide sheet metal saddle for piping 1" and larger. Refer to 230700 for inserts on larger piping.
4. All sizes of non-insulated copper piping shall be supported using "Trisolator #500" isolators at all support locations.

5. Insulated piping up to 1-1/2" shall continue insulation through support clamp or hanger.
6. Plastic piping shall be supported a minimum of 4' on center or as required to avoid sagging.
7. Except where governed by local codes, maximum hanger spacing for metal piping and minimum hanger rod sizes shall conform to the following table:

	Pipe Size	Spacing	Hanger Rod
Copper Pipe	1/2"	6'-0"	3/8"
	3/4", 1"	8'-0"	3/8"
	1-1/4"-2"	10'-0"	3/8"

2.7 GENERAL PIPING SPECIALTIES

A. Unions:

1. Unions in copper pipe 2" and smaller shall be ground joint copper unions equivalent to Mueller C-107.
2. Provide nuts, bolts, and gaskets for flanges. Materials shall be compatible with the piping and fluid conveyed.

B. Sleeves:

1. Pipe sleeves shall be schedule 40 steel pipe for all pipes passing through fire rated floors or walls. Sleeves for non-rated walls shall be PVC schedule 40 pipe or 18 gauge sheet metal. Sleeves for uncovered pipe shall be two pipe sizes larger than the main. Sleeves for insulated mains shall be of sufficient size to pass the covering with a minimum 1/4" clearance.

PART 3 – EXECUTION

3.1 VALVES

- A. Valves shall be installed with valve stem in upright (vertical) orientation.
- B. Provide access panels for any valves located above solid ceilings at valve location.
- C. Provide a shut-off valve or angle stop with cast brass stem and nuts to isolate all plumbing equipment.
- D. Valve box for cold water service shall be pre-cast concrete construction with cast iron cover marked "water".
- E. Provide isolation valves where shown on drawings and at branch lines to multiple (more than two) fixture groups.
- F. All flexible piping connectors (expansion joints) shall be installed on the equipment side of the shut off valves.

3.2 PLASTIC PIPE

- A. Joints in plastic pipe shall be made with solvent and cement per manufacturer's recommendations.

- B. Plastic piping exposed to sunlight shall be painted with two coats of latex paint. Color shall be white unless otherwise specified by Architect.

3.3 COPPER PIPING JOINTS

- A. No acid core solder or flux containing acid shall be used.
- B. Pipe shall be cut square and reamed.
- C. The parts of the pipe and fittings to be soldered shall be thoroughly cleaned with sand cloth before applying flux.
- D. Maintain a minimum of 50% penetration of brazed joints.

3.4 THREADED PIPE

- A. Joints in threaded pipe shall be made with sharp clean threads with Teflon joint compound on the male threads only. Joint compound shall be listed and approved and compatible with pipe materials and fluid being conveyed. All pipe shall be reamed to full inside diameter. Only pipe reamers shall be used to ream pipes.

3.5 HANGERS AND SUPPORTS

- A. Support piping to adequately prevent sagging, pocketing, swaying, and displacement.
- B. Vertical piping shall be secured to structure.
- C. Piping shall not be racked to the floor in kitchen or areas other than mechanical rooms.

3.6 ESCUTCHEONS

- A. All pipes passing through walls, floors, or ceiling in finished rooms shall be fitted with polished chrome plated escutcheons.

3.7 UNIONS

- A. A dielectric union shall be used to join any dissimilar metals.
- B. Unions shall be installed in piping on the equipment side of each service valve and in all connections to fixtures or equipment where the trimmings do not permit convenient removal.
- C. Provide dielectric unions at all tank (including hot water storage tanks) connections.

3.8 SLEEVES

- A. Where pipes pass through floors (except slab on grade) or interior masonry or concrete walls, pipe sleeves shall be installed. Sleeves through concrete walls or floors shall be installed with minimum 1" clearance to be packed & sealed. Sleeves through floors shall extend a minimum of two inches above the finished floor. Sleeves through walls shall be one continuous piece and shall extend from finished surface to finished surface.
- B. The outer surface of the sleeve shall be fixed to the partition it penetrates with pour rock, mortar, or etc. for fire-resistance-rated assemblies, the internal surface shall be sealed with a UL 2079 approved firestopping material. Sealant shall be tested per ASTM E 1399. Equivalent to Bio Fireshield Biostop 500+.

1. Firestopping material shall have maximum volatile organic compound (VOC) emissions of 50 g/L less water.
- C. Sleeve shall not support pipes as it will transmit vibration and sound to structure.
- D. Copper pipe passing through a steel sleeve shall be protected with polyethylene tape or other approved dielectric materials.

3.9 INSTALLATION

- A. No service lines shall be laid on the backfill over other service lines or conduits except at crossings. All piping shall be accurately cut and installed in place without forcing. Changes in direction shall be made with fittings. Bending of pipe is not permitted. Reducing fittings shall be used where pipe sizes change, rather than bushings.
- B. Route piping to allow sufficient access to all equipment, valves, controls, etc., for maintenance.
- C. In general, piping shall be installed below electrical conduits not requiring maintenance access.
- D. All pipe and fittings exposed in finished areas shall be chrome plated unless otherwise approved in writing.
- E. It shall be this contractor's responsibility to coordinate inverts of underground waste lines with sanitary and other site utilities.
- F. Install piping sufficiently below structure to allow top air vents.
- G. Cap all pipe openings during construction until final connections are made. Also caps or plugs for end of line valves until final connections are made.
- H. Provide approved, listed fire-stopping materials for any piping which pass through fire partitions, rated walls, or floors. Coordinate with Architectural specifications.
- I. Install piping parallel or at right angles to the building, straight, plumb, and level (or at slope as required). Piping shall be pitched for drainage at a uniform slope to drainage points.
- J. Provide a pressure reducing valve on water lines which are subject to pressures above 80 psi and for any lines to fixtures which require less pressure than the building pressure.

3.10 EXCAVATION, TRENCHING AND BACKFILLING

- A. Do all excavating and backfilling necessary for the installation of this work. This shall include the cutting of sidewalks and pavings if required.
- B. All work under this heading shall be in accordance with Section 31 (earthwork section) of these specifications.
- C. Where trenches cross roads, walks, or public thoroughfares, provide suitable barricades and bridges adequately protected by signs or red flags during the day and lights at night.
- D. No piping shall be concealed or buried before inspection by authorized person.
- E. All trenches shall be dug to exact grade and depth with only sufficient dirt removed to provide working space. Trenches shall be dug 6" below the required depth and shall be

refilled to proper depth with sand. Accurately grade sand in bottom of trenches to provide uniform bearing and support for each section of pipe at every point along its length. Trenches shall not be more than 18" wider than the external diameter of the pipe or duct and the sides shall be as perpendicular as possible. Trenches shall be shored or sheet piled if necessary to prevent caving and to protect the work of other contractors of existing structure.

- F. All excavations shall be refilled with sand to 6" above piping and the rest with loose granular, moist earth thoroughly tamped. Compact backfill to 95% of maximum density within limits of building, under sidewalks, under slabs on grade, and under asphalt or concrete paving.
- G. After the trench is backfilled per specifications to within 12" of the finished grade, install a detectable pipe locating tape over the entire piping runs. The backfill shall be sufficiently leveled so that the tape will be installed on a flat surface. The tape shall be centered in the trench and laid flat with printed side up. Caution shall be exercised to avoid displacement of tape and to ensure its integrity. The tape shall consist of a minimum 4.0 mil thickness, inert polyethylene plastic which is impervious to all known alkalis, acids, chemicals, reagents and solvents likely to be encountered in the soil, with a minimum 1/3 mil metallic foil. The tape shall be at least three inches in width and shall be yellow in color with identifying print in black letters. The tape shall have printed thereon the following:

CAUTION - BURIED PIPELINES BELOW

The identifying lettering shall be 1" high and repeated continuously the full length of the tape. In no instance shall the spacing of the individual segment of the identifying message be greater than eight inches. Approved detection tape manufacturers are Reef Industries, Alarmatape, and Linetec, Inc. The remainder of the trench shall be backfilled and compacted in accordance with these specifications.

- H. Coordinate all trenching with operation "Arizona 811", as applicable.
- I. Underground private sewer lines outside the building structure shall have a green #18 tracer wire securely attached to it at 8' O.C. and shall have 12" of tracer wire accessible above grade at the cleanout and be securely attached at that point.
- J. Underground water lines outside the building structure shall have a blue #18 tracer wire securely attached to it at 8' O.C. and shall have 12" of tracer wire accessible above grade at the termination and be securely attached at that point.

3.11 TESTS AND ADJUSTMENTS

- A. All waste, vent, rainwater, gas, and water piping shall be tested per International Plumbing Code (IPC) before being concealed in any way. All joints shall be made driptight before being concealed. Domestic water piping shall be tested at 1-1/2 times working pressure or 100 psig, whichever is greater, for at least 15 minutes. Test on building drain, vent and rainwater piping shall be made with hydrostatic pressure to minimum 10'-0" head for at least 15 minutes. Final test of the complete drain and vent system per section 312.4 of the IPC shall be performed at final acceptance.
- B. Piping shall not be insulated or covered until tested and approved.
- C. Refrigeration piping shall have a triple evacuation with dry nitrogen and a 12 hour holding tests inspected by IHS Contract Officer's representative.

3.12 ACTIVE SERVICES

- A. When encountered in work, active electric, steam, water, gas and sewer services shall be protected against damage due to construction work. If active services are encountered which require relocation, make request to proper authorities for determinations of procedure. Do not prevent or disturb operation of active services that are to remain.

END OF SECTION

SECTION 233000 - AIR DISTRIBUTION

PART 1 – GENERAL

1.1 WORK INCLUDED

- A. Ducts
- B. Duct Accessories

1.2 RELATED SECTIONS

- A. Section 230500 - Basic Mechanical Materials and Methods
- B. Section 230593 - Testing, Adjusting, and Balancing

1.3 QUALITY ASSURANCE

- A. The following is a list of additional equipment approved for use on this project.
 - 1. AIR DEVICES: Krueger, Price, Titus, Nailor, Anemostat
 - 2. INTAKE LOUVERS: Ruskin, Potteroff
 - 3. FLEXIBLE DUCT: Thermaflex, ATCO
 - 4. DUCT FITTINGS: Flexmaster, Air Tight Inc., Metal Masters

1.4 SUBMITTALS (also refer to Section 230500)

- A. Before beginning work, submit shop drawings or literature bound on the following items:
 - 1. Air Devices
 - 2. Duct Accessories
 - 3. Above Grade Ductwork
 - 4. Other equipment as directed by the Architect.

PART 2 – PRODUCTS

2.1 DUCTS

- A. Metal Ducts:
 - 1. All metal ductwork shall be constructed of new galvanized steel ASTM A 527, G90 of lock-forming quality.
 - 2. Ductwork gauges shall be according to latest SMACNA "HVAC Duct Construction Standards" for the 2" W.G. pressure class unless otherwise specified.
 - a. All duct joints shall be sealed with Hardcast FG1402-181BFX foil-grip tape or Hardcast VG-181 duct sealant. Material used for joining ducts shall be UL181 listed.

- b. Branch duct connections manufactured by "Air-Tite Inc." (1-501-935-8483) may be used in lieu of spin-in collars but must still be sealed with hardcast.

B. Flexible Ducts:

- 1. Shall be Thermaflex M-KC Class 1 duct with bi-directional reinforced metalized vapor barrier with triple ply stand-up seam. Woven and coated fiberglass fabric permanently bonded to a coated spring steel wire helix and supporting a thick blanket of fiber glass insulation. Insulation Value: R-6.0. Velocity rating: 6000 FPM. Minimum positive pressure for all sizes shall be 10" w.c. Minimum negative pressure for all sizes shall be 2" w.c.

2.2 DUCT ACCESSORIES

A. Volume Control Dampers:

- 1. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.
 - a. Fabricate single blade dampers for duct sizes to 9-1/2 x 30 inch (240 x 760 mm).
 - b. Provide locking, indicating quadrant regulators on single dampers.

B. Flexible Connections:

- 1. Provide Duro Dyne UL approved neoprene-coated fiberglass flexible connection at inlet and outlet of all air moving devices.
- 2. Equivalent manufacturer: Ductmate Industries

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Install flexible connections between fan or motorized equipment and ductwork. Flexible connectors shall not be in tension while running.
- B. Prevent passage of unfiltered air around filters with felt, rubber, or neoprene gaskets.
- C. Provide balancing dampers on duct take-off to diffusers, grilles and registers, regardless of whether dampers are specified as part of the diffuser, grille or register assembly.
- D. Install a new set of filters after final inspection.

3.2 DUCTS

- A. Furnish and install all sheet metal ducts together with necessary dampers, supports and other items required for a complete installation.
- B. All ductwork shall, where practicable, be run parallel to or at right angles to the lines of the building.
- C. All duct work shall be hung with sheet metal strap hangers per latest SMACNA "HVAC Duct Construction Standards" fastened to structure above.

- D. The sizes shown on plans for internally lined ducts (where allowed by 230700) are actual outside sheet metal dimensions.
- E. Inside radius of all elbows shall be not less than 6" and shall incorporate turning vanes as shown on drawings. Turning vanes shall be single thickness with standard metal runners as manufactured by Duro Dyne or Aero Dyne and installed per SMACNA.
- F. Reducing elbows with turning vanes shall not be used. All elbows with turning vanes shall have the same inlet and outlet sizes with transitions as necessary downstream of the elbow.
- G. Changes in duct sizes or shape shall be made with transitions as long as practicable. The absolute maximum angle between the side and axis of the duct shall be 30 degrees divergence or 45 degrees convergence.
- H. Extractors shall not be used.
- I. Flexible duct connections shall be made with a round hole cutter and a spin-in collar sealed with hardcast. No dove tail fittings and no duct tape allowed.
- J. Flexible duct connections shall be made with metal type hose clamps per installation recommended by manufacturer and as required by UL 181 label procedure.
- K. Clothes dryers shall be exhausted in accordance with the manufacturer's installation instructions. Dryer vents that penetrate wall or ceiling membranes shall be a noncombustible dryer exhaust duct wall receptacle with means for a cleanout. Dryer vents shall terminate independently to the outside the building and be equipped with back draft damper. Screens or any similar device that will obstruct exhaust air flow shall be prohibited in dryer vents. Ducts shall not be connected or installed with sheet metal screws or other fasteners that will obstruct exhaust flow. Dryer vents shall not extend into or through ducts or plenums.
- L. Where ductwork passes through roof, provide curbs and flashings in accordance with details on Architectural drawings or as directed by Architect.
- M. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
- N. Ductwork shall be stored in a clean location prior to installation. Openings shall be covered to prevent entry of dust, moisture, and general construction dirt/debris. 10 mil plastic sheeting securely taped over open ends will be acceptable.

END OF SECTION

SECTION 237000 - HEATING, VENTILATING, AND AIR CONDITIONING EQUIPMENT

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Exhaust Fans
- B. Air Conditioning Equipment

1.2 RELATED DOCUMENTS

- A. Section 230500 – Basic Mechanical Materials and Methods
- B. Section 230593 – Testing, Adjusting, and Balancing

1.3 QUALITY ASSURANCE

- A. The following is a list of additional equipment approved for use on this project.
 - 1. EXHAUST FANS: Broan, Greenheck, Twin City, Penn, Nutone
 - 2. AIR CONDITIONING EQUIPMENT: Trane, Carrier, York, Lennox, Ruud, McQuay

1.4 SUBMITTALS

- A. Before beginning work, submit shop drawings or literature bound on the following items:
 - 1. Exhaust Fans
 - 2. Fan Coil Units
 - 3. Air Conditioning Equipment
 - 4. Variable Refrigerant Air Conditioning System

PART 2 - PRODUCTS

2.1 EXHAUST FANS

- A. QT Series Ceiling Fan (Residential):
 - 1. Ceiling fan shall have white polymeric grille held in place with torsion springs easily removed if necessary. Centrifugal blower wheel shall be electrically balanced for smooth, quiet operation. Unit shall have built-in non-metallic backdraft damper. Motor shall have vibration isolators. Unit shall have prewired outlet box with plug in receptacle. Unit shall have adjustable hanger bracket.

2.2 AIR CONDITIONING SYSTEM

- A. Summary

1. Section includes Variable capacity heat pump air conditioning systems. Each system shall consist of an evaporator (fan coil), a two-pipe refrigeration distribution system, a direct expansion (DX) outdoor air-cooled heat pump with variable speed inverter driven compressor using R-410A refrigerant, and a PID control system. The indoor unit shall be able to provide room temperature set point control and scheduling independently via a local remote controller.

B. References

1. Comply with applicable Standards/Codes ANSI/ASHRAE 15, ETL, cETL, NEC, and OSHA as adopted by the State.

C. Submittals

1. Submit shop drawings and product data in accordance with the specifications.
2. Submittals shall include the following:
 - a. Dimensioned plan and elevation view drawings, required clearances, and location of all field connections.
 - b. Summary of electrical requirements.
 - c. Schematic diagram of control system indicating points for field interface/connection.
 - d. Computer generated performance at scheduled conditions. Additionally, provide IEER, EER, and COP values certified to AHRI Std. 1230.
 - e. Computer generated piping diagrams with all sizes indicated as well as an estimate of additional refrigerant requirements.

D. Quality assurance

1. The units shall be tested by a Nationally Recognized Testing Laboratory (NRTL), in accordance with ANSI/UL 1995 – Heating and Cooling Equipment and bear the Listed mark.
2. Performance of equipment shall meet or exceed the scheduled values and be certified and published in AHRI Std. 1230 – latest edition.
3. All wiring shall be in accordance with the National Electric Code (NEC).
4. The system will be produced in an ISO 9001 and ISO 14001 facility, which are standards set by the International Standard Organization (ISO). The system shall be factory tested for safety and function.

E. Delivery and Handling

1. Equipment shall be stored and handled according to the manufacturer's recommendations.

F. Warranty

1. The manufacturer shall warrant products to be free from defects in material or workmanship for a period of one year from date of equipment start-up or 18 months from shipment whichever occurs first. This warranty applies to parts only. Refrigerant compressors shall be warrantied for seven (7) years. The effective date of this extended warranty shall be established as above.

