Retrofit of the
Oregon Manufacturing Innovation Center R&D
33701 Charles T Parker Way,
Scappoose OR 97056

PROJECT MANUAL

Permit Set:
March 30, 2020

EDA Award Number: No. 07-01-07446

Project #1404

AKAAN Architecture + Design LLC
101 St Helens, OR, 97051
503-366-3050

Retrofit of the Oregon Manufacturing Innovation Center
33701 Charles T Parker Way, Scappoose OR

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LIST OF DRAWINGS

PART 1 GENERAL

1.1 SUMMARY

This section lists the drawings and Subsurface Data for the project.

1.2 CONTRACT DRAWINGS

Contract drawings are listed on Architectural Cover Sheet Drawing CS1.

1.3 SUPPLEMENTARY INFORMATION

These supplementary drawings and information are not be a part of the contract but are included for information.

1.3.1 Reference Drawings

The following reference drawings are intended only to show the original construction. Drawings are not intended for any other purpose. Supply of these drawings does not warrant that actual conditions do not vary from those indicated.

Metalic Building Company Drawings dated 09/14/2007:
Drawings include: C1, ES-1, F-1, F-2, F-3, E-1, E-2, E-3, E-4, E-5, E-6, E-7, E-8, E-9, E-10, E-11, NS-1, NS-2, NS-3, NS-4, NS-5, NS-6, WS-1.

Building Permit Drawings and additional information by Sherman Engineering submitted to the Columbia County Building Department 11-06-2008:

Drawings include: A1, A3, A4, A5, A6, A7, A8, A9, A10, A11, A12, S1, 1of2, 2of2 along with miscellaneous sketches and calculations.

1.3.2 Subsurface Data

2007 Geotechnical Report by GeoDesign Inc.

-- End of Document --

SECTION 01 11 00

SUMMARY OF WORK

PART 1 GENERAL

1.1 WORK COVERED BY CONTRACT DOCUMENTS

1.1.1 Project Description

The work includes the renovation of the existing OMIC R&D facility. Renovation includes exterior and interior renovations, including but not limited to removing overhead doors, replacing some with new doors, replacing others with walls, installing additional insulation and new heating and cooling equipment and replacing all light fixtures in high-bay, install (2)-5 ton overhead cranes in high-bay, install a new elevator, a new ADA lift, and various other interior renovations, site work including underground utility connections to City and other public utilities, paving, fencing and landscaping, entrance signage and incidental related work.

See Section 01 23 00 for Alternates.

1.1.2 Location

The work is located at 33701 Charles T. Parker Way Scappoose, OR 97056.

1.2 OCCUPANCY OF PREMISES

Building(s) will be occupied during performance of work under this Contract. Before work is started, arrange with the Owner a schedule and sequence of procedure, means of access, space for storage of materials and equipment, and use of approaches, corridors, and stairways.

1.3 EXISTING WORK

Protection of Existing Vegetation, Structures, Equipment, Utilities, and Improvements:

a. Remove or alter existing work in such a manner as to prevent injury or damage to any portions of the existing work which remain.

b. Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work. At the completion of operations, existing work must be in a condition equal to or better than that which existed before new work started.

1.4 LOCATION OF UNDERGROUND UTILITIES

Obtain digging permits prior to start of excavation, and comply with Installation requirements for locating and marking underground utilities. Contact local utility locating service a minimum of 48 hours prior to excavating, to mark utilities, and within sufficient time required if work occurs on a Monday or after a Holiday. Verify existing utility locations indicated on contract drawings, within area of work.

Identify and mark all other utilities not managed and located by the local utility companies. Scan the construction site with Ground Penetrating Radar (GPR), electromagnetic, or sonic equipment, and

mark the surface of the ground or paved surface where existing underground utilities or structures are discovered. Verify the elevations of existing piping, utilities, and any type of underground obstruction not indicated, or specified to be removed, that is indicated or discovered during scanning, in locations to be traversed by piping, ducts, and other work to be conducted or installed. Verify elevations and document before installing new work.

1.4.1 Notification Prior to Excavation

Notify the Owner at least 48 hours prior to starting excavation work.

1.5 SALVAGE MATERIAL AND EQUIPMENT

Items designated to be salvaged remain the property of the Owner. Segregate, itemize, deliver and off-load the salvaged property at the designated storage area.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

-- End of Section --

SECTION 01 23 00

ALTERNATES

PART 1 - GENERAL

1.1 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.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to or deducted from the Base Bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

A. Coordination: Modify or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates.

C. Execute accepted alternates under the same conditions as other work of the Contract.

D. Schedule: A Schedule of Alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF BASE BID AND ALTERNATES

BASE BID: All Interior and exterior building renovation, and site improvements including entry drive, entry sidewalk, paving of drive areas east, north, and west of building, exterior lighting and landscaping, striping of new parking east of side walk, new ADA spaces, and existing parking and as indicated on site plan. Include in base bid all connections to public utilities including water, sewer, storm including storm main to the west side of the building as indicated on drawings as well as trenching and backfill for gas main (assume that gas piping will be supplied by gas utility).

A. **Alternate No. 1** (add) **Parking lot**: Construct Parking lot area west of entry drive and sidewalk as shown on drawings. Items include drive aisles, parking areas, storm drainage, landscaping, parking lot lighting, and striping and striping around building.
Note: Alternate shall include all site striping except that included in the base bid.

B. **Alternate No. 2** (deduct) **ADA Lift:** Substitute Worm Drive operated ADA lift of same size and configuration for specified hydraulic operated ADA lift.

END OF SECTION

SECTION 01 33 00

SUBMITTAL PROCEDURES

PART 1 GENERAL

0.1 DEFINITIONS

0.1.1 Submittal Descriptions

Submittal requirements are specified in the technical sections. Preconstruction

Submittals

Preconstruction Submittals include schedules and a tabular list of locations, features, and other pertinent information regarding products, materials, equipment, or components to be used in the work. Submit pre-construction submittals as specified in contract, or within 30 days if not specified elsewhere.

- Certificates Of Insurance
- Surety Bonds
- List Of Proposed Subcontractors
- List Of Proposed Products

Shop Drawings

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

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

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

Product Data

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

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

Samples

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

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

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

the project and those that will be removed at conclusion of the work.

Design Data

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

Test Reports

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

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

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

Investigation reports

Daily logs and checklists

Final acceptance test and operational test procedure

Certificates

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

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

Confined space entry permits.
Factory test reports.
Text of posted operating instructions.

Manufacturer's Instructions

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

Manufacturer's Field Reports

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

Operation and Maintenance Data

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

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

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

Closeout Submittals

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

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

0.1.2 Approving Authority

Designated person authorized to approve the submittal.

0.1.3 Work

As used in this section, on-site and off-site construction required by contract documents, including labor necessary to produce submittals, construction, materials, products, equipment, and systems incorporated or to be incorporated into construction.

0.2 SUBMITTALS

Submit the required submittals as listed in individual specification sections.

0.3 INFORMATION ONLY

0.3.1 For Information Only

Submittals not requiring approval will be for information only.

0.4 PREPARATION

0.4.1 Submittal Format

0.4.1.1 Format of Preconstruction Submittals

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

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

0.4.1.2 Format for Shop Drawings

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

a. Include the nameplate data, size, and capacity on drawings. Also include applicable technical society publication references.

b