G. Maintenance

1. Maintenance of the equipment shall be the responsibility of the owner and performed in accordance with the manufacturer's instructions.
- H. Acceptable manufacturers, provided they meet this specification and the scheduled performance, include:
1. Samsung
 2. Daikin-McQuay
 3. Mitsubishi
 4. Other manufacturers may be considered on a prior approval basis. Interested suppliers shall provide a complete submittal package that demonstrates compliance with this specification as well as with the design requirements (scheduled performance, physical compatibility, etc.) for review by the engineer at least (10) days prior to the published bid date. Contractors shall base their proposals using only manufacturers listed above or "Approved" via published addenda.
- I. System Requirements
1. Voltage Platform – Heat pump condensing units shall be available with 208-230V/1/60 power supply as scheduled.
 2. Each system shall have a refrigerant auto-charging function and a refrigerant charge checking function.
 3. Manufacturer shall have published cooling performance data up to 122°F ambient.
 4. Systems shall be capable of operating at outdoor ambient conditions of 23°F in cooling mode and 0°F in heating mode.
 5. Systems shall maintain continuous heating during defrost operation and during oil return operation.
 6. Each indoor unit shall use a dedicated electronic expansion valve.
 7. Each condensing unit shall use a variable speed "inverter" compressor coupled with inverter fan motors. Compressor capacity shall be modulated automatically to maintain a constant suction pressure, while varying the refrigerant volume for the needs of the cooling or heating loads. Indoor units shall use a PID control algorithm to control superheat.
 8. Condensing unit fans shall be capable of delivering adequate airflow for cataloged performance with up to 0.32" WG of external static pressure.
 9. Systems shall include a self-diagnostic, auto-check function to detect a malfunction and display the type and location.
 10. Indoor and outdoor units shall not exceed scheduled Sound Pressure levels dB(A) at fan discharge.
 11. The system shall automatically restart operation after a power failure without loss of any settings.
 12. In the event of compressor failure the remaining compressors shall continue to operate and provide heating or cooling as required at a proportionally reduced capacity. The microprocessor and associated controls shall be designed to specifically address this condition.
- J. Condensing Units
1. The condensing unit shall be factory assembled and pre-wired with all necessary electronic and refrigerant controls. The refrigeration circuit of the condensing unit shall consist of scroll compressors (fixed speed and inverter), motors, fans, condenser coil, electronic expansion valves, solenoid valves, 4-way valve,

- distribution headers, capillaries, filters, shut off valves, oil separators, service ports and refrigerant regulator. Liquid and suction lines must be individually insulated between the condensing and indoor units.
2. The condensing unit shall be designed to allow it to be wired and piped with access from the left, right, rear or bottom.
 3. The condensing unit shall be modular in design and should allow for side-by-side installation with minimum spacing
 4. The following safety devices shall be included on the condensing unit:
 - a. High pressure sensor and switch
 - b. Low pressure switch
 - c. Control circuit fuses
 - d. Crankcase heaters
 - e. Overload relay Inverter overload protector
 - f. Thermal protectors for compressor and fan motors
 - g. Over current protection for the inverter
 - h. Anti-recycling timers
 5. The condensing unit shall be completely weatherproof and corrosion resistant. The unit shall be constructed from rust-proofed mild steel panels coated with a baked enamel finish.
 6. The condensing unit shall consist of one or more propeller type, direct-drive fan motors that have multiple speed operation via a DC (digitally commutating) inverter. The fan motors shall have inherent protection and permanently lubricated bearings.
 7. Night setback control of the fan motor for low noise operation by way of automatically limiting the maximum speed shall be a standard feature. Operation sound level shall be selectable from 3 steps.
 8. Condenser coil shall be manufactured from copper tubes expanded into aluminum fins to form a mechanical bond. The fins shall be covered with an anti-corrosion acrylic resin.
 9. The inverter compressors shall be digitally commutating, hermetically sealed scroll-type featuring neodymium magnet rotor construction. Inverter compressors shall be capable of changing speed (4% to 100%) to follow the variations in total cooling and heating load as determined by the suction gas pressure measured at the condensing unit.
 10. Compressors shall be spring isolated.

K. Fan Coil Units

1. All Units
 - a. Factory assembled and tested including wiring, piping, electronic proportional expansion valve, control circuit board, return air thermistor, fan motor thermal protector, flare connections, condensate drain pan, condensate safety shutoff and alarm, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch.
 - b. Unit shall be charged with dehydrated air prior to shipment from the factory.
 - c. Computerized PID control of the electronic expansion valve shall be used to control superheat
 - d. The indoor unit will be powered with 208~230V/1-phase/60Hz. (253 volts maximum and 187 volts minimum). Fan motor shall be thermally protected.
 - e. Coils shall be direct expansion type with copper tubes expanded into aluminum fins.
 - f. All units shall be equipped with return air, liquid, and gas line thermistors.
 - g. Each unit shall include a microprocessor-based control board to interface with remote controllers, centralized controllers, and EMCS if applicable.

- h. Sound Power Levels shall not exceed scheduled values when producing maximum airflow (high speed operation).
 - 2. Vertical Air Handling Unit
 - a. Construct with pre-painted heavy-gauge steel casing with foil-faced insulation.
 - b. Unit should be suitable for horizontal or vertical installation.
 - c. Supply fan shall be direct-drive ECM type with auto CFM adjustment.
 - d. Return air shall be through a field supplied MERV 8 pleated filter.
 - e. Condensate draining shall be via gravity.
- L. Controls
 - 1. General
 - b. All control wiring shall be 18 AWG, 2 wire, multi-stranded, non-shielded and non-polarized.
 - 2. Local Controllers
 - a. As indicated on the drawings, provide each unit or group of units with a wired local (remote) controller capable of interfacing with the fan coil(s) control board to provide all operating functions in a stand-alone fashion including:
 - 1. Control/monitoring of unit(s)
 - 2. Establishing a setpoint range to limit (or prohibit) temperature adjustment
 - 3. Setback/Setup temperature control during unoccupied periods
 - 4. Complete 7-day programmable scheduling
 - b. Controller shall be backlit and have a built-in time clock with 48-hr backup.
 - c. Controller shall include a temperature sensing thermistor and field adjustable settings to define whether the unit(s) will be controlled based on their return air thermistor(s) or the controller thermistor.
 - d. Controller shall be lockable thru a combination of buttons and include Field Settings to allow for prohibiting buttons on the Remote Controller such as "On/OFF", "Mode", and "Fan Speed" from being manipulated by unauthorized personnel.
 - e. Scheduling capabilities shall include:
 - 1. 7-Day, Weekday + Weekend, and Weekday + Saturday + Sunday patterns.
 - 2. Up to (5) On/Off actions per day
 - 3. Cool / Heat setpoints or Setup / Setback setpoints

PART 3 - EXECUTION

3.1 MANNER OF PERFORMING WORK

- A. Coordinate location of piping, ductwork, sleeves, inserts, hangers and equipment for this work with other trades.
- B. All materials and equipment shall be installed in accordance with the approved recommendations and guidelines as issued by the respective manufacturers to conform with contract documents. Workmen skilled in the trades involved shall accomplish the installation.

3.2 SERVICE CONNECTIONS

- A. Conventional fan coil units and coils shall be equipped with required valves, vents, drain valves and safety devices and connected to piping systems and electrical services in a neat and workmanlike manner.

END OF SECTION

SECTION 312000 – EARTH MOVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Excavating and filling for rough grading the Site.
2. Preparing subgrades for slabs-on-grade and pavements.
3. Excavating and backfilling for buildings and structures.
4. Drainage course for concrete slabs-on-grade.
5. Excavating and backfilling trenches for utilities and pits for buried utility structures.

1.2 DEFINITIONS

A. Backfill: Soil material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.

C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.

G. Fill: Soil materials used to raise existing grades.

H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

I. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix

asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.

- J. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.
- K. Utilities: On-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.

1.3 INFORMATIONAL SUBMITTALS

- A. Material test reports.

1.4 FIELD CONDITIONS

- A. Utility Locator Service: Notify utility locator service and owner for area where Project is located before beginning earth-moving operations.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory Soils: Shall conform to the earthwork section of the Geotechnical Report for the property, and any addendums to the report.
 - 1. Unsatisfactory soils also include satisfactory soils not maintained within the range of optimum content specified in the Geotechnical Report at the time of compaction and those not meeting the gradation requirement specified in the report.
- C. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- D. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.
- E. Engineered Fill: Shall meet the requirements specified in the Geotechnical Report.
- F. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.
- G. Drainage Course: Narrowly graded mixture of washed, crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and zero to 5 percent passing a No. 8 sieve.
- H. Sand" ASTM C 33; fine aggregate

2.2 ACCESSORIES

- A. Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility; colored to comply with local practice or requirements of authorities having jurisdiction.
- B. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored to comply with local practice or requirements of authorities having jurisdiction.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth-moving operations.
- B. Protect and maintain erosion and sedimentation controls during earth-moving operations.
- C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 DEWATERING

- A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooring the Project site and surrounding area.
- B. Protect subgrades from softening, undermining washout, and damage by rain or water accumulation.
 - 1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

- 3.3 It is the Contractor's responsibility to protect excavations from surface water and the Owner will not compensate the Contractor for delays due to flooding of excavations or for the costs of dewatering excavations where the Contractor did not prevent the excavations from flooding.

3.4 EXCAVATION, GENERAL

- A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.
 - 1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

3.5 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
 - 1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
 - 2. Pile Foundations: Stop excavations 6 to 12 inches above bottom of pile cap before piles are placed. After piles have been driven, remove loose and displaced material. Excavate to final grade, leaving solid base to receive concrete pile caps.
 - 3. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended as bearing surfaces.
- B. Excavations at Edges of Tree- and Plant-Protection Zones:
 - 1. Excavate by hand or with an air spade to indicated lines, cross sections, elevations, and subgrades. If excavating by hand, use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
 - 2. Cut and protect roots according to requirements in Section 015639 "Temporary Tree and Plant Protection."

3.6 EXCAVATION FOR WALKS AND PAVEMENTS

- A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.7 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.
- B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.
 - 1. Clearance: **12 inches each side of pipe or conduit.**
- C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.
 - 1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.
- D. Trenches in Tree- and Plant-Protection Zones:
 - 1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop

- exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
- 2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.
- 3. Cut and protect roots according to requirements in Section 015639 "Temporary Tree and Plant Protection."

3.8 SUBGRADE INSPECTION

- A. Notify Architect and Owner's Testing Agency when excavations have reached the required sub-grade. If the Owner's Testing Agency determines that unsatisfactory soil is present. Continue the excavation based on the Owner's Testing Agency's recommendations.
- B. Proof-roll subgrade below the building slabs and pavements with a pneumatic-tired dump truck to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
- C. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

3.9 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Architect.
 - 1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Architect.

3.10 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.11 UTILITY TRENCH BACKFILL

- A. Place backfill on subgrades free of mud, frost, snow, or ice.
- B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- C. Trenches under Footings: Backfill trenches excavated under footings and within 18 inches of bottom of footings per the structural drawings
- D. Initial Backfill: Place and compact initial backfill of subbase material, free of particles larger than **1 inch** in any dimension, to a height of 12 inches over the pipe or conduit.
 - 1. Carefully compact initial backfill under pipe haunches and compact evenly up on both

sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.

- E. Final Backfill: Place and compact final backfill of satisfactory soil to final subgrade elevation.
- F. Warning Tape: Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.12 SOIL FILL

- A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- B. Place and compact fill material in layers to required elevations as follows:
 - 1. Under walks and pavements, use satisfactory soil material.
 - 2. Under building slabs, use engineered fill.
 - 3. Under footings and foundations, use engineered fill.

3.13 SOIL MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
 - 1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
 - 2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.14 COMPACTION OF SOIL BACKFILLS AND FILLS

- A. Place backfill and fill soil materials in layers as indicated in the Geotechnical Report for proper material compacted by heavy compaction equipment.
- B. Place backfill and fill soil materials evenly on all sides of structures to required elevations and uniformly along the full length of each structure.
- C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 698.
 - 1. Under structures, building slabs, steps, and pavements, scarify and recompact to a depth indicated in the Geotechnical Report and recompact the existing subgrade and each layer of backfill of soil fill as indicated in the Geotechnical report.
 - 2. Under turf or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 90 percent.
 - 3. For utility trenches, compact each layer of initial and final backfill soil material at 95 percent.

3.15 GRADING

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between the existing grades and the new grades subject to approval by the civil engineer.
- B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to elevations required to achieve indicated finish elevations, within the following subgrade tolerances:
 1. Turf or Unpaved Areas: Plus or minus 1 inch.
 2. Walks: Plus or minus 1 inch .
 3. Pavements: Plus or minus 1/2 inch.
- C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10- foot straightedge.

3.16 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

- A. Place subbase course and base course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place subbase course and base course under pavements and walks as follows:
 1. Shape subbase course and base course to required crown elevations and cross-slope grades.
 2. Place subbase course and base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
 3. Compact subbase course and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less indicated in the Geotechnical Report according to ASTM D 698.

3.17 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

- A. Place drainage course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs- on-grade as follows:
 1. Place drainage course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
 2. Compact each layer of drainage course to required cross sections and thicknesses to not less than 98 percent of maximum dry unit weight according to ASTM D 698.

3.18 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform inspections:
- B. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections to meet the requirements of the Geotechnical Report.
- C. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with

requirements.

- D. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.
- E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.19 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
 - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.20 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 312000

GEOTECHNICAL EVALUATION REPORT

PARKER DUPLEX

Southwest Corner of Grant Street and Kennedy Drive
Parker, Arizona
Western Reference No. 4122JD014

PREPARED FOR:

BWS Architects
261 North Court Avenue
Tucson, Arizona 85701

June 13, 2022



Expires 06/30/2025

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TABLE OF CONTENTS

1.0	PURPOSE	1
2.0	PROJECT DESCRIPTION	1
3.0	SCOPE OF SERVICES.....	2
3.1	Field Exploration	2
3.2	Laboratory Analyses.....	2
3.3	Analyses and Report	2
4.0	SITE CONDITIONS.....	3
4.1	Surface	3
4.2	Subsurface.....	3
4.3	Groundwater.....	3
4.4	Geologic Hazards.....	3
5.0	GEOTECHNICAL PROPERTIES & ANALYSIS	4
5.1	Laboratory Tests	4
5.2	Field Tests	4
6.0	RECOMMENDATIONS.....	4
6.1	General.....	4
6.2	Design Considerations	5
6.3	Foundations	5
6.4	Lateral Design Criteria.....	6
6.5	Seismic Considerations	7
6.6	Conventional Slab-on-Grade Support.....	8
6.7	Drainage	8
6.8	Pavements.....	9
6.9	Corrosivity to Concrete	10
7.0	EARTHWORK	11
7.1	General.....	11
7.2	Site Clearing	11
7.3	Excavation	11
7.3.1	Temporary Excavations and Slopes	11
7.4	Building Pad and Foundation Preparation.....	12
7.5	Materials	12
7.6	Placement and Compaction.....	13
7.7	Pavement Preparation	14
7.8	Compliance	14

8.0	PLAN REVIEW	14
9.0	ADDITIONAL SERVICES	14
10.0	LIMITATIONS	15
11.0	CLOSURE.....	15
SITE VICINITY MAP		Figure 1
EXPLORATION LOCATION DIAGRAM		Figure 2
APPENDIX A		
	Definition of Terminology	A-1
	Method of Classification	A-2
	Boring/Test Pit Log Notes	A-3
	Boring/Test Pit Logs	A-4 to A-11
APPENDIX B		
	Soil Properties	B-1 to B-3

**GEOTECHNICAL EVALUATION
PARKER DUPLEX
SOUTHWEST CORNER OF GRANT STREET AND KENNEDY DRIVE
PARKER, ARIZONA
JOB NO. 4122JD014**

1.0 PURPOSE

This report contains the results of our geotechnical evaluation for two proposed duplex structures to be constructed in Parker, Arizona. The purpose of these services is to provide information and recommendations regarding:

- Subsurface conditions
- Foundation design parameters
- Lateral earth pressures
- Earthwork guidelines
- Drainage
- Groundwater
- Corrosivity (soil to concrete)
- Slabs-on-grade
- Seismic conditions
- Excavation conditions
- Geologic hazards

Results of the field exploration, field tests, and laboratory testing program are presented in the Appendices.

Our services specifically excluded recommendations for preparation of subgrade soils beneath exterior concrete flatwork (driveways, patios, walkways, etc.) or earthwork associated with public infrastructure (sidewalks, curbs, gutters, etc.). Should you request, we are available to review the applicability of municipal (standard) infrastructure drawings and specifications, and provide consultation concerning design and preparation of exterior flatwork elements such as patios and driveways.

2.0 PROJECT DESCRIPTION

We understand the proposed duplexes will be single-story, slab-on-grade structures each totaling about 2,656 square feet in plan area using wood-frame construction. Maximum wall and column loads are assumed to be 3 kips per linear foot (klf) and 30 kips, respectively. We anticipate that ground floor level will be within 2 feet of existing site grade and that no extraordinary slab criteria are required. Final site grading plans were not available at the time of this report.

3.0 SCOPE OF SERVICES

3.1 Field Exploration

Three borings were drilled to depths ranging from about 16 to 31 feet below existing site grade in the proposed building area. In addition, five test trenches were excavated to depths of about 10 feet across the site. The borings and test trenches were at the approximate locations shown on the attached Exploration Location Diagram. A field log was prepared for each test boring and test pit. These logs contain visual classifications of the materials encountered during the exploration as well as interpolation of the subsurface conditions between samples. Final logs, included in Appendix A, represent our interpretation of the field logs and may include modifications based on laboratory observations and tests of the field samples. The final logs describe the materials encountered, their thickness, and the locations where samples were obtained.

3.2 Laboratory Analyses

Laboratory analyses were performed on representative soil samples to aid in material classification and to estimate pertinent engineering properties of the on-site soils for preparation of this report. Testing was performed in general accordance with applicable standard test methods. The following tests were performed and the results are presented in Appendix B.

- Plasticity
- Gradation
- Water soluble salts
- Soluble sulfate and chloride content

3.3 Analyses and Report

This geotechnical engineering report includes a description of the project, a discussion of the field and laboratory testing programs, a discussion of the subsurface conditions, and design recommendations as appropriate to its purpose. The scope of services for this project does not include, either specifically or by implication, any environmental assessment of the site, discovery of underground storage tanks or other underground structures, or identification of contaminated or hazardous materials or conditions. If there is concern about the potential for such contamination, other studies should be undertaken. We are available to discuss the scope of such studies with you.

4.0 SITE CONDITIONS

4.1 Surface

We understand the site had been previously developed. The previous structures were destroyed in a fire and were subsequently demolished. The ground surface was relatively flat and contained an abandoned sewer manhole, sections of concrete and scattered construction debris. Site drainage trended to the south as sheet surface flow. The site is bound by a parking lot to the south, Grant Street and residences to the north, Kennedy Drive and residences to the east, and residences to the west.

4.2 Subsurface

As presented on the Boring / Test Pit Logs, the top approximate 4 feet consisted of fill materials that appeared to be native soils mixed with construction debris. Native soils below the fill consisted of medium dense to very dense Silty, Clayey SANDS with Gravel and low plasticity fines. A detailed description of the soils encountered can be found on the boring / test pit logs in Appendix A.

4.3 Groundwater

Groundwater was not encountered in any test boring or test pit at the time of exploration. These observations represent the groundwater conditions at the time of exploration and may not be indicative of other times. Groundwater levels can be expected to fluctuate with varying seasonal conditions.

4.4 Geologic Hazards

No known or mapped earth subsidence fissures, due to regional groundwater withdrawal exist in the Site vicinity. No evidence has been noted of distress arising from areal subsidence due to regional groundwater withdrawal.

Observation of the ground surface indicated no readily discernible evidence of recent compaction faulting or fissuring. Compaction faults are generally accepted as features resulting from deep-seated differential consolidation of alluvial materials with dissimilar grain-size and compressibility characteristics. Fissures are understood to be the results of a subsurface erosion process occurring in tension fractures at or near the surface of non-cemented, relatively fine-grained soils.

5.0 GEOTECHNICAL PROPERTIES & ANALYSIS

5.1 Laboratory Tests

Undisturbed samples suitable for compression testing were not obtained due to the granular nature of the soils encountered. Native undisturbed soils below the fill are expected to exhibit low compressibility at existing and elevated water contents.

Chemical tests were performed on a representative sample of the on-site soils to determine the amount of water-soluble sulfate and chloride. The tests were performed by Sims and Associates, LLC and the test results are presented in Appendix B.

5.2 Field Tests

On-site subsoils near and below anticipated shallow foundation levels exhibited variable, low to high resistance to penetration using the standard penetration test method (ASTM D1586) and ring-lined barrel sampler (ASTM D3550). Penetration resistance values exhibited some variability between test locations. This represents a potential for differential movement within structures supported on existing soils in their present condition.

The boring and test pit logs included in this report are indicators of subsurface conditions only at the specific location and date noted. Variations from the field conditions represented by the borings and test pits may become evident during construction. If variations appear, we should be contacted to re-evaluate our recommendations.

6.0 RECOMMENDATIONS

6.1 General

Recommendations contained in this report are based on our understanding of the project criteria described in Section 2.0 and the assumption that the soil and subsurface conditions are those disclosed by the explorations. Others may change the plans, final elevations, number and type of structures, foundation loads, and floor levels during design or construction. Substantially different subsurface conditions from those described herein may be encountered or become known. Any changes in the project criteria or subsurface conditions shall be brought to our attention in writing. This report does not

encompass the effects, if any, of underlying geologic hazards or regional groundwater withdrawal and expresses no opinion regarding their effects on surface movements at the project site.

Note: additional laboratory testing of soils obtained at test pit locations is pending and will be presented in an addendum to the report once the testing is complete.

6.2 Design Considerations

As previously discussed, fill material consisting of native soils mixed with construction debris was found in all the test borings and test pits to a depth of about 4 feet. These fill materials will need to be removed down to native undisturbed soils. The removed soils, minus any construction debris, can be used as fill material in all areas of the site provided they are that placed and compacted under engineering observation and testing as recommended in the **EARTHWORK** section of this report.

6.3 Foundations

We recommend shallow spread foundations bearing upon engineered fill for support of anticipated loads. The engineered fill should extend to a minimum depth of 2 feet below the bottom of the footing and a minimum of 2 feet horizontally beyond the edges of the footings. An allowable bearing capacity of 2,500 pounds per square foot (psf) should be used in proportioning the footings. Footings should bear a minimum of 18 inches below finished grade. Recommended minimum widths of column and wood-frame and/or masonry wall footings are 24 and 16 inches, respectively.

We anticipate that total settlement of the proposed structures, supported as recommended, should be less than $\frac{3}{4}$ inch. Differential settlement is anticipated to be less than $\frac{1}{2}$ inch. Additional foundation movements could occur if water from any source infiltrates the foundation soils. Therefore, proper drainage should be provided in the final design and during construction.

Finished grade is the lowest adjacent grade for perimeter footings and floor level for interior footings. The allowable bearing capacity applies to dead loads plus design live load conditions.

All footings, stem walls and masonry walls should be reinforced to reduce the potential for distress caused by differential foundation movements. The use of joints at openings or other discontinuities in masonry walls is recommended.

We recommend that the geotechnical engineer or his representative observe the footing excavations before reinforcing steel and concrete are placed. This observation is to evaluate whether the soils exposed are similar to those anticipated for support of the footings. Any soft, loose or unacceptable soils should be undercut to suitable materials and backfilled with approved fill materials or lean concrete. Soil backfill should be properly compacted.

6.4 Lateral Design Criteria

Lateral loads may be resisted by concrete interface friction and by passive resistance. For shallow foundations bearing on properly compacted fill at this site, we recommend the following lateral resistance criteria:

- Passive:
Shallow wall footings.....200 psf/ft
Shallow column footings350 psf/ft
- Coefficient of base friction (passive).....0.30

Earth retaining structures less than (6) feet in height, above any free water surface, with level backfill and no surcharge loads may be designed using the equivalent fluid pressure method. Recommended active equivalent fluid pressures and coefficients of base friction for unrestrained elements are:

- Active:
Undisturbed subsoil.....40 psf/ft
Compacted site soils35 psf/ft
- Coefficient of base friction (active).....0.30

Where the design includes restrained elements, the following equivalent fluid pressures are recommended:

- At-rest:

Undisturbed subsoil.....	60 psf/ft
Compacted site soils.....	55 psf/ft

The equivalent fluid pressures presented herein do not include the lateral pressures arising from the presence of:

- hydrostatic conditions, submergence or partial submergence
- sloping backfill, positively or negatively
- surcharge loading, permanent or temporary
- seismic or dynamic conditions

We recommend a free-draining soil layer or manufactured geosynthetic material be constructed adjacent to the back of any retaining walls. A filter may be required between the soil backfill and drainage layer. This drainage zone should help prevent development of hydrostatic pressure on the wall. This vertical drainage zone should be tied into a gravity drainage system at the base of the wall. It is important that all backfill be properly placed and compacted. Backfill should be mechanically compacted in layers. Flooding or jetting should not be permitted. Care should be taken not to damage the walls when placing the backfill. Backfills should be observed and tested during placement. Fill against footings, stem walls, and any retaining walls should be compacted to densities specified in **EARTHWORK**. Clayey soils should not be used as backfill against retaining walls. Compaction of each lift adjacent to walls should be accomplished with hand-operated tampers or other lightweight compactors. Over-compaction may cause excessive lateral earth pressures that could result in wall movements.

6.5 Seismic Considerations

Structures should be designed in accordance with applicable building codes. The seismic design parameters presented in the following table, in accordance with the 2018 International Building Code and ASCE 7-16, are applicable to the project site:

Seismic Design Parameters International Building Code 2018, ASCE 7-16	
Soil Site Class	D
Mapped Spectral Response Acceleration at 0.2 sec period (S_s)	0.193g
Mapped Spectral Response Acceleration at 1.0 sec period (S_1)	0.118g
Site Coefficient for 0.2 sec period (F_a)	1.6

Site Coefficient for 1.0 sec period (F_v)	2.364
Design Spectral Response Acceleration at 0.2 sec period (S_{DS})	0.206g
Design Spectral Response Acceleration at 1.0 sec period (S_{D1})	0.186g

Based on information obtained from Google Maps, the Latitude and Longitude for the Site are determined to be 34.1479°N and 114.3039°W, respectively.

6.6 Conventional Slab-on-Grade Support

Floor slabs can be supported on properly placed and compacted fill. The slab subgrade should be prepared by the procedures outlined in this report. A minimum 4-inch layer of base course should be provided beneath all slabs to help prevent capillary rise and a damp slab. The modulus of subgrade reaction (k) is estimated to be 250 pounds per cubic inch (pci).

The use of vapor retarders or barriers is desirable for any slab-on-grade where the floor will be covered by products using water based adhesives, wood, vinyl backed carpet, impermeable floor coatings (urethane, epoxy, acrylic terrazzo, etc.) or where the floor will be in contact with moisture sensitive equipment or product. When used, the design and installation should be in accordance with the recommendations given in ACI 302.1R and 302.2R. Final determination on the use of a vapor retarder should be left to the slab designer.

All concrete placement and curing operations should follow the American Concrete Institute manual recommendations. Improper curing techniques and/or high slump (high water-cement ratio) could cause excessive shrinkage, cracking or curling. Concrete slabs should be allowed to cure adequately before placing vinyl or other moisture sensitive floor covering.

6.7 Drainage

The major cause of soil problems in this vicinity is moisture increase in soils below structures. Therefore, it is extremely important that positive drainage be provided during construction and maintained throughout the life of the facility.

In areas where sidewalks or paving do not immediately adjoin the structures, protective slopes should be provided with an outfall of five percent for at least 10 feet from

perimeter walls. Scuppers and drainpipes should be designed to provide drainage away from structures for a minimum of 10 feet. Water and sewer utility lines should be properly installed to avoid possible sources for subsurface saturation. It is important that all utility trenches be properly backfilled. If practicable, planters and/or landscaping should not be constructed adjacent to or near structures. If planters and/or landscaping are adjacent to or near the structures, we recommend the following:

- Planters should be sealed
- Grades should slope away from the structures
- Only shallow rooted landscaping should be used
- Watering should be kept to a minimum

It should be understood that these recommendations will help reduce the potential for soil movement and resulting distress, but will not eliminate this potential.

6.8 Pavements

Based on existing subgrade conditions, the following pavement sections are recommended:

Traffic Area	Asphalt Concrete Pavement (inches)	Base Course (inches)	PCC (inches)	Base Course ¹ (inches)
Automobile and Pick-up Trucks	2	4	5	4
Truck Traffic (Light Volume)	3	6	6	4

Bituminous surfacing should be constructed of dense-graded, central plant-mix, asphalt concrete. Base course material should conform to the specification requirements for Aggregate Base of the *Maricopa Association of Governments* (MAG), or other local governing specifications. Asphalt concrete should conform to the specification requirements for “3/4-inch” Marshall Mix of the MAG specifications, or other applicable governing specifications.

¹ Base course is not required below PCC pavements from a geotechnical engineering point of view. However, a thin layer of aggregate base course, up to 4 inches in thickness, may be desired for construction purposes.

Material and compaction requirements should conform to recommendations presented under **EARTHWORK**. The gradient of paved surfaces should ensure positive drainage. Water should not pond in areas directly adjoining paved sections.

The minimum Portland cement pavement section is based on a minimum compressive strength of 3,000 pounds per square inch and being placed on a properly prepared subgrade and base course. PCC mixes should comply with the minimum requirements set forth in the MAG specifications, or other local governing specifications.

PCC non-reinforced pavements should contain properly spaced weakened plane control joints in both the longitudinal and transverse directions. Normal control joints should be square patterns not to exceed 15 feet per side. All control joints should have a depth of at least 1/4 of the slab thickness. Depending on the method used, control joints should be cut as soon as possible during curing operations to prevent random cracking. Structures and features projecting into the pavement should be isolated from the pavement with a 1-inch thick pre-molded expansion joint material. Transverse expansion joints should be placed at proper intervals to provide expansion/contraction relief. All joints should be cleaned and sealed with an approved material prior to opening to traffic. Immediately after finishing and after all bleed water has evaporated, the newly placed concrete should be cured. Curing can be accomplished by spray-applying liquid membranes or by covering with burlap-type mats or poly sheeting. Curing should be maintained for a minimum of 7 days. The pavement should be closed to traffic for a minimum of 14 days. Construction traffic should be kept off new paving for at least 4 days.

The American Concrete Institute's, Guide for the Design and Construction of Concrete Parking (ACI 330R), should be used for reference. Field and laboratory testing of the concrete and base materials should be performed to determine whether specific requirements have been met.

6.9 Corrosivity to Concrete

The chemical test results indicate that the soils at the site classify as negligibly corrosive to concrete. However, in keeping with local practice, we recommend that Type V Portland cement be utilized in all concrete in contact with site soils.

7.0 EARTHWORK

7.1 General

The conclusions contained in this report for the proposed construction are contingent upon compliance with recommendations presented in this section. Any excavating, trenching, or disturbance that occurs after completion of the earthwork must be backfilled, compacted and tested in accordance with the recommendations contained herein. It is not reasonable to rely upon our conclusions and recommendations if any future unobserved and untested trenching, earthwork activities or backfilling occurs.

Although underground facilities such as septic tanks, cesspools, basements, utilities, and dry wells were not observed, such features might be encountered during construction. These features should be demolished in accordance with the recommendations of the geotechnical engineer. Any loose or disturbed soils resulting from demolition should be removed or recompacted as engineered fill and any excavations should be backfilled in accordance with recommendations presented herein.

7.2 Site Clearing

Strip and remove all existing fill material, vegetation, debris, and any other deleterious materials from the building and pavement areas. Approximately 4 feet of fill material was encountered at all of the exploration locations. The building area is defined as that area within the building footprint plus 5 feet beyond the perimeter of that footprint. All exposed surfaces should be free of mounds and depressions that could prevent uniform compaction.

7.3 Excavation

We anticipate that excavations for shallow foundations and utility trenches for the proposed construction can be accomplished with conventional equipment.

7.3.1 Temporary Excavations and Slopes

Temporary, non-surcharged construction excavations should be sloped or shored. The individual contractor should be made responsible for designing and constructing stable, temporary excavations as required to maintain stability of both the excavation sides and bottom. All excavations should be sloped or shored in the interest of safety

following local and federal regulations, including current OSHA excavation and trench safety standards. OSHA recommends a maximum slope inclination of $\frac{3}{4}$:1 (horizontal:vertical) for Type A soils, 1:1 for Type B soils, and $1\frac{1}{2}$:1 for Type C soils.

As a safety measure, it is recommended that all vehicles and soil piles be kept a minimum lateral distance back from the crest of the slope at least equal to the slope height. The exposed slope face should be protected against the elements.

If any excavation, including a utility trench, is extended to a depth of more than 20 feet, it will be necessary to have the side slopes designed by a professional engineer.

We recommend that the contractor retain a geotechnical engineer to observe the soils exposed in all excavations and provide engineering design for the slopes. This will provide an opportunity to classify the soil types encountered, and to modify the excavation slopes as necessary. This also allows the opportunity to analyze the stability of the excavation slopes during construction.

7.4 Building Pad and Foundation Preparation

Remove the existing fill materials throughout the entire building area down to native undisturbed soils, or to a minimum depth of 2 feet below the lowest bottom of footing elevation, whichever is deeper. The removal and replacement should extend laterally a minimum of 5 feet beyond the perimeter of the building. Following the removal, scarify, moisten or dry as required, and recompact the bottom of the excavation to a minimum depth of 8 inches, prior to placing and additional fill materials necessary to reach the finished subgrade elevation.

7.5 Materials

Clean on-site native soils with a maximum dimension of 6 inches, fill materials that have the construction debris removed, and imported materials may be used as fill material for the following:

- Foundation areas
- Concrete slab areas
- Backfill
- Pavement Areas

Imported soils should conform to the following:

- Gradation (ASTM C136): percent finer by weight

6"	100
4"	85-100
$\frac{3}{4}$ "	70-100
No. 4 Sieve	50-100
No. 200 Sieve	30 (max)
- Maximum expansive potential (%)² 1.5
- Maximum soluble sulfates (%) 0.10

7.6 Placement and Compaction

- a. Place and compact fill in horizontal lifts, using equipment and procedures that will produce recommended water contents and densities throughout the lift.
- b. Uncompacted lift thickness should not exceed 8 inches.
- c. Materials should be compacted to the following:

Minimum Percent Material Compaction (ASTM D1557)

- On-site or imported soil, reworked and fill:

Below footings.....	95
Below slabs-on-grade.....	90
Trenches below slabs-on-grade.....	95
Below pavements.....	95
- Base course below slabs-on-grade and foundations 95
- Nonstructural backfill 90

² Measured on a sample compacted to approximately 95 percent of the ASTM D698 maximum dry density at about 3 percent below optimum water content. The sample is confined under a 100 psf surcharge and submerged.

Fill at depths greater than 5 feet below finished grade should be compacted to at least 100 percent of the ASTM D698 dry-density value to within 5 feet of finished grade. Fill at depths less than 5 feet below finished grade should be compacted to the minimum values provided above.

On-site and imported soils should be compacted within a water content range of 3 percent below to 3 percent above optimum.

7.7 Pavement Preparation

After the removal of all fill materials down to native soils, the exposed subgrade should be scarified, moistened as required, and recompacted for a minimum depth of 8 inches prior to placement of fill and pavement materials.

7.8 Compliance

Recommendations for foundations, slabs-on-grade, and pavements supported on compacted fills or prepared subgrade depend upon compliance with the **EARTHWORK** recommendations. To assess compliance, observation and testing should be performed under the direction of a WT geotechnical engineer. Please contact us to provide these observation and testing services.

8.0 PLAN REVIEW

Foundation and grading plans were not available at the time of this report. WT should be retained to review the final plans to determine if they are consistent with the recommendations presented in this report. If the Client does not retain WT to review the plans and specifications, WT shall have no responsibility for the suitability of the plans for project application.

9.0 ADDITIONAL SERVICES

The recommendations provided in this report are based on the assumption that a sufficient schedule of tests and observations will be performed during construction to verify compliance. At a minimum, these tests and observations should be comprised of the following:

- Observations and testing during site preparation and earthwork,

- Observation of foundation excavations, and
- Consultation as may be required during construction.

Retaining the geotechnical engineer who developed your report to provide construction observation is the best way to verify compliance and to help you manage the risks associated with unanticipated conditions.

10.0 LIMITATIONS

This report has been prepared assuming the project criteria described in **2.0 PROJECT DESCRIPTION**. If changes in the project criteria occur, or if different subsurface conditions are encountered or become known, the conclusions and recommendations presented herein shall become invalid. In any such event, WT should be contacted in order to assess the effect that such variations may have on our conclusions and recommendations. If WT is not retained for the construction observation and testing services to determine compliance with this report, our professional responsibility is accordingly limited.

The recommendations presented are based entirely upon data derived from a limited number of samples obtained from widely spaced explorations. The attached logs are indicators of subsurface conditions only at the specific locations and times noted. This report assumes the uniformity of the geology and soil structure between explorations, however variations can and often do exist. Whenever any deviation, difference, or change is encountered or becomes known, WT should be contacted.

This report is for the exclusive benefit of our client alone. There are no intended third-party beneficiaries of our contract with the client or this report, and nothing contained in the contract or this report shall create any express or implied contractual or any other relationship with, or claim or cause of action for, any third party against WT.

This report is valid for the earlier of one year from the date of issuance, a change in circumstances, or discovered variations. After expiration, no person or entity shall rely on this report without the express written authorization of WT.

11.0 CLOSURE




We prepared this report as an aid to the designers of the proposed project. The comments, statements, recommendations and conclusions set forth in this report reflect the opinions of the authors. These opinions are based upon data obtained at the location of the explorations,

and from laboratory tests. Work on your project was performed in accordance with generally accepted standards and practices utilized by professionals providing similar services in this locality. No other warranty, express or implied, is made.



 <p>Not to Scale</p>	 <p>Western Technologies Inc. The Quality People Since 1955</p>	<p>Site Vicinity Map</p> <p>Parker Duplex SW Corner of Grant St and Kennedy Dr Parker, Arizona</p> <p>Western Job No. 4122JD014</p>	<p>Figure 1</p>
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<p>Legend</p> <p> Boring Location</p> <p> Test Pit / Trench Location</p>	<p> Western Technologies Inc. The Quality People Since 1955</p>	<p>Boring Location Diagram</p> <p>Parker Duplex SW Corner of Grant St and Kennedy Dr Parker, Arizona</p> <p>Western Job No. 4122JD014</p>	<p>Figure 2</p>
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Allowable Soil Bearing Capacity	The recommended maximum contact stress developed at the interface of the foundation element and the supporting material.
Backfill	A specified material placed and compacted in a confined area.
Base Course	A layer of specified aggregate material placed on a subgrade or subbase.
Base Course Grade	Top of base course.
Bench	A horizontal surface in a sloped deposit.
Caisson/Drilled Shaft	A concrete foundation element cast in a circular excavation which may have an enlarged base (or belled caisson).
Concrete Slabs-On-Grade	A concrete surface layer cast directly upon base course, subbase or subgrade.
Crushed Rock Base Course	A base course composed of crushed rock of a specified gradation.
Differential Settlement	Unequal settlement between or within foundation elements of a structure.
Engineered Fill	Specified soil or aggregate material placed and compacted to specified density and/or moisture conditions under observations of a representative of a soil engineer.
Existing Fill	Materials deposited through the action of man prior to exploration of the site.
Existing Grade	The ground surface at the time of field exploration.
Expansive Potential	The potential of a soil to expand (increase in volume) due to absorption of moisture.
Fill	Materials deposited by the actions of man.
Finished Grade	The final grade created as a part of the project.
Gravel Base Course	A base course composed of naturally occurring gravel with a specified gradation.
Heave	Upward movement.
Native Grade	The naturally occurring ground surface.
Native Soil	Naturally occurring on-site soil.
Rock	A natural aggregate of mineral grains connected by strong and permanent cohesive forces. Usually requires drilling, wedging, blasting or other methods of extraordinary force for excavation.
Sand and Gravel Base Course	A base course of sand and gravel of a specified gradation.
Sand Base Course	A base course composed primarily of sand of a specified gradation.
Scarify	To mechanically loosen soil or break down existing soil structure.
Settlement	Downward movement.
Soil	Any unconsolidated material composed of discrete solid particles, derived from the physical and/or chemical disintegration of vegetable or mineral matter, which can be separated by gentle mechanical means such as agitation in water.
Strip	To remove from present location.
Subbase	A layer of specified material placed to form a layer between the subgrade and base course.
Subbase Grade	Top of subbase.
Subgrade	Prepared native soil surface.



COARSE-GRAINED SOILS

LESS THAN 50% FINES

GROUP SYMBOLS	DESCRIPTION	MAJOR DIVISIONS
GW	WELL-GRADED GRAVEL OR WELL-GRADED GRAVEL WITH SAND, LESS THAN 5% FINES	GRAVELS MORE THAN HALF OF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE SIZE
GP	POORLY-GRADED GRAVEL OR POORLY-GRADED GRAVEL WITH SAND, LESS THAN 5% FINES	
GM	SILTY GRAVEL OR SILTY GRAVEL WITH SAND, MORE THAN 12% FINES	
GC	CLAYEY GRAVEL OR CLAYEY GRAVEL WITH SAND, MORE THAN 12% FINES	
SW	WELL-GRADED SAND OR WELL-GRADED SAND WITH GRAVEL, LESS THAN 5% FINES	SANDS MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE SIZE
SP	POORLY-GRADED SAND OR POORLY-GRADED SAND WITH GRAVEL, LESS THAN 5% FINES	
SM	SILTY SAND OR SILTY SAND WITH GRAVEL, MORE THAN 12% FINES	
SC	CLAYEY SAND OR CLAYEY SAND WITH GRAVEL, MORE THAN 12% FINES	

NOTE: Coarse-grained soils receive dual symbols if they contain 5% to 12% fines (e.g., SW-SM, GP-GC).

FINE-GRAINED SOILS

MORE THAN 50% FINES

GROUP SYMBOLS	DESCRIPTION	MAJOR DIVISIONS
ML	SILT, SILT WITH SAND OR GRAVEL, SANDY SILT, OR GRAVELLY SILT	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50
CL	LEAN CLAY OF LOW TO MEDIUM PLASTICITY, SANDY CLAY, OR GRAVELLY CLAY	
OL	ORGANIC SILT OR ORGANIC CLAY OF LOW TO MEDIUM PLASTICITY	
MH	ELASTIC SILT, SANDY ELASTIC SILT, OR GRAVELLY ELASTIC SILT	SILTS AND CLAYS LIQUID LIMIT MORE THAN 50
CH	FAT CLAY OF HIGH PLASTICITY, SANDY FAT CLAY, OR GRAVELLY FAT CLAY	
OH	ORGANIC SILT OR ORGANIC CLAY OF HIGH PLASTICITY	
PT	PEAT AND OTHER HIGHLY ORGANIC SOILS	HIGHLY ORGANIC SOILS

NOTE: Fine-grained soils may receive dual classification based upon plasticity characteristics (e.g. CL-ML).

SOIL SIZES

COMPONENT	SIZE RANGE
BOULDERS	Above 12 in.
COBBLES	3 in. – 12 in.
GRAVEL Coarse Fine	No. 4 – 3 in. ¾ in. – 3 in. No. 4 – ¾ in.
SAND Coarse Medium Fine	No. 200 – No. 4 No. 10 – No. 4 No. 40 – No. 10 No. 200 – No. 40
Fines (Silt or Clay)	Below No. 200

NOTE: Only sizes smaller than three inches are used to classify soils

CONSISTENCY

CLAYS & SILTS	BLOWS PER FOOT	
	N	R
VERY SOFT	0 – 2	0 – 3
SOFT	3 – 4	4 – 6
FIRM	5 – 8	7 – 13
STIFF	9 – 16	14 – 26
VERY STIFF	17 – 32	27 – 52
HARD	OVER 32	OVER 52

RELATIVE DENSITY

SANDS & GRAVELS	BLOWS PER FOOT	
	N	R
VERY LOOSE	0 – 4	0 – 5
LOOSE	5 – 10	6 – 16
MEDIUM DENSE	11 – 30	17 – 50
DENSE	31 – 50	51 – 83
VERY DENSE	OVER 50	OVER 83

NOTE: Number of blows using 140-pound hammer falling 30 inches to drive a 2-inch-OD (1½-inch ID) split-barrel sampler (ASTM D1586).

PLASTICITY OF FINE GRAINED SOILS

PLASTICITY INDEX	TERM
0	NON-PLASTIC
1 – 7	LOW
8 – 20	MEDIUM
Over 20	HIGH

DEFINITION OF WATER CONTENT

DRY
SLIGHTLY DAMP
DAMP
MOIST
WET
SATURATED

Geotechnical
Environmental
Inspections
Materials



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METHOD OF CLASSIFICATION

PLATE

A-2

The number shown in "**BORING NO.**" or "**TEST PIT NO.**" refers to the approximate location of the same number indicated on the "Boring and Test Pit Location Diagram" as positioned in the field by pacing or measurement from property lines and/or existing features, or through the use of Global Positioning System (GPS) devices. The accuracy of GPS devices is somewhat variable.

"**DRILLING TYPE**" refers to the exploratory equipment used in the boring wherein **HSA = hollow stem auger**, and the dimension presented is the outside diameter of the HSA used.

"**EQUIPMENT TYPE**" refers to the equipment used in the excavation of the test pit, and may include the width of the bucket on the excavator and the use of "rock" teeth or attachments.

"**N**" in "**BLOW COUNTS**" refers to a 2-in. outside diameter split-barrel sampler driven into the ground with a 140 lb. drop-hammer dropped 30 in. repeatedly until a penetration of 18 in. is achieved or until refusal. The number of blows, or "blow count", of the hammer is recorded for each of three 6-in. increments totaling 18 in. The number of blows required for advancing the sampler for the last 12 in. (2nd and 3rd increments) is defined as the Standard Penetration Test (SPT) "N"-Value. Refusal to penetration is considered more than 50 blows for a 6-inch increment. (Ref. ASTM D1586).

"**R**" in "**BLOW COUNTS**" refers to a 3-in. outside diameter ring-lined split spoon sampler driven into the ground with a 140 lb. drop-hammer dropped 30 inches repeatedly until a penetration of 12 inches is achieved or until refusal. The number of blows required to advance the sampler 12 inches is defined as the "R" blow count. The "R" blow count requires an engineered conversion to an equivalent SPT N-Value. Refusal to penetration is considered more than 50 blows for a 6-inch increment. (Ref. ASTM D3550).

"**CS**" in "**BLOWS/FT.**" refers to a 2½-in. outside diameter California style split-barrel sampler, lined with brass sleeves, driven into the ground with a 140-pound hammer dropped 30 inches repeatedly until a penetration of 18 inches is achieved or until refusal. The number of blows of the hammer is recorded for each of the three 6-inch increments totaling 18 inches. The number of blows required for advancing the sampler for the last 12 inches (2nd and 3rd increments) is defined as the "CS" blow count. The "CS" blow count requires an engineered conversion to an equivalent SPT N-Value. Refusal to penetration is considered more than 50 blows for a 6-inch increment. (Ref. ASTM D3550)

"**SAMPLE TYPE**" refers to the form of sample recovery, in which **N** = Split-barrel sample, **R** = Ring-lined sample, **CS** = California style split-barrel sample, **G** = Grab sample, **B** = Bucket sample, **C** = Core sample (ex. diamond-bit rock coring).

"**DRY DENSITY (LBS/CU FT)**" refers to the laboratory-determined dry density in pounds per cubic foot. The symbol "**NR**" indicates that no sample was recovered.

"**WATER (MOISTURE) CONTENT (% OF DRY WT.)**" refers to the laboratory-determined water content in percent using the standard test method ASTM D2216.

"**USCS**" refers to the "Unified Soil Classification System" Group Symbol for the soil type as defined by ASTM D2487 and D2488. The soils were classified visually in the field, and where appropriate, classifications were modified by visual examination of samples in the laboratory and/or by appropriate tests.

These notes and boring/test pit logs are intended for use in conjunction with the purposes of our services defined in the text. Boring/test pit log data should not be construed as part of the construction plans nor as defining construction conditions.

Boring/test pit logs depict our interpretations of subsurface conditions at the locations and on the date(s) noted. Variations in subsurface conditions and characteristics may occur between borings/test pits. Groundwater levels may fluctuate due to seasonal variations and other factors.

The stratification lines shown on the boring/test pit logs represent our interpretation of the approximate boundary between soil or rock types based upon visual field classification at the boring/test pit location. The transition between materials is approximate and may be more or less gradual than indicated.

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.


DATE DRILLED: 2-16-22		BORING NO. 1		EQUIPMENT TYPE: CME-75	
LOCATION: See Exploration Location Diagram				DRILLING TYPE: 7" H.S.A	
ELEVATION: Not Determined				FIELD ENGINEER: B. Dean	

MOISTURE CONTENT (% OF DRY WT.)	DRY DENSITY (LBS/CU FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT.	DEPTH (FEET)	USCS	GRAPHIC	SOIL DESCRIPTION
*		R		75				FILL: Silty Clayey SAND with Gravel; low plasticity, light brown, slightly damp Scattered construction debris
NR		R		50	5	SC-SM		Native: Silty Clayey SAND with Gravel; medium dense, low plasticity, light brown, slightly damp
NR		R		26	10			
NR		R		50-5"	15			very dense
Stopped at 15.5 feet								
					20			
					25			
					30			

N- STANDARD SAMPLER R- RING SAMPLER B- BUCKET SAMPLE G- GRAB SAMPLE M- OPEN SAMPLER - (no rings)	NOTES: Groundwater Not Encountered NR = No Sample Recovery *Sample too disturbed to determine in-situ density
--	--

<div style="display: flex; align-items: center;"> <div style="margin-right: 10px;"> <i>Geotechnical Environmental Inspections Materials</i> </div> <div style="text-align: center;"> Western Technologies Inc. <i>The Quality People</i> Since 1955 </div> </div>	PROJECT: Parker Duplex PROJECT NO.: 4122JD014	PLATE A-4
BORING LOG		


THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

DATE DRILLED: 2-16-22		BORING NO. 2		EQUIPMENT TYPE: CME-75				
LOCATION: See Exploration Location Diagram				DRILLING TYPE: 7" H.S.A				
ELEVATION: Not Determined				FIELD ENGINEER: B. Dean				
MOISTURE CONTENT (% OF DRY WT.)	DRY DENSITY (LBS/CU FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT.	DEPTH (FEET)	USCS	GRAPHIC	SOIL DESCRIPTION
*		R		43				FILL: Silty Clayey SAND with Gravel; low plasticity, light brown, slightly damp Scattered construction debris
NR		R		34	5	SC-SM		Native: Silty Clayey SAND with Gravel; medium dense, low plasticity, light brown, slightly damp
NR		N		8	10			loose
NR		N		45	15			dense
NR		N		33	20			
NR		N		44	25			
NR		N		44	30			
Stopped at 31.5 feet								
N- STANDARD SAMPLER R- RING SAMPLER B- BUCKET SAMPLE G- GRAB SAMPLE M- OPEN SAMPLER - (no rings)								NOTES: Groundwater Not Encountered NR = No Sample Recovery *Sample too disturbed to determine in-situ density
Geotechnical Environmental Inspections Materials  Western Technologies Inc. The Quality People Since 1955								PROJECT: Parker Duplex PROJECT NO.: 4122JD014 BORING LOG
								PLATE A-5


THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

DATE DRILLED: 2-16-22		BORING NO. 3		EQUIPMENT TYPE: CME-75				
LOCATION: See Exploration Location Diagram				DRILLING TYPE: 7" H.S.A				
ELEVATION: Not Determined				FIELD ENGINEER: B. Dean				
MOISTURE CONTENT (% OF DRY WT.)	DRY DENSITY (LBS/CU FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT.	DEPTH (FEET)	USCS	GRAPHIC	SOIL DESCRIPTION
*		R		19				FILL: Silty Clayey SAND with Gravel; low plasticity, light brown, slightly damp Scattered construction debris
NR		R		24	5	SC-SM		Native: Silty Clayey SAND with Gravel; medium dense, low plasticity, light brown, slightly damp
NR		N		11	10			
NR		N		62	15			very dense
Stopped at 16.5 feet								
<div> <div> N- STANDARD SAMPLER R- RING SAMPLER B- BUCKET SAMPLE G- GRAB SAMPLE M- OPEN SAMPLER - (no rings) </div> <div> NOTES: Groundwater Not Encountered NR = No Sample Recovery *Sample too disturbed to determine in-situ density </div> </div>								
<div> <div> Geotechnical Environmental Inspections Materials </div> <div> Western Technologies Inc. The Quality People Since 1955 </div> </div>							PROJECT: Parker Duplex PROJECT NO.: 4122JD014	<div>PLATE</div> <div>A-6</div>
							BORING LOG	


THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

DATE DRILLED: 5-4-22		TEST PIT NO. 1		EQUIPMENT TYPE: Caterpillar 416 Backhoe					
LOCATION: See Exploration Location Diagram				DRILLING TYPE: 12" Bucket					
ELEVATION: Not Determined				FIELD ENGINEER: D.Sobol					
MOISTURE CONTENT (% OF DRY WT.)	DRY DENSITY (LBS/CU FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT.	DEPTH (FEET)	USCS	GRAPHIC	SOIL DESCRIPTION	
								FILL: Silty Clayey SAND with Gravel; low plasticity, light brown, slightly damp Scattered construction debris	
					5	SC-SM		Native: Silty Clayey SAND with Gravel; low plasticity, light brown, slightly damp	
					10			Stopped at 10 feet	
					15				
					20				
					25				
					30				
N- STANDARD SAMPLER R- RING SAMPLER B- BUCKET SAMPLE G- GRAB SAMPLE M- OPEN SAMPLER - (no rings)							NOTES: Groundwater Not Encountered		
<div>Geotechnical Environmental Inspections Materials</div> <div>Western Technologies Inc. The Quality People Since 1955</div>							PROJECT: Parker Duplex PROJECT NO.: 4122JD014		PLATE A-7
							TEST PIT LOG		


THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

DATE DRILLED: 5-4-22		TEST PIT NO. 2		EQUIPMENT TYPE: CASE Backhoe					
LOCATION: See Exploration Location Diagram				DRILLING TYPE: 12" Bucket					
ELEVATION: Not Determined				FIELD ENGINEER: D.Sobol					
MOISTURE CONTENT (% OF DRY WT.)	DRY DENSITY (LBS/CU FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT.	DEPTH (FEET)	USCS	GRAPHIC	SOIL DESCRIPTION	
								FILL: Silty Clayey SAND with Gravel; low plasticity, light brown, slightly damp Scattered construction debris	
					5	SC-SM		Native: Silty Clayey SAND with Gravel; low plasticity, light brown, slightly damp	
					10			Stopped at 10 feet	
					15				
					20				
					25				
					30				
N- STANDARD SAMPLER R- RING SAMPLER B- BUCKET SAMPLE G- GRAB SAMPLE M- OPEN SAMPLER - (no rings)							NOTES: Groundwater Not Encountered		
<div>Geotechnical Environmental Inspections Materials</div> <div>Western Technologies Inc. The Quality People Since 1955</div>							PROJECT: Parker Duplex PROJECT NO.: 4122JD014		PLATE A-8
							TEST PIT LOG		


THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

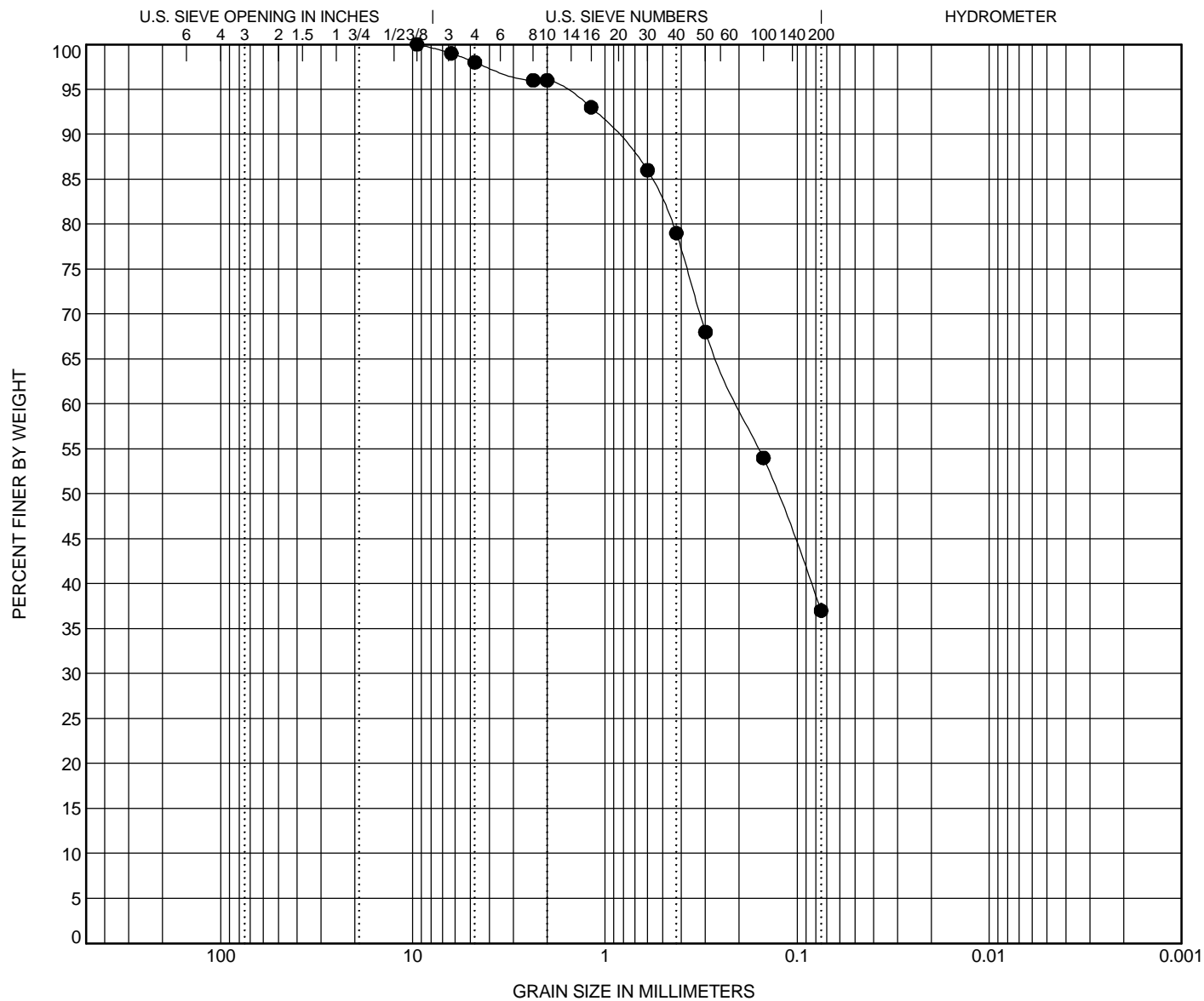
DATE DRILLED: 5-4-22		TEST PIT NO. 3		EQUIPMENT TYPE: CASE Backhoe					
LOCATION: See Exploration Location Diagram				DRILLING TYPE: 12" Bucket					
ELEVATION: Not Determined				FIELD ENGINEER: D.Sobol					
MOISTURE CONTENT (% OF DRY WT.)	DRY DENSITY (LBS/CU FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT.	DEPTH (FEET)	USCS	GRAPHIC	SOIL DESCRIPTION	
								FILL: Silty Clayey SAND with Gravel; low plasticity, light brown, slightly damp Scattered construction debris	
					5	SC-SM		Native: Silty Clayey SAND with Gravel; low plasticity, light brown, slightly damp	
					10			Stopped at 10 feet	
					15				
					20				
					25				
					30				
N- STANDARD SAMPLER R- RING SAMPLER B- BUCKET SAMPLE G- GRAB SAMPLE M- OPEN SAMPLER - (no rings)							NOTES: Groundwater Not Encountered		
<div>Geotechnical Environmental Inspections Materials</div> <div>Western Technologies Inc. The Quality People Since 1955</div>							PROJECT: Parker Duplex PROJECT NO.: 4122JD014		PLATE A-9
							TEST PIT LOG		

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

DATE DRILLED: 5-4-22		TEST PIT NO. 4		EQUIPMENT TYPE: CASE Backhoe					
LOCATION: See Exploration Location Diagram				DRILLING TYPE: 12" Bucket					
ELEVATION: Not Determined				FIELD ENGINEER: D.Sobol					
MOISTURE CONTENT (% OF DRY WT.)	DRY DENSITY (LBS/CU FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT.	DEPTH (FEET)	USCS	GRAPHIC	SOIL DESCRIPTION	
								FILL: Silty Clayey SAND with Gravel; low plasticity, light brown, slightly damp Scattered construction debris	
					5	SC-SM		Native: Silty Clayey SAND with Gravel; low plasticity, light brown, slightly damp	
					10			Stopped at 10 feet	
					15				
					20				
					25				
					30				
N- STANDARD SAMPLER R- RING SAMPLER B- BUCKET SAMPLE G- GRAB SAMPLE M- OPEN SAMPLER - (no rings)							NOTES: Groundwater Not Encountered		
<div>Geotechnical Environmental Inspections Materials</div> <div>Western Technologies Inc. The Quality People Since 1955</div>							PROJECT: Parker Duplex PROJECT NO.: 4122JD014		PLATE A-10
							TEST PIT LOG		

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

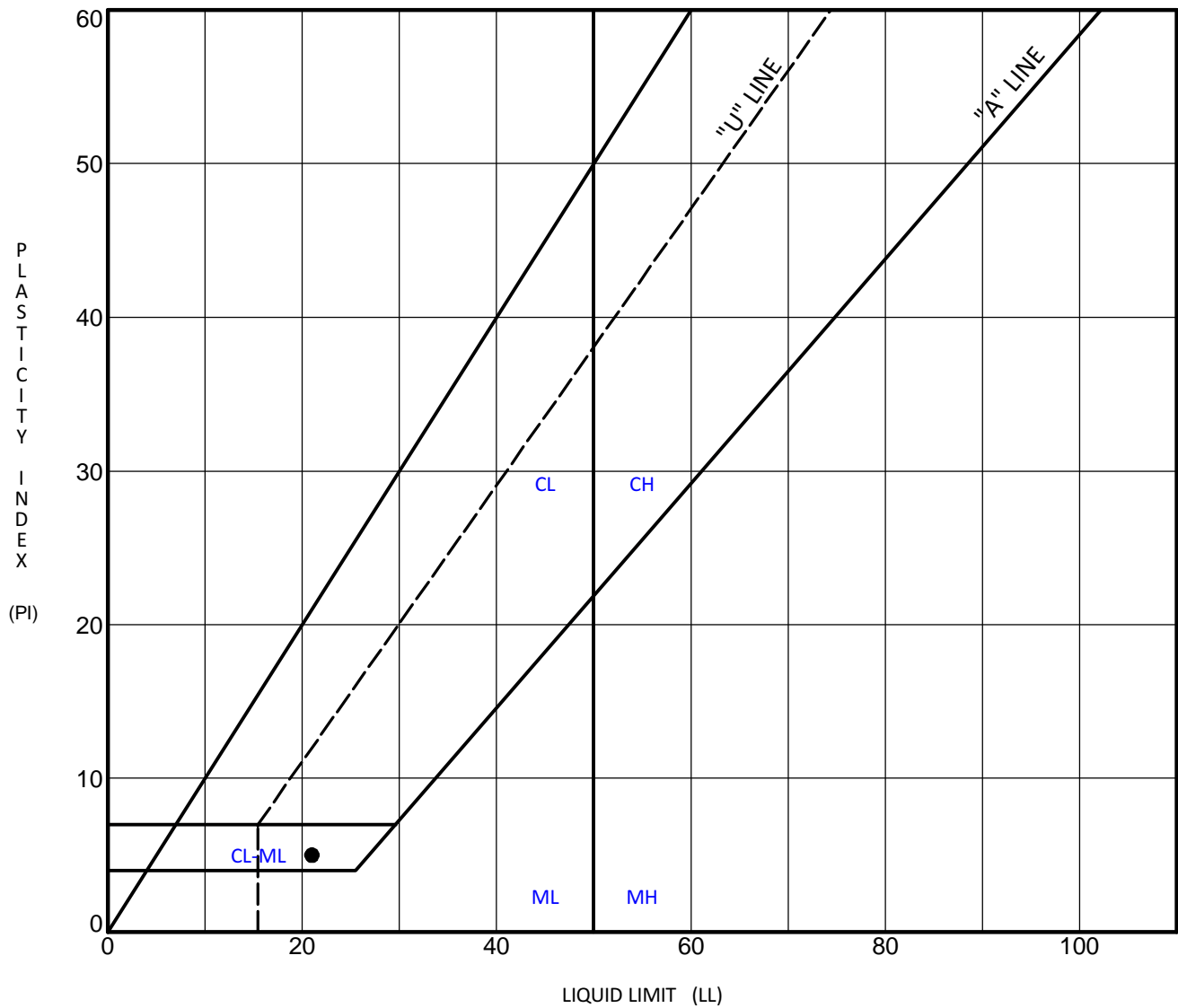
DATE DRILLED: 5-4-22		TEST PIT NO. 5		EQUIPMENT TYPE: CASE Backhoe					
LOCATION: See Exploration Location Diagram				DRILLING TYPE: 12" Bucket					
ELEVATION: Not Determined				FIELD ENGINEER: D.Sobol					
MOISTURE CONTENT (% OF DRY WT.)	DRY DENSITY (LBS/CU FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT.	DEPTH (FEET)	USCS	GRAPHIC	SOIL DESCRIPTION	
								FILL: Silty Clayey SAND with Gravel; low plasticity, light brown, slightly damp Scattered construction debris	
					5	SC-SM		Native: Silty Clayey SAND with Gravel; low plasticity, light brown, slightly damp	
					10			Stopped at 10 feet	
					15				
					20				
					25				
					30				
N- STANDARD SAMPLER R- RING SAMPLER B- BUCKET SAMPLE G- GRAB SAMPLE M- OPEN SAMPLER - (no rings)							NOTES: Groundwater Not Encountered		
<div>Geotechnical Environmental Inspections Materials</div> <div> Western Technologies Inc. The Quality People Since 1955</div>							PROJECT: Parker Duplex PROJECT NO.: 4122JD014		PLATE A-11
							TEST PIT LOG		



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Sample Identification	Symbol	Classification				LL	PL	PI	C _c	C _u	F _m
● TP-2 4.0 ft	SC-SM	Silty Clayey SAND				21	16	5			3.48
Sample Identification	D ₁₀₀	D ₆₀	D ₃₀	D ₁₀	%Gravel	%Sand	%Silt	%Clay			
● TP-2 4.0 ft	9.5	0.202			2.0	61.0	37.0				

PLASTICITY CHART



Test Results							
#	Source	Depth	LL	PL	PI	Classification	% Swell
●	TP-2	4.0 ft	21	16	5	Silty Clayey SAND	--

*Standard 60 pounds swell test

Geotechnical
Environmental
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Materials



**Western
Technologies Inc.**
The Quality People
Since 1955

PROJECT: **Parker Duplex**
LOCATION: **PARKER, ARIZONA**
PROJECT NO.: **4122JD014**

ATTERBERG LIMITS RESULTS

PLATE

B-2



Report Date: May 6, 2022

Report: 26819

Client:

Western Technologies, Inc.
6633 West Post Road
Las Vegas, NV 89118-2113

Laboratory Report

Client Project Number: 4122JD014

PO Number: 4122P539

TP-2 @ 5

Sample received May 6, 2022

Sample processed May 6, 2022

Client Lab ID	Na ⁺ %	SO ₄ ²⁻ %	Na ₂ SO ₄ %	Cl- ppm	Soil Solubility %*
24951	0.02	0.03	0.05	563	0.16

Note: mg kg⁻¹ is equal to ppm. To calculate ppm from Na₂SO₄, multiply the percent by 10,000; this will equal a near estimate without significant figures. <0.01 denotes below instrument detection limits (IDL). Below IDL does not affect the outcome of the overall sample(s) values. Methods are AWWA SM4500-SO₄²⁻, SM4500-Na⁺; and Na₂SO₄ by calculation. * Soil Solubility is the % soluble in water that passes through a 0.45 µm Whatman filter paper per SM2540B. Chloride was per AWWA SM4500D-Cl.

Respectively Submitted,

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Environmental Geochemist

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SECTION 313116 - TERMITE CONTROL

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following for termite control: Soil treatment for new structural concrete on grade, including slabs and footings.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.3 DEFINITIONS

- A. EPA: Environmental Protection Agency.
- B. PCO: Pest control operator.

1.4 SUBMITTALS

- A. Product Data: Treatments and application instructions, including EPA-Registered Label.
- B. Product Certificates: Signed by manufacturers of termite control products certifying that treatments furnished comply with requirements.
- C. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names, and addresses of architects and owners, and other information specified.
- D. Soil Treatment Application Report: After application of termiticide is completed, submit report for Owner's record information, including the following as applicable:
 - 1. Date and time of application.
 - 2. Brand name and manufacturer of termiticide.
 - 3. Quantity of undiluted termiticide used.
 - 4. Dilutions, methods, volumes, and rates of application used.
 - 5. Areas of application.
 - 6. Water source for application.
- E. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

- A. Applicator Qualifications: A PCO who is licensed according to regulations of authorities having jurisdiction to apply termite control treatment in jurisdiction where Project is located and who is experienced and has completed termite control treatment similar to that indicated for this Project and whose work has a record of successful in-service performance.
- B. Regulatory Requirements: Formulate and apply termiticides, and label with a Federal registration number, to comply with EPA regulations and authorities having jurisdiction.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: To ensure penetration, do not treat soil that is water saturated or frozen. Do not treat soil while precipitation is occurring. Comply with EPA-Registered Label requirements and requirements of authorities having jurisdiction.

1.7 COORDINATION

- A. Coordinate soil treatment application with excavating, filling, and grading and concreting operations. Treat soil under footings, grade beams, and ground-supported slabs, before construction.

1.8 WARRANTY

- A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Special Warranty: Written warranty, signed by applicator and Contractor certifying that termite control work, consisting of applied soil termiticide treatment, will prevent infestation of subterranean termites. If subterranean termite activity or damage is discovered during warranty period, re-treat soil and repair or replace damage caused by termite infestation.
- C. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOIL TREATMENT

- A. Termiticide: Provide an EPA-registered termiticide complying with requirements of authorities having jurisdiction, in a soluble or emulsible, concentrated formulation that dilutes with water or foaming agent, and formulated to prevent termite infestation. Use only soil treatment solutions that are not harmful to plants. Provide quantity required for application at the label volume and rate for the maximum termiticide concentration allowed for each specific use, according to the product's EPA-Registered Label.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for moisture content of the soil, interfaces with earthwork, slab and foundation work, landscaping, and other conditions affecting performance of termite control. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's written instructions for preparing substrate. Remove all extraneous sources of wood cellulose and other edible materials such as wood debris, tree stumps and roots, stakes, formwork, and construction waste wood from soil and around foundations.
- B. Soil Treatment Preparation: Remove foreign matter and impermeable soil materials that could decrease treatment effectiveness on areas to be treated. Loosen, rake, and level soil to be treated, except previously compacted areas under slabs and footings. Termiticides may be applied before placing compacted fill under slabs if recommended by termiticide manufacturer.
- C. Fit filling hose connected to water source at the site with a backflow preventer, complying with requirements of authorities having jurisdiction.

3.3 APPLICATION, GENERAL

- A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's EPA-Registered Label for products.

3.4 APPLYING SOIL TREATMENT

- A. Application: Mix soil treatment termiticide solution to a uniform consistency. Provide quantity required for application at the label volume and rate for the maximum specified concentration of termiticide, according to manufacturer's EPA-Registered Label, to the following so that a continuous horizontal and vertical termiticidal barrier or treated zone is established around and under building construction. Distribute the treatment evenly.
 - 1. Slabs-on-Grade: Underground-supported slab construction, including footings, building slabs, and attached slabs as an overall treatment. Treat soil materials before concrete footings and slabs are placed.
 - 2. Foundations: Adjacent soil including soil along entire inside perimeter of foundation walls, along both sides of interior partition walls, around plumbing pipes and electric conduit penetrating slab, and around interior column footers and piers; and along entire outside perimeter, from grade to bottom of footing. Avoid soil washout around footings.
 - 3. Penetrations: At expansion joints, control joints, and areas where slabs will be penetrated.

- B. Avoid disturbance of treated soil after application. Keep off treated areas until completely dry.
- C. Protect termiticide solution, dispersed in treated soils and fills, from being diluted until ground-supported slabs are installed. Use waterproof barrier according to EPA-Registered Label instructions.
- D. Post warning signs in areas of application.
- E. Reapply soil treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application.

END OF SECTION 313116

SECTION 321313 - PORTLAND CEMENT CONCRETE PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes exterior Portland cement concrete paving for the following:
 - 1. Curbs and gutters.
 - 2. Walkways, landings, and other exterior non-structural concrete paving.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Section 033000 - Cast-In-Place Concrete for criteria applying to work of this section and for general building applications of concrete.

1.3 QUALITY ASSURANCE

- A. Concrete Standards: Comply with provisions of the following standards, except where more stringent requirements are indicated.
 - 1. American Concrete Institute (ACI) 301, "Specifications for Structural Concrete for Buildings."
 - 2. ACI 318, "Building Code Requirements for Reinforced Concrete."
 - 3. Concrete Reinforcing Steel Institute (CRSI) "Manual of Standard Practice."
- B. All work under this section shall be in accordance with the materials and workmanship requirements of referenced standards and details and as shown on the Civil drawings.
- C. PROJECT CONDITIONS: Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 - PRODUCTS

2.1 FORMS

- A. Form Materials: Plywood, metal, metal-framed plywood, or other acceptable panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.
 - 1. Use flexible or curved forms for curves of a 100-foot or less radius and to produce configurations as shown on site paving.
- B. Form Release Agent: Provide commercial formulation form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.2 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type II.
- B. Normal-Weight Aggregates: ASTM C 33.
- C. Water: Potable.

2.3 ADMIXTURES: Provide for concrete paving as specified in Section 033000.

2.4 CURING MATERIALS

- A. Liquid Membrane-Forming Curing Compound: ASTM C 309, Type I, Class A or B, wax free.

2.5 RELATED MATERIALS

- A. Bonding Agent: Acrylic or styrene butadiene.
- B. Epoxy Adhesive: ASTM C 881, two-component material suitable for dry or damp surfaces. Provide material type, grade, and class to suit requirements.

2.6 CONCRETE MIX

- A. Prepare design mixes for each type and strength of normal-weight concrete by either laboratory trial batch or field experience methods as specified in ACI 301. For the trial batch method, use a qualified independent testing agency for preparing and reporting proposed mix designs.
 - 1. Do not use the Owner's field quality-control testing agency as the independent testing agency.
- B. Proportion mixes according to ACI 211.1 and ACI 301 to provide normal-weight concrete with the following properties:
 - 1. Compressive Strength (28-Day): 3000 psi.
 - 2. Slump: Comply with Section 033000.

2.7 CONCRETE MIXING

- A. Ready-Mixed Concrete: Comply with requirements and with ASTM C 94.
 - 1. When air temperature is between 85 deg F and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

- A. Proof-roll prepared subbase surface to check for unstable areas and verify need for additional compaction. Do not begin paving work until such conditions have been corrected and are ready to receive paving.

- B. Remove loose material from compacted subbase surface immediately before placing concrete.

3.2 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for paving to required lines, grades, and elevations. Install forms to allow continuous progress of work and so that forms can remain in place at least 24 hours after concrete placement.
 - 1. Provide block-outs or additional forming as needed to produce colored concrete pattern areas as shown on the drawings.
- B. Check completed formwork and screeds for grade and alignment to following tolerances:
 - 1. Top of Forms: Not more than 1/8 inch in 10 feet.
 - 2. Vertical Face on Longitudinal Axis: Not more than 1/4 inch in 10 feet.
- C. Clean forms after each use and coat with form release agent as required to ensure separation from concrete without damage.

3.3 PLACING REINFORCEMENT

- A. General: Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars" for placing and supporting reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.
- C. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

3.4 JOINTS

- A. General: Construct contraction, construction, and isolation joints true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to the centerline, unless indicated otherwise.
 - 1. When joining existing paving, place transverse joints to align with previously placed joints, unless indicated otherwise.
- B. Contraction Joints: Provide weakened-plane contraction joints, sectioning concrete into areas as shown on Drawings. Construct contraction joints for a depth equal to at least 1/4 of the concrete thickness, as follows:
 - 1. Tooled Joints: Form contraction joints in fresh concrete by grooving and finishing each edge of joint with a radiused jointer tool.
 - 2. Inserts: Form contraction joints by inserting premolded plastic, hardboard, or fiberboard strips into fresh concrete until top surface of strip is flush with paving surface. Radius each joint edge with a jointer tool. Carefully remove strips or caps of two-piece assemblies after concrete has hardened. Clean groove of loose debris.
- C. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than 1/2 hour, unless paving terminates at isolation joints.

1. Provide preformed galvanized steel or plastic keyway-section forms or bulkhead forms with keys, unless indicated otherwise. Embed keys at least 1-1/2 inches into concrete.
 2. Continue reinforcement across construction joints unless indicated otherwise. Do not continue reinforcement through sides of strip paving unless indicated.
 3. Provide tie bars at sides of paving strips where indicated.
 4. Use bonding agent on existing concrete surfaces that will be joined with fresh concrete.
- D. Isolation Joints: Form isolation joints of preformed joint filler strips abutting concrete curbs, catch basins, manholes, inlets, building foundations, other fixed objects, and where indicated.
1. Locate expansion joints at intervals of 50 feet, unless indicated otherwise. Locate contraction joints at 20 feet on center, or as shown on drawings.
 2. Extend joint fillers full width and depth of joint, not less than 1/2 inch or more than 1 inch below finished surface where joint sealant is indicated. Place top of joint filler flush with finished concrete surface when no joint sealant is required.
 3. Furnish joint fillers in one-piece lengths for full width being placed wherever possible. Where more than one length is required, lace or clip joint filler sections together.
 4. Protect top edge of joint filler during concrete placement with a metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

3.5 CONCRETE PLACEMENT

- A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.
- B. Moisten subbase to provide a uniform dampened condition at the time concrete is placed. Do not place concrete around manholes or other structures until they are at the required finish elevation and alignment.
- C. Comply with requirements and with ACI 304R for measuring, mixing, transporting, and placing concrete. Add color admixture to concrete at plant in strict accordance with manufacturer's instructions.
- D. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
1. When concrete placing is interrupted for more than 1/2 hour, place a construction joint.
- E. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- F. Consolidate concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures to consolidate concrete complying with ACI 309R.
1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand-spreading and consolidation. Consolidate with care to prevent dislocating reinforcing, dowels, and joint devices.
- G. Screed paved surfaces with a straightedge and strike off. Use bull floats or darbies to form a smooth surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces prior to beginning finishing operations.
1. Radius Edges: Provide minimum 3/8" radius edges for all flatwork.

- H. Place concrete in two operations; strike off initial pour for entire width of placement and to the required depth below finish surface. Lay welded wire fabric or fabricated bar mats immediately in final position. Place top layer of concrete, strike off, and screed.
 - 1. Remove and replace portions of bottom layer of concrete that have been placed more than 15 minutes without being covered by top layer or use bonding agent if acceptable to Architect.
- I. Curbs and Gutters: Comply with local Standards and details on drawings.
- J. CONCRETE FINISHING
 - 1. Float Finish: For concrete to receive specified finishes, begin floating when bleed water sheen has disappeared, and the concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand-floating if area is small or inaccessible to power units. Finish surfaces to true planes within a tolerance of 1/4 inch in 10 feet as determined by a 10-foot-long straightedge placed anywhere on the surface in any direction. Cut down high spots and fill low spots. Refloat surface immediately to a uniform granular texture.
 - 2. Broom Finish: Provide at new paving to match existing.
- K. Final Tooling: Tool edges of paving, gutters, curbs, and joints formed in fresh concrete with a jointing tool to a smooth radius. Repeat tooling of edges and joints after applying surface finishes. Eliminate tool marks on concrete surfaces.

3.6 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with the recommendations of ACI 306R for cold weather protection and ACI 305R for hot weather protection during curing.
- B. Evaporation Control: In hot, dry, and windy weather, protect concrete from rapid moisture loss before and during finishing operations.
- C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- D. Curing Methods: Cure concrete by curing compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.

- 3.7 FIELD QUALITY CONTROL TESTING: Test concrete in accordance with Section 033000. Remove and replace any concrete sections (from joint to joint or other logical stopping point) that has been damaged during construction processes prior to Substantial Completion.

END OF SECTION 321313

SECTION 323119 – CHAIN-LINK FENCES AND GATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Chain-Link Fencing and Gates as shown.
- B. Related Sections:
 - 1. Section 033000 - Cast-in-Place Concrete for cast-in-place concrete post footings.

1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide chain-link fences and gates capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Determine minimum post size, group, and section according to ASTM F 1043 for framework up to 10 feet high, and post spacing not to exceed 10 feet.
- B. Existing Building and Vegetation: Review existing conditions and locate fence to interfere with existing structure and plants as little as possible – all shall remain in place.

1.4 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for chain-link fences and gates.
 - 1. Fence and gate posts, rails, and fittings.
 - 2. Chain-link fabric, insect screening, reinforcements, and attachments.
 - 3. Gates and hardware.
 - 4. Accessories: Wire mesh screening.
- B. Shop Drawings: Provide an installation drawings to show locations of fence, gates, posts, rails, tension wires, gate swing, hardware, chain link mesh, and accessories. Indicate materials, dimensions, sizes, weights, and finishes of components. Include plans, gate elevations, sections, details of each type of framing, connection and post anchorage, attachment, bracing, and other required installation and operational clearances.

1.5 PROJECT CONDITIONS

- A. Field Measurements: Verify layout information for chain-link fences and gates shown on Drawings in relation to existing structures and plants. Verify dimensions by field measurements.

PART 2 - PRODUCTS

2.1 CHAIN-LINK FENCE FABRIC

- A. General: Provide fabric in one-piece heights measured between top and bottom of outer edge of selvage knuckle or twist. Comply with ASTM A 392, CLFMI CLF 2445, and requirements indicated below:
1. Steel Wire Fabric: Metallic coated wire with a nominal diameter of 0.120 inches (11 ga.).
 - a. Mesh Size: 2 inch.
 - b. Weight of Metallic (Zinc) Coating: ASTM A 392, Type II, Class 2, 2.0 oz./sq. ft. with zinc coating applied before weaving.

2.2 FENCE FRAMING

- A. Posts and Rails: Comply with ASTM F 1043 for framing, ASTM F 1083 for Group IC round pipe, and the following:
1. Group: IA, round steel pipe, Schedule 40
 2. Fence Height: 6 foot.
 3. Strength Requirement: Light industrial according to ASTM F 1083.
 4. Post Diameter and Thickness: For perimeter fencing, provide according to ASTM F 1043.
 - a. Swing Gate Post: 2.375-inch diameter, 3.11-lb/ft.
 5. Coating for Steel Framing: Type A zinc, not less than 2.0 oz/sf.

2.3 TENSION WIRE: General: Provide horizontal tension wire at bottom of fence fabric.

- A. Metallic-Coated Steel Wire: 0.177-inch-diameter, marcelled tension wire complying with ASTM A 817, ASTM A 824.:

2.4 SWING GATES

- A. General: Comply with ASTM F 900 for single swing gate types.
1. Metal Pipe and Tubing: Galvanized steel. Comply with ASTM F 1043 and ASTM F 1083 for materials and protective coatings.
- B. Frames and Bracing: Fabricate members from round tubing with outside dimension and weight according to ASTM F 900 and the following:
1. Frame Members:

- a. Tubular Steel 1.66 inches (42 mm) round.
 - C. Frame Corner Construction: Welded.
 - D. Hardware: Latches permitting operation from both sides of gate, with integral eye openings for padlocking; padlock accessible from both sides of gate. Cane bolt. Hinges. **Padlock by Owner.**
- 2.5 FITTINGS: Provide standard chain link fittings as described below.
- A. General: Comply with ASTM F 626.
 - B. Post and Line Caps: Provide for each post.
 - 1. Line post caps with loop to receive top rail.
 - C. Rail and Brace Ends: Attach rails securely to each gate, corner, pull, and end post.
 - D. Rail Fittings: Provide the following:
 - 1. Top Rail Sleeves: Pressed-steel or round-steel tubing not less than 6 inches long.
 - 2. Rail Clamps: Line and corner boulevard clamps for connecting intermediate and bottom rails in the fence line-to-line posts.
 - E. Tension and Brace Bands: Pressed steel.
 - F. Tension Bars: Steel length not less than 2 inches shorter than full height of chain-link fabric. Provide one bar for each gate and end post, and two for each corner and pull post, unless fabric is integrally woven into post.
 - G. Truss Rod Assemblies: Steel, hot-dip galvanized after threading rod and turnbuckle or other means of adjustment.
 - H. Tie Wires, Clips, and Fasteners: According to ASTM F 626. Tie wires shall be "twist-tie" prefabricated type that are mechanically fastened in the field.
- 2.7 CAST-IN-PLACE CONCRETE: 3000-psi at 28 days.
- 2.8 GROUT AND ANCHORING CEMENT
- I. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout, recommended in writing by manufacturer, for exterior applications.
 - J. Erosion-Resistant Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with potable water at Project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended in writing by manufacturer, for exterior applications.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Stake locations of fence lines, gates, and terminal posts. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

3.2 INSTALLATION, GENERAL

- A. Install chain-link fencing to comply with ASTM F 567 and more stringent requirements specified.

3.3 CHAIN-LINK FENCE INSTALLATION

- A. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacings shown on installation drawings in firm, undisturbed soil.
- B. Post Setting: Set posts for perimeter fencing in concrete plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.
 - 1. Concrete Fill: Place concrete around posts to dimensions indicated and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.
 - a. Exposed Concrete: Extend 2 inches above grade; shape and smooth to shed water.
- C. Terminal Posts: Locate terminal end, corner, and gate posts per ASTM F 567 and terminal pull posts at changes in horizontal or vertical alignment of as indicated on Drawings.
- D. Line Posts: Space line posts uniformly at maximum 10 feet o.c., except as required by terminal posts.
- E. Post Bracing and Intermediate Rails: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Install braces at end and gate posts and at both sides of corner and pull posts.
 - 1. Locate horizontal braces at mid-height of fabric 6 feet or higher, on fences with top rail. Install so posts are plumb when diagonal rod is under proper tension.
- F. Tension Wire: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Pull wire taut, without sags. Fasten fabric to tension wire with 0.120-inch-diameter hog rings of same material and finish as fabric wire, spaced a maximum of 24 inches o.c. Install tension wire in locations indicated before stretching fabric.
 - 1. Bottom Tension Wire: Install tension wire within 4 inches of bottom of fabric and tie to each post with not less than same diameter and type of wire.
- G. Top Rail for Building Chain Link Fencing: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Run rail continuously through line post caps, bending to radius for curved runs and terminating into rail end attached to posts or post caps fabricated to receive rail at terminal posts. Provide expansion couplings as recommended in writing by fencing manufacturer.

- H. Tension or Stretcher Bars: Thread through fabric and secure to end, corner, pull, and gate posts with tension bands spaced not more than 15 inches o.c.
 - 1. Tie Wires: Attach twist-ties following manufacturer's instructions at the following spacings: To line posts at 12 inches o.c. and to braces at 24 inches o.c.
- I. Fasteners: Install nuts for tension bands and carriage bolts on the side of the fence opposite the fabric side. Peen ends of bolts or score threads to prevent removal of nuts.

3.4 GATE INSTALLATION

- A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach fabric as for fencing. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.

END OF SECTION 323119

SECTION 32-80-00 - IRRIGATION SYSTEM

PART 1 - PART ONE: GENERAL

1.1 RELATED DOCUMENTS:

- A. The General Provisions of the Contract, including all General and Supplementary Conditions and Supplements and Amendments to the General Conditions of the Contract apply to work specified in this section.

1.2 DESCRIPTION OF WORK

- A. The work covered by this section includes, but is not limited to, the:

1. Installation and testing of backflow preventers
2. Installation of backflow preventer security enclosures
3. Installation of backflow preventer freeze protection insulation blanket
4. Excavation, backfill, and compaction of trenches
5. Installation and pressure testing of mainline pipe
6. Installation of lateral line pipe
7. Installation of sleeves for pipe and wire under pavements
8. Installation of mainline isolation valves
9. Installation of remote control valve assemblies
10. Installation of automatic controllers
11. Installation of controller security cabinets
12. Installation of control wiring, and related equipment
13. Installation of drip emitters
14. Installation of drip zone filters and pressure regulators
15. Operational testing of the irrigation system
16. Initial maintenance of the irrigation system

The extent of the irrigation work is shown on the drawings and details.

1.3 RELATED WORK

- A. Related work includes, but is not limited to, the:

1. Installation / planting of trees, shrubs, and turf areas
2. Construction of hardscape, and other site improvements.

1.4 COORDINATION

- A. The Contractor shall coordinate all irrigation system work with the Owner's Representative. Work that is completed or in-progress shall be protected during the installation of the irrigation system. The Contractor shall notify the Owner's Representative of field conditions that prevent installation of the irrigation system as shown.

1.5 REQUIRED LICENSURE

- A. All work shall be performed by a licensed Contractor. The commercial license classification held by the Contractor shall be appropriate for the work to be performed.

1.6 QUALIFICATIONS OF IRRIGATION SYSTEM INSTALLERS

- A. The irrigation system shall be installed by, and under the direct supervision of, individuals who have appropriate experience with the installation of irrigation systems similar to the system being installed. A supervisor, with not less than three-years of irrigation system installation experience, shall be on-site at all times when the project irrigation system is being installed.

1.7 COMPLIANCE WITH APPLICABLE REGULATIONS

- A. The Contractor shall comply with all local, state, and federal regulations regarding materials, methods of work, and disposal of excess and waste materials. The Contractor shall provide notices required by governmental authorities, request required inspections, obtain required permits, and pay for all associated fees.

1.8 REFERENCE SPECIFICATIONS

- A. Material and Equipment Information: Submittal requirements shall be in accordance with Division 1 Specifications. The Contractor shall submit to the Owner's Representative, three (3) sets of catalog cuts for all irrigation system materials and equipment proposed for use on the project. The information submitted shall clearly indicate the type, model, and size of the equipment proposed and shall be sufficient for the Owner's Representative to determine if the proposed equipment meets the project specifications. As an alternative to the three printed sets of submittals, the Contractor may submit the requested information in digital (.pdf file) format on a CD, on a flash drive, or by email to the Owner's Representative. No materials or equipment shall be ordered or incorporated into the Work until the material or equipment has been approved for use on the project. The submittal shall include information related to the following items, if required for the project

- B. American Society for Testing and Materials:

- | | |
|-----------------------|--|
| 1. ASTM-D-1784-11 | Standard Specification for Rigid Poly (Vinyl Chloride) Compounds |
| 2. ASTM-D-1785-15 | Standard Specification for Poly (Vinyl Chloride) (PVC) Pipe, Schedules 40, 80, and 120 |
| 3. ASTM-D-2241-15 | Specification for Poly (Vinyl Chloride) (PVC) Pressure Rated Pipe (SDR-Series) |
| 4. ASTM-D-2564-12 | Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems |
| 5. ASTM-D-2672-14 | Standard Specification for Joints for IPS PVC Pipe Using Solvent Cement |
| 6. ASTM-F-656-15 | Standard Specification for Primers for use in Solvent Weld Joints of Poly (Vinyl Chloride) (PVC) plastic Pipe and Fittings |
| 7. ASTM-A-536 | Standard Specification for Ductile Iron Castings |
| 8. ASTM-F-477 | Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe |
| 9. ASTM-B-33-10(2014) | Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes |

1.9 SUBMITTAL REQUIREMENTS

- | | |
|--|---|
| 1. Backflow Preventers | |
| 2. Backflow Preventer Security Enclosures | |
| 3. Backflow Preventer Freeze Protection Enclosures | |
| 4. Mainline Pipe (Potable) | |
| 5. Lateral Line Pipe (Potable) | |
| 6. Fittings for Mainline Pipe | |
| 7. Fittings for Lateral Line Pipe | |
| 8. Solvent Weld Primer for PVC Pipe | |
| 9. Solvent Weld Cement for PVC Pipe | |
| 10. Fittings (Copper and Galvanized Steel) | |
| 11. Isolation Valves (Gate and Ball) | |
| 12. Remote Control Valves | |
| 13. Pressure Regulating Valves | |
| | 14. Access Boxes for Remote Control Valves |
| | 15. Access Boxes for Isolation Valves |
| | 16. Controller |
| | 17. Controller Security Enclosure |
| | 18. Low Voltage Control Wire |
| | 19. Surge Protectors |
| | 20. Grounding Equipment |
| | 21. Drip Emitters (Multi-outlet, all types) |
| | 22. In-Line Screen Filters |
| | 23. Emitter Distribution Tubing |
| | 24. Access Boxes for Emitters |
| | 25. Access Boxes for Flush Caps |
| | 26. Mainline Marking Tape |

- A. As-Built Record Drawings: The Contractor shall submit to the Owner's Representative prior to Substantial Completion of the work, As-Built Record drawings for the irrigation system installed. The drawings shall indicate the location of all; mainlines, master valves, flow sensors, mainline isolation valves, remote control valves, quick coupling valves, and sleeves and pipelines under roadways or other paved surfaces.
1. Preliminary As-Built Drawings: Preliminary as-built drawings shall be prepared for the irrigation mainline and mainline isolation valves prior to the backfilling of mainline trenches. The preliminary as-built drawings shall be presented to the Owner's Representative when the mainline is pressure tested. Approval of the pressure test and authorization to backfill the mainline trenches will be contingent upon submittal of acceptable Preliminary As-Built Drawings.
 2. Procedures to be Used to Document As-Built Locations: The location of all mainlines shall be identified by two or more dimensions from fixed objects such as curbs or structures. The location of all valves shall be identified by Global Positioning System (GPS) coordinates using the State Plane Coordinate System. The GPS equipment used to locate irrigation system valves shall be accurate to within +/-1 meter and shall be as approved by the Owner's Representative. A table listing all system valves and their corresponding coordinates shall be included on the as-built drawings.
 3. Format for Final As-Built Drawings: The Final As-Built Drawings shall be prepared as .pdf files that include the original drawings (as issued for construction) marked-up to note the location of irrigation system features. The As-Built Drawings shall also include all addenda and supplemental drawings related to the irrigation system installed. The Final As-Built Drawings shall be submitted on a CD, flash drive, or other electronic storage device as approved by the Owner's Representative. The preparation of the As-Built Drawings shall be at the Contractor's expense.

1.10 IRRIGATION SYSTEM DRAWINGS

- A. The irrigation drawings are diagrammatic and are intended to show the approximate location of outlets, equipment, and piping. Certain runs of piping may be shown distorted for clarity. Minor adjustment to the layout of the system will be necessary. Significant adjustments to the layout, including all changes that effect the configuration of the system or length of piping runs, shall be approved by the Owner's Representative.

PART 2 - PART TWO: MATERIALS

2.1 PIPE AND FITTINGS

- A. **PVC Mainline and Lateral Line Pipe:** Mainline (pipe subject to constant pressure) and lateral line pipe (pipe not subject to constant pressure) shall be PVC plastic pipe extruded from virgin parent materials. Pipe shall comply with ASTM standards D-1785-15 or D-2241-15 as applicable and shall be free from defects. Pipe type and associated joint type shall be as follows:

Pipe Application	Schedule or Size	Joint Type
Mainline Pipe (2" and Smaller Size)	Schedule 40 PVC Pipe or as Noted on the Project Plans	Solvent Weld Type Joint
Lateral Line Pipe (1/2" – 3" Size)	Schedule 40 PVC Pipe or as Noted on the Project Plans	Solvent Weld Type Joint

- B. **Sleeves for Pipe and Control Wire:** Sleeves for irrigation pipe and control wire or control cable under roadways, parking lots, and walkways shall be Schedule 40 PVC pipe.
- C. **PVC Pipe Fittings:** PVC fittings shall be made from Type I, Grade I, PVC compounds conforming to ASTM D-1784-11, D-2672-14, and D-2241-15 as applicable. Fitting types for various applications and sizes shall be as follows:

Application	Fitting Size	Fitting Type
Mainline	Equal to or Smaller than 4" Size	Schedule 80 PVC Fittings
Remote Control Valve Assemblies / Risers	All Sizes	Schedule 80 PVC Fittings
Pipe Nipples and Threaded Fittings	All Sizes	Schedule 80 PVC Fittings
Lateral Lines	All Sizes	Schedule 40 PVC Fittings

- D. PVC Solvent Cement and Primer: Solvent cement and primer for joining PVC pipe and fittings shall be as approved by the pipe and fitting manufacturers and shall comply with ASTM Standards D-2564-12 and F-656-15.
 - 1. Primer: Primer shall be manufactured for use on all Classes and Schedules of rigid PVC pipe and fittings, including Schedule 80. Color shall be purple.
 - 2. Solvent Weld Cement: Solvent weld cement shall be manufactured for use on all Classes and Schedules of rigid PVC pipe and fittings, including Schedule 80. It shall have a medium fast set-up time. Color shall be grey. Fast-set or "hot-glue" solvent weld cement shall not be utilized without written approval by the Owner's Representative.
- E. Steel Pipe and Fittings: Steel pipe and fittings shall be Schedule 40 galvanized steel pipe. Unless otherwise detailed on the project plans, steel pipe shall be used for backflow preventer risers only.
- F. Copper Pipe and Fittings: Copper pipe shall be Type K rigid pipe. Fittings shall be wrought copper or cast bronze fittings. Unless otherwise detailed on the project plans, copper pipe shall be used for backflow preventer risers only.
- G. Corrosion Protection Pipe Wrap: Pipe wrap for galvanized steel and copper pipe installed below grade shall be adhesive backed polyethylene tape specifically designed for the protection of buried metallic pipe in below-grade installations.

2.2 BACKFLOW PREVENTERS

- A. Backflow Preventers: Backflow preventers shall be of the reduced pressure principle type with bronze body and stainless steel springs. The device shall be equipped with ball valves on the upstream and downstream ends. The backflow preventer manufacturer and model shall be as shown on the drawings, or the water utility providing irrigation water to the project. Size shall be as noted on the drawings.
- B. Backflow Preventer Security Enclosure: The backflow preventer security enclosure shall be fabricated from bent 1-1/4" diameter Schedule 40 steel pipe, 1" x 1" x 1/8" steel angle, and 13 gauge expanded metal panels. The enclosure shall be equipped with hinges and U-bolt hasp for padlocking. The enclosure shall have a powder coated finish. Color shall be "Woodland Tan." The security enclosure manufacturer and model shall be as noted on the project plans.
- C. Backflow Preventer Freeze Protection: The backflow preventer freeze protection enclosure shall consist of an insulated fabric bag that can be seasonally installed over the backflow preventer and secured without impacting the operation of the device. It shall have a 22 oz. vinyl coated, UV resistant, and waterproof outer fabric shell. Insulation shall be R-19 (min.) polyfill insulation. The enclosure shall be equipped with rust-proof grommets that allow for securing / locking the enclosure around the backflow preventer. The freeze protection enclosure shall either be installed on the device or turned over to the Owner as directed by the Owner's Representative.

2.3 AUTOMATED CONTROL VALVES

- A. Remote Control Valves: Remote control valves shall be of the globe type with heavy duty glass-filled nylon body and bonnet, nylon reinforced rubber diaphragm, stainless steel flow control stem, self-cleaning scrubber, and 24 volt heavy-duty solenoid. The remote control manufacturer, model, and size shall be as noted on the project plans.

2.4 MANUAL VALVES

- A. Gate Valves: Gate Valves shall be 200 psi rated WOG bronze gate valves with female NPT threaded ends. Valves shall have a clear waterway equal to the full nominal diameter of the valve and shall be equipped with a handwheel and non-rising stem.
- B. Ball Valves: Ball valves shall be 400 p.s.i. rated WOG brass or bronze ball valves with threaded ends. Ball valves shall be equipped with resilient TFE seats and blow-out proof stems. Valve handle shall provide 1/4 turn on / off control.
- C. In-line Pressure Regulating Valves: In-line pressure regulating valves shall be of the permanently assembled type with heavy-duty plastic body and FPT ends. The regulator shall have a pre-set outlet pressure of 30 or 40 psi as noted on the drawings. The pressure regulating valve manufacturer and model shall be as noted on the project plans.

2.5 CONTROLLER:

- A. Controller: Controller shall be of the microprocessor based electronic type and shall operate on 120 VAC, 60 Hz input. Controller output shall be 24 VAC, 2.5 A. The controller shall be capable of operating two or more 24 VAC, 7 VA remote control valves per station. It shall be capable of operating four independent programs with eight or more start times per program per day. The controller shall also be capable of manual operation. The controller shall retain all program information during power outages. The quantity of stations shall be as indicated on the project plans. The controller shall be housed on a heavy-duty, lockable housing. The controller manufacturer and model shall be as identified on the project plans.

2.6 CONTROLLER ENCLOSURES:

- A. Cabinet Type Wall Mounted Controller Enclosures: Cabinet type enclosures shall be free-standing, vandal and weather resistant enclosures that are designed for installation on a concrete slab. The enclosure shall be fabricated from stainless steel, powder-coated steel, or painted steel. A single access door with continuous hinge shall provide access to the interior of the enclosure. The exterior of the enclosure shall include provisions for padlocking and shall have a protective steel plate that covers the padlock. The enclosure manufacturer and model shall be as identified on the project plans.

2.7 MISCELLANEOUS AND INCIDENTAL EQUIPMENT:

- A. Grounding Equipment: Grounding equipment shall consist of a No. 6 solid copper ground wire that is connected to a 5/8" diameter by 8' long copper ground rod. Connections shall be made as detailed and per the control system manufacturer's recommendations.
- B. Other Incidental Equipment: The Contractor shall provide and install all other incidental equipment required for the proper operation of the irrigation control system.

2.8 LOW VOLTAGE CONTROL WIRING:

- A. Low Voltage Irrigation Control Wire for Type 1 and Type 2 Control Systems: Control wire shall be Type UF and shall be of the size and type recommended by the valve manufacturer. Wire size for control wires shall be #14 AWG or as noted on the drawings. Wire size for common ground wires shall be #12 AWG or as noted on the drawings. Wire shall be Underwriters Laboratory (UL) approved for direct burial.
 - 1. The color of the insulation on the low-voltage wire(s) shall be as follows:
 - 2. Control Wires to Remote Control Valves:.....Red
 - 3. Spare Control Wires (if noted on the project plans)Green

4. Common Wire:White

- B. Waterproof Wire Splices for Low Voltage Control Wiring: Wire splices shall be of the two piece, sealant filled type which permit connection of 2 or 3 wires of 18 through 10 gauge size. Wire splices shall be Underwriter Laboratory (UL) listed.

2.9 DRIP EMITTERS:

- A. Six-Outlet Drip Emitters: Emitters shall be of the permanently assembled, pressure compensating, six-outlet type with 1/2" FPT inlets. The flow rate per outlet shall be nearly the same at inlet pressures of 15 to 50 psi. The six-outlet emitter manufacturer and model shall be as noted on the project plans.
- B. Emitter Distribution Tubing: Emitter distribution tubing shall be fabricated from polyvinyl materials with a .160" I.D. and a .220" O.D. The tubing manufacturer and model shall be as noted on the project plans.
- C. Emitter Lateral Line Flush Caps: Flush caps for systems using PVC laterals shall consist of a Schedule 40 PVC pipe riser, a Schedule 40 PVC male adapter fitting, and a Schedule 40 PVC threaded cap. Flush caps for systems using polyethylene tubing for drip laterals shall have a barbed insert, compression fitting with a threaded cap. The fitting shall be constructed of durable, UV resistant, ABS materials. Flush caps shall be installed as detailed.

2.10 ACCESS BOXES:

- A. Color Coding of Access Boxes:
1. Valve Boxes for Valves in Pipelines Conveying Potable Water: Access boxes installed above valves in pipelines conveying potable water shall be equipped with tops or lids that are green when the access box is installed within a turf area or tan when the access box is installed within a decomposed granite or other non-turf area.
- B. Valve Access Boxes in Areas with No Vehicular Traffic: Valve access boxes for gate valves, ball valves, master valves, flow sensors, remote control valve assemblies, quick-coupling valves, surge protectors, emitters, flush caps, and other similar devices installed in areas not subject to motor vehicle traffic shall be constructed of heavy-duty HDPE plastic materials. Valve box covers shall be permanently marked with the word "IRRIGATION". Valve access boxes shall be of the manufacturer(s) and model (s) as noted on the project plans. All boxes, exclusive of emitter line flush cap access boxes, shall be equipped with bolt-down lids. Box sizes and configurations shall be as follows:

Valve or Device	Top Opening Length (Min.)	Top Opening Width (Min.)	Access Box Height (Min.) With Extensions Added as Required
Remote Control Valve (Drip)	19-5/8"	13-1/4"	12"
Isolation Valve (2" and Larger)	19-5/8"	13-1/4"	12"
Isolation Valve (Smaller than 2")	16-7/8"	11-3/4"	12"
Quick Coupling Valves	10" Diameter	10" Diameter	10"
Surge Protectors	16-7/8"	11-3/4"	12"
Ground Rods	16-7/8"	11-3/4"	12"
Flush Cap	6-1/8" Diameter	6-1/8" Diameter	8-3/4"

Multi-Outlet Emitter	6-1/8" Diameter	6-1/8" Diameter	8-3/4"
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2.11 MISCELLANEOUS IRRIGATION SYSTEM EQUIPMENT:

- A. Detectable Marking Tape: Detectable marking tape to be installed above all mainlines shall be a five mil thick, five-ply composition, polyethylene tape. The tape shall have a 20 gauge solid aluminum foil core that is encapsulated within the polyethylene material. The tape shall be three inches (3") wide.
- B. Tape for Potable Water Irrigation Systems: Tape for potable water systems shall the words "CAUTION, IRRIGATION LINE BELOW" printed at regular intervals. Tape color shall be green. The manufacturer and model of the detectable tape to be installed above potable water mainlines shall be as Identified on the project plans.

PART 3 - PART THREE: EXECUTION

3.1 BLUE STAKING:

- A. Blue Staking: The Contractor shall request that the project site be Blue Staked prior to the start of any excavation or trenching work. The Blue Stake request shall include a request to the Flowing Wells School District (or other applicable jurisdiction) that the location of all private (School District owned) utilities be marked. Blue Staking shall be kept current during the course of the project. All utilities damaged by the Contractor shall be repaired or replaced by the Contractor, as required by the Owner or appropriate utility company, at the Contractor's expense.

3.2 LAYOUT

- A. Layout of Irrigation System: Prior to the start of trenching and excavation work, the Contractor shall layout the irrigation system, staking out the location of mainlines, master valves, flow sensors, remote control valves, sprinkler heads and other equipment as shown on the drawings. All deviations from the layout shown on the drawings impacting the length of piping runs or the configuration of the system shall be approved by the Owner's Representative.

3.3 BACKFLOW PREVENTER INSTALLATION

- A. Backflow Preventer: Backflow preventers shall be installed as detailed in all locations shown on the project plans. All backflow preventers shall be tested by an individual certified by Tucson Water or the appropriate water provider. Backflow preventers that do not pass the test shall be repaired or replaced and the test repeated. Test certificates, signed by the tester, shall be filed with the water provider in accordance with the water utility's requirements. A copy of the test report(s) shall be provided to the Owner's Representative.
- B. Backflow Preventer Security Enclosure: The backflow preventer security enclosure shall be installed as detailed. The device shall be positioned so as to allow for the opening and closing of the security enclosure without interfering with the backflow preventer.

3.4 TRENCHING FOR PIPE AND CONTROL WIRING

- A. Trenching: Trench excavations shall be straight and true with uniform bottom for bearing of pipe. Minimum depth of cover on pipe, sleeves, and wire shall be as follows:
 1. PVC Sleeves under Roadways and Parking Areas.....18 inches
 2. PVC Sleeves for Mainlines under Walkways.....18 inches

3. PVC Sleeves for Lateral Lines under Walkways12 inches
4. PVC Mainline18 inches
5. Detectable Marking Tape over Mainline8 inches
6. PVC Lateral Lines12 inches
7. Control and Common Wires18 inches

- B. Barriers to Prevent Public Access to Open Trenches: The Contractor shall provide barriers as required to restrict public access to open irrigation trenches. Barriers shall be in compliance with applicable construction site safety regulations and the Contractor's approved safety plan.

3.5 PLACEMENT OF SLEEVES AND (MAINLINE / LATERAL LINE) PIPE

- A. Sleeves: Sleeves shall be installed as detailed. Separate sleeve shall be provided for pipe and control wire. Sleeve size shall be as noted. If not noted, the sleeve shall be a minimum of two standard pipe sizes larger than the pipe enclosed.
- B. Mainline and Lateral Line Pipe: Bedding material shall be placed in the bottom of trench as detailed before laying pipe. Do not install pipe in trench that is wet or when conditions are otherwise unsuitable for the work. Keep inside of pipe clean during installation. Snake pipe from side to side of trench to allow for expansion and contraction. Provide 2 inch minimum vertical and horizontal clearance between irrigation pipes. Provide 12 inch minimum clearance between irrigation pipes and pipe, conduit, or cable of other trades.

3.6 CONSTRUCTION OF PIPE JOINTS:

- A. PVC Pipe – Solvent Weld and Threaded Joints: Make all solvent weld joints using only procedures recommended by the pipe, fitting, and solvent weld cement manufacturers. Make all threaded connections using teflon tape on male threads.
- B. PVC Pipe – Mechanical Joints: Make all mechanical joints using only the procedures recommended by the pipe and gasketed fitting manufacturer.

3.7 FLUSHING AND PRESSURE TESTING OF MAINLINE:

- A. Notification: The Contractor shall notify the Owner's Representative of his intent to perform pressure testing 72 hours prior to the scheduled test time. Except as otherwise approved, all tests shall be performed in the presence of the Owner's Representative. The entire mainline shall be tested at one time except for instances where project phasing requires testing of individual segments of the mainline system.
- B. Tools and Equipment: The Contractor shall furnish all tools, materials, fittings, and equipment required for testing and shall make all temporary connections.
- C. Trench and Backfill Conditions for Testing: The trench(es) shall not be backfilled until pressure testing of mainline has been successfully completed. Center loading of mainline pipe during testing is acceptable. All joints shall be exposed during testing operations.
- D. Flushing: After all mainline piping and risers are connected in place and all related work is complete, open each control valve(s) and use a full head of water to flush the mainline system.
- E. Testing: The mainline shall be tested at a pressure of 100 psi for a period of 4 hours. For acceptance, the original test pressure shall be maintained for the duration of the test.

- F. Repairs: All leaks or defects which develop under pressure testing shall be promptly repaired and the test repeated until satisfactory results have been achieved. Repairs shall be made using only materials and procedures specified herein.

3.8 CONTROL WIRE INSTALLATION

- A. Control Wiring: Wires shall be snaked in trench locations shown on drawings at a uniform depth of 18 inches minimum relative to finish grade. A minimum of 1 foot in every 10 feet of trench shall be in excess for snaking the wire. Where ever possible, mainline trenches shall be used for installation of wire. Tie a loose 20 in. loop in all wiring at changes of direction of greater than 30 degrees and untie all loops after all connections have been made. All wiring shall be taped together every 10 feet using plastic electrical tape wrapped at least 2 times around the bundle of wires.
- B. Wire Splices: Each end of the control or "hot" wire and the common or "ground" wire shall be brought to the remote control valve and a coil of wire shall be neatly looped in the access box as detailed. Splices shall be made using waterproof wire splices. Wire shall be spliced at remote control valve locations only.

3.9 BACKFILLING OF TRENCHES

- A. Placement of Bedding Material: Place select backfill material around pipe to provide minimum cover shown on the details. Carefully tamp or water-in bedding material around pipe.
- B. Placement of Backfill: Place excavated material as backfill in lifts of six inches, maximum. Carefully compact each lift as work progresses. Grade top of trenches to be level with adjacent finished grade. All trenches improperly backfilled or where settlement occurs shall be re-excavated and compacted as specified.
- C. Removal of Excess Material: Excavated material that is removed from trenches and not used as backfill shall be carefully removed from the site and disposed of in an approved location at the Contractor's expense.

3.10 INSTALLATION OF VALVES AND VALVE ACCESS BOXES:

- A. Valves: Gate valves, ball valves, master valves, remote control valves, pressure regulating valves, and quick coupling valves shall be installed as detailed. Use teflon tape on all threaded connections.
- B. Valve Access Boxes: Install valve access boxes such that top of box is parallel to and flush with the surrounding finished grade, or as detailed. Provide gravel sumps, brick footings, and filter fabric as detailed. Where more than one access box is to be installed in a given location, group boxes together and keep boxes within a uniform alignment. Provide adequate clearance around enclosed valves to allow for valve operation and/ or removal.

3.11 CONTROL SYSTEM INSTALLATION

- A. Controller(s): The controller(s) shall be installed as detailed, in the location(s) approved by the Owner's Representative. Extend electrical power and telephone / Ethernet connections to the new controller(s) as shown on the project plans and make connections. All work shall be in accordance with applicable code requirements.

- B. Programming of Controllers: The Contractor shall be responsible for the initial programming of all controllers. Programming work shall be performed by a technician certified by the control system manufacturer. Controllers shall be programmed to operate as stand-alone controller during construction and during the initial Contractor Maintenance Period.
- C. Grounding Equipment: Grounding equipment shall be installed at each controller in accordance with the controller manufacturer's written recommendations and applicable codes.
- D. Surge Protectors: Surge protectors shall be installed at each controller in accordance with the controller manufacturer's written recommendations.

3.12 DRIP EMITTERS:

- A. Drip Emitters: Install drip emitters in access boxes and extend distribution tubing to locations around the irrigated plant as detailed.

3.13 MISCELLANEOUS IRRIGATION EQUIPMENT:

- A. In-Line Filters: Install in-line filters as detailed. Position filter in access box so that the unit can be disassembled and the filter removed and/or replaced, without removal of the access box.
- B. Detectable Marking Tape: Install detectable marking tape above all mainline pipe as detailed.

3.14 OPERATIONAL TESTING:

- A. Operational Test: An operational test shall be performed by the Contractor after the irrigation system installation is complete. The test shall demonstrate that all controller and control valves perform properly and that all sprinkler heads and emitters are operating correctly and are providing adequate irrigation water to landscape plantings. All tests shall be performed in the presence of the Owner's Representative. Irrigation system components found to be operating incorrectly or to be defective shall be replaced or repaired by the Contractor at no cost to the Owner.
- B. Schedule for Performance of Operational Test: The operational test shall be performed at the date and time of the Substantial Completion inspection. The operational test may be performed in advance of the Substantial Completion inspection, if requested by the Contractor. The request for an operational test inspection shall be submitted to the Owner's Representative not-less-than seven (7) days prior to the requested inspection date.

3.15 REPAIR OF DAMAGE BY LEAKS:

- A. Repair of Damage: The Contractor shall be responsible for damages to the slabs, curbs, roadways, walkways, piping systems, electrical systems, buildings and associated equipment and contents caused by leaks in the irrigation piping systems being installed or having been installed by him. The Contractor shall repair all damage so caused at his expense. All repair work shall be performed in a manner that is satisfactory to the Owner's Representative, and at no cost to the Owner.

3.16 CLEAN-UP:

- A. Clean up: Perform cleaning operations during the installation of the work and upon completion of the project. Remove from the site all excess materials, debris, and equipment. Legally dispose of all excess and waste materials. Repair all damage resulting from irrigation system installation.

3.17 MAINTENANCE AND GUARANTEE:

- A. Maintenance during Construction: The Contractor shall operate and maintain the irrigation system during project construction. Operation and maintenance procedures shall include, but not be limited to: programming of the controller(s), repair / adjustment of sprinklers, repair / replacement of emitters, and replacement of defective installations. Maintenance during construction shall continue until the issuance of a Certificate of Substantial Completion .
 - B. Inspection of Completed Irrigation Work: Upon substantial completion of the irrigation work, the Contractor shall notify the Owner's Representative who will schedule an inspection of the irrigation system improvements. During the inspection, items which are incomplete or which must be repaired or replaced will be identified. The Issuance of a Certificate of Substantial Completion will be contingent on the completion or correction of noted items.
 - C. Maintenance after Substantial Completion: After issuance of a Certificate of Substantial Completion, the Contractor shall continue to operate and maintain the irrigation system for a period of 60 consecutive calendar days. Operation and maintenance procedures shall include, but not be limited to: programming of the controller(s), repair / adjustment of sprinklers, repair / replacement of emitters, and replacement of defective installations. Upon satisfactory completion of the initial Contractor maintenance period, the Owner will assume responsibility for irrigation system operation and maintenance.
- 1. Irrigation Maintenance Requirements: Activities and tasks associated with the 60 day maintenance period shall include, but not be limited to:
 - a. Daily inspection of the project to check on-site conditions and to perform activities required to correct safety deficiencies and/or to address field conditions impacting the proper operation of the irrigation system.
 - b. Daily observation of the turf grass irrigation system operation to verify that sprinklers are performing correctly and that all turf areas are receiving adequate and appropriate irrigation water.
 - c. Weekly checking and adjustment of the irrigation controller program(s) as needed to provide appropriate application of water to the project plantings.
 - d. inspection of the operation of each sprinkler to check for proper pop-up and retraction, arc adjustment, radius adjustment, nozzle performance, rubber cover installation, and head height adjustment.
 - e. Weekly inspection of the operation of each drip emitter to check for proper water flow from each of the emitter distribution tubing outlets.
 - f. Weekly flushing of the in-line filter at each drip zone remote control valve assembly.
 - g. As-needed repair of leaks and other system deficiencies.
 - h. As-needed replacement of defective irrigation system equipment.
 - 2. Suspension of Initial Contractor Maintenance Period for Non-Compliance: Failure to properly operate and maintain the irrigation system as specified herein, as determined by the Owner's Representative, will result in the suspension of the number of days being credited towards the initial 60 day Contractor maintenance period. The suspension will remain in effect until such time as the remedial actions required by the Owner's Representative have been implemented by the Contractor.

3.18 STANDARDS FOR FINAL ACCEPTANCE OF THE LANDSCAPE IMPROVEMENTS

- A. Standards for Acceptance of the Irrigation System: Standards for acceptance of the irrigation system include, but are not limited to, the following:

1. On-site control system (controller(s) and remote control valves) have been tested and are operating correctly.
2. All drip emitter lateral lines have been flushed to remove contamination.
3. All drip emitters are operating correctly and providing uniform flow the irrigated plants.
4. All emitter distribution tubing has been extended to the locations detailed on the project plans and covered with soil or surfacing material as detailed.
5. All irrigation system components are in place and operating as detailed on the project plans, as specified herein, as required by the irrigation equipment manufacturer, and as required for proper operation of the irrigation system.

3.19 GUARANTEE:

- A. Guarantee: The Contractor shall guarantee the irrigation system to be free of defects in materials and workmanship for a period of one year from the date of Final Acceptance. All material and equipment that proves defective within that period shall be promptly repaired or replaced by the Contractor at no additional cost to the Owner. The guarantee period for any part so repaired or replaced shall be extended for a period of one year from the date of repair or replacement.

END OF SECTION 32-80-00

SECTION 32-90-00 LANDSCAPE WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. The General Provisions of the Contract including all General and Supplementary Conditions and Supplements and Amendments to the General Conditions of the Contract apply to the work specified in this section.

1.2 DESCRIPTION OF WORK:

- A. The work covered by this Section includes, but is not limited to, the:
 - 1. Fine grading of landscaped areas
 - 2. Excavation of plant pits
 - 3. Replanting of salvaged specimen trees
 - 4. Planting of Contractor provided nursery grown trees, shrubs, and cacti
 - 5. Installation of decomposed granite and other aggregate surfacing materials
 - 6. Installation of artificial turf surfacing
 - 7. Installation of concrete headers
 - 8. Clean up of soil, debris, and excess materials from the project site
 - 9. Initial maintenance of the landscape improvements
- B. The extent of the landscape work is shown on the drawings and details.

1.3 RELATED WORK:

- A. Related work includes, but is not limited to:
 - 1. Earthwork and site grading
 - 2. The installation of an automatic irrigation system.
 - 3. The construction of other site improvements

1.4 COORDINATION:

- A. The Contractor shall coordinate all planting and related landscape work with the Owner's Representative. Work that is completed or in-progress shall be protected during installation of landscape plantings. The Contractor shall notify the Owner's Representative of field conditions that prevent the installation of landscape improvements as shown.

1.5 REQUIRED LICENSURE:

- A. All work shall be performed by a registered licensed Contractor. The commercial license classification held by the Contractor shall be appropriate for the work to be performed.

1.6 COMPLIANCE WITH APPLICABLE REGULATIONS:

- A. The Contractor shall comply with all local, state, and federal regulations regarding materials, methods of work, and disposal of excess and waste materials. The Contractor shall provide notices required by governmental authorities, request required inspections, obtain required permits, and pay for all associated fees.

1.7 REFERENCE SPECIFICATIONS:

A. American National Standards Institute

1. ANSI Z60.1-2014 American Standard for Nursery Stock
2. ANSI A-300 Tree Care Operation: Tree, Shrub, and other Woody Plant Maintenance - Standard Practices

B. Arizona Nursery Growers Association

1.8 SUBMITTAL REQUIREMENTS:

- A. General:** Submittal requirements shall be in accordance with Division 1 Specifications. The Contractor shall make the submittals identified below. Submittals shall be made and approved prior to the delivery of material to the site and its incorporation into the work.
- B. Certificates of Compliance:** Submit three (3) copies of the following certificates of compliance to the Owner's Representative for review and approval, as applicable.
1. **Plant Materials:** The certificate, signed by the nursery and/or grower, shall indicate that all plant materials provided for this project will be available in the variety, size, and quantity specified or noted on the project plans.
 2. **Organic Soil Conditioner:** The certificate, signed by the supplier, shall indicate that the material complies with the project specifications.
 3. **Fertilizer:** The certificate shall be a copy of the manufacturer's guaranteed statement of analysis indicating compliance with these specifications.
 4. **Soil Sulfur:** The certificate shall be a copy of the manufacturer's guaranteed statement of analysis indicating compliance with these specifications.
- C. Samples:** Submit the following samples to the Owner's Representative for review and approval.
1. **Decomposed Granite and/or Crushed Rock:** One cubic foot of the gradation and color proposed for use on the project.
 2. **Angular Rip Rap Mulch:** One cubic foot of the gradation and color proposed for use on the project.

PART 2 - MATERIALS

2.1 TOPSOIL:

- A. Topsoil:** Native soil shall be the existing surface soil on the project site.
1. **Removal of Extraneous Materials from Native Soils:** Prior to the use of on-site native soil for the plant pit backfill or for the preparation of planting beds for turf grass, all large roots, brush, rocks with a dimension of three inches (3") or larger, clay lumps, caliche, debris, and other extraneous material shall be removed from the soil and disposed of off-site.

2.2 SOIL AMENDMENTS

- A. Organic Soil Conditioner:** Organic soil conditioner shall be composted, ground, or shredded fir or ponderosa pine bark shavings with at least 85% able to pass through a 1/4" screen. The pH shall not exceed 7.5. The material shall be hygroscopic or contain a wetting agent, and shall be Nitrogen stabilized with a 0.5 percent Nitrogen content.

- B. Soil Sulfur: Soil sulfur shall be agricultural sulfur for soil treatment. It shall be grained or pelleted, containing 90% (minimum) sulfur and 10% (maximum) inert ingredients. Soil sulfur shall be Disper-Sul Elemental Sulfur or approved equal.

2.3 FERTILIZERS

- A. General Requirements: All fertilizers used on the project shall be in pelleted form and of recent manufacture. Fertilizers shall be delivered to the site in the original unopened containers bearing the manufacturer's guaranteed statement of analysis.

2.4 PREPARED PLANTING SOIL MIX

- A. Prepared Soil for Trees and Shrubs: The prepared soil mix for the backfill of tree and shrub plant pits shall consist of a uniform mixture, by volume and loose measure, of the following components per cubic yard: 20 cubic feet of native/on-site soil, 7 cubic feet of organic soil conditioner, 4 lb. soil sulfur, and 3 lb. of ammonium phosphate fertilizer. Prepared planting soil shall be thoroughly blended prior to placement in plant pits.
- B. Prepared Planting Cacti and Stem Succulents: Prepared planting soil mix for cacti and stem succulents shall consist of on-site native soil with 0.25 lbs. of soil Sulfur incorporated into the soil backfill at each plant.

2.5 CONTRACTOR PROVIDED NURSERY GROWN TREES, SHRUBS, AND CACTI

- A. Plant Form and Quality: All nursery grown trees, shrubs, cacti shall be normally developed individuals of their species. The habit of branching, development of foliage, and outline shall conform to grades of sound, first quality nursery stock for the subject species. All plants shall be free of disease, insects, insect eggs and larvae, animals, or animal damage.
- B. Plant Size: Plant size shall conform to the measurements specified on the plant list, and all provisions of ANSI Z60.1-2014 "American Standards for Nursery Stock" or the "Growers Committee Recommended Tree Specifications" by the Arizona Nursery Association, whichever is the more stringent specification. Minimum caliper and other dimensions shall be as noted on the drawings.
- C. Plant Root Systems: Container grown plants shall be in containers for a sufficient length of time for the root system to hold the earth when taken from the container but not long enough to become rootbound or cause a "hardening off" of the root system. No plant shall be loose in the root ball.

2.6 INORGANIC SURFACING MATERIALS

- A. Decomposed Granite Surfacing: Decomposed granite shall be durable granite material that has been screened to remove particles over one-quarter inch (1/4") in diameter or of the gradation noted on the project plans. Except as may be approved by the Owner's Representative, all material used on the project shall be from the same source and shall match the approved sample. The decomposed granite shall be as supplied by Pioneer Landscape Centers, color "Desert Brown," or approved equal.
- A. Angular Rock Rip Rap Mulch: Angular rock Rip Rap shall be durable granite material that has been screened to provide a range of rock sizes ranging from 4" to 8". Except as may be approved by the Owner's Representative, all material used on the project shall be from the same source and shall match the approved sample. The 4" to 8" rip rap shall be as supplied by Pioneer Landscape Centers, color "Desert Brown," or approved equal.

2.7 STAKING MATERIALS:

- A. Tree Stakes: Tree stakes shall be 2 inch (min.) diameter by 8 feet (min.) long peeled lodge pole pine stakes. Stakes shall be pressure treated with a wood preservative that is approved by state and federal regulatory agencies. Stakes longer than 8 feet shall be utilized, at no additional cost to the Owner, if required to properly support the trees installed on the project.
- B. Guy Wire: Guy Wire shall be 12 gauge, annealed, galvanized wire.
- C. Chaffing Guards: Chaffing guards shall be new, ½ or ¾ inch diameter, reinforced rubber or vinyl hose. Guards shall be 12 inches in length, minimum, as required to protect tree from damage by guy wires.

2.8 HORTICULTURAL CHEMICALS:

- A. Pre-emergent Herbicide: The pre-emergent herbicide shall be "Surflan" or approved equal.
- B. Post-emergent Herbicide: The post emergent herbicide shall be "Round-up" or approved equal.

PART 3 - EXECUTION

3.1 BLUE STAKING

- A. Blue Staking: The Contractor shall have the work area Blue Staked prior to the start of any landscape excavation work. Blue Staking shall be kept current during the course of the project. All utilities damaged by the Contractor shall be repaired or replaced by the Contractor, as required by the Owner or appropriate utility company, at the Contractor's expense.

3.2 INSPECTION OF EXISTING PLANTS

- A. Identification and Marking of Plants to be Preserved-in-Place: Individual plant specimens to be preserved-in-place shall be as shown on the project plans. Plants to be preserved-in-place may have been identified with metal tags. The Contractor shall prominently mark all plants to be preserved-in-place with bright colored flagging tape or other approved method all specimen plants to be preserved-in-place.

3.3 LAYOUT:

- A. Layout: The Contractor shall layout his work, staking out the location of plant materials as shown on the drawings. Tree locations shall be approved by the Owner's Representative prior to the excavation of plant pits.

3.4 INSPECTION OF PLANT MATERIALS AND PLANT PITS:

- A. On-Site Inspection of Plant Materials at Time of Delivery: The Contractor shall notify the Owner's Representative of his intent to deliver plants to the project site 72 hours prior to the scheduled delivery time. The Owner's Representative may elect to inspect plants at the time of delivery. Plants that are rejected at the time of delivery shall be immediately removed from the project site.
- B. Inspection of Plant Pits: All plant pits shall be inspected and approved by the Owner's Representative prior to the placement of prepared soil or prepared topsoil and prior to the installation of plants.

3.5 PLANTING OF TREES, SHRUBS, AND CACTI SUPPLIED IN STANDARD NURSERY POTS AND

TREE POTS:

- A. Seasonal Limitations: The planting of trees, shrubs, and cacti may be conducted at any time selected by the Contractor consistent with the overall project completion schedule. Planting operations conducted during extremely hot, cold, or windy periods shall be performed at the Contractor's risk. Plants which die or become damaged due to weather conditions shall be replaced by the Contractor at no additional cost to the Owner.
- B. Excavation of Plant Pits: Plant pits and plant beds shall be excavated to dimensions detailed. All rock in the excavated soil with a dimension of three inches (3") or larger, shall be removed and disposed of off-site.
- C. Tests for Drainage: When the excavation of plant pits is difficult and it appears that the drainage of irrigation water may not be adequate, the Owner's Representative may direct the Contractor to test selected plant pits for drainage. The testing of up to 25 percent of the total number of plant pits shall be performed by the Contractor, if requested, at no additional cost to the Owner. Testing shall consist of partially filling the pit with water and measuring the rate of infiltration. For acceptance, the pit shall drain at a rate of not less than 6" in 60 minutes. All pits which have not drained at the rate noted shall be deepened or relocated as directed by the Owner's Representative. Deepening shall consist of the construction of a 6" diameter "chimney" to the depth required to achieve an acceptable drainage rate. The deepening or relocation of up to 25 percent of the total number of plant pits shall be performed by the Contractor at no additional cost to the Owner.
- D. Plant Pit Sizes: Plant pit sizes shall be as indicated on the details for the plant type and container size noted.
- E. Removal of Plants from Containers: Plants in containers shall be removed from containers immediately prior to planting in a manner that will not injure the roots, stems, or foliage. Plants that are damaged during planting operations shall be replaced by the Contractor, at his expense, with plants of the same species, variety, and size as originally specified.
- F. Planting Depth: Trees and shrubs shall be set such that the top of the rootball relative to finished grade, is as detailed. Plants that settle shall be excavated, removed, and reset to match the detailed condition.
- G. Staking: Trees of the sizes noted herein as to be staked be staked and guyed the same day they are planted. The number of stakes and the manner in which trees are secured to stakes shall be as detailed.
 - 1. Request for Waiver from Staking Requirement: The Contractor may request a waiver from the requirement to stake trees if it appears staking will not be necessary or beneficial. The waiver may be granted, in part or full, at the sole discretion of the Owner's Representative.

3.6 PRUNING OF TREES AND SHRUBS

- A. Pruning of Trees and Shrubs: Trees and shrubs shall be pruned by qualified personnel as required to promote healthy plant development and form consistent with the park environment. Pruning work shall be performed in accordance with ANSI A-300 (Tree Care Operations: Tree, Shrub, and other Woody Plant Maintenance - Standard Practices).

3.7 INORGANIC SURFACING MATERIALS

- A. Decomposed Granite Surfacing: All areas to be surfaced with decomposed granite shall be brought to the lines and grades shown on the drawings with allowances made for the depth of the surfacing material. Prior to the placement of the decomposed granite, the subgrade shall be treated with pre-emergent herbicide. The herbicide application shall be made in accordance with the manufacturer's written instructions and shall be made by an Applicator licensed by the State of Arizona. The decomposed granite shall be installed over the treated subgrade to the depth noted on the plans. The material shall be fine graded, wetted, and rolled with a hand propelled, water filled drum roller.
1. Reveal at Paved Surfaces: A reveal shall be provided at the interface of decomposed granite / crushed rock areas and paved surfaces. The reveal dimension shall be as detailed. Where not detailed, the reveal shall be one inch (1").

3.8 LANDSCAPE MAINTENANCE:

- A. Maintenance During Construction: The Contractor shall maintain all trees, shrubs, succulents, decomposed granite, and other landscape improvements during project construction. Maintenance shall include, but not be limited to: irrigation, fertilization, pruning, mowing, weed removal, clean-up, herbicide application, and repair of damaged staking. Plants or turf areas which die or become diseased during the construction period shall be replaced at no additional cost to the Owner. Maintenance during construction shall continue until issuance of a Certificate of Substantial Completion.
- B. Inspection of Completed Landscape Planting Work: Upon completion of the landscape planting work, the Contractor shall notify the Owner's Representative who will schedule an inspection of the landscape improvements. During the inspection items that are incomplete or that must be repaired or replaced will be identified. Completion or correction of items noted will be required prior to the issuance of a Certificate of Substantial Completion.
- C. Maintenance after Substantial Completion: After issuance of a Certificate of Substantial Completion, the Contractor shall continue to operate and maintain the landscape improvements for a period of 60 consecutive calendar days. Maintenance shall include, but not be limited to: irrigation, fertilization, pruning, mowing, weed removal in decomposed granite or raked-earth areas, site clean-up, herbicide application, and repair of damaged staking. Plants or turf areas which die or become diseased during the maintenance period, shall be replaced at no additional cost to the Owner. After satisfactory completion of the maintenance period, the Owner will assume responsibility for landscape maintenance.
1. Suspension of Initial Contractor Maintenance Period for Non-Compliance: Failure to comply with the maintenance requirements specified herein, as determined by the Owner's Representative, will result in the number of days being credited to the initial 365 day maintenance period being suspended. The suspension will remain in effect until such time as the remedial action(s) required by the Owner's Representative have been implemented by the Contractor.

3.9 STANDARDS FOR FINAL ACCEPTANCE OF THE LANDSCAPE IMPROVEMENTS\

- A. Standards for Acceptance of Trees, Shrubs, and Cacti: Standards for acceptance of trees, shrubs, cacti, and other plants include, but are not limited to, the following:
1. All trees, shrubs, cacti, and other plants are in place as shown on the project plans, including replacement plants, as required
 2. All tree stakes, guy wires, and chaffing guards are in-place and adjusted as shown on the project plans

3. All trees have been pruned in accordance with these specifications

B. Standards for Acceptance of Areas with Inorganic Surfacing: Standards for acceptance of areas with inorganic include, but are not limited to, the following:

1. Surfacing is free from erosion and displacement of material
2. The finished grade of surfacing material has been maintained and the surface has been raked to provide neat and clean appearance
3. The reveal where the surfacing material abuts paved surfaces has been maintained or re-established as detailed or noted on the project plans.
4. Surfacing is free of weeds, turf grass, and other plants except as shown noted on the project plans

3.10 GUARANTEE:

A. Contractor Installed Plant Material: The Contractor shall guarantee all Contractor installed plant materials for a period of one year commencing on the date of Final Acceptance. Plants which become diseased, or which die during the guarantee period, for reasons other than neglect, improper maintenance, Acts-of-God, or causes deliberate, as determined by the Owner's Representative, shall be replaced by the Contractor at no additional cost to the Owner.

END OF SECTION – 32-90-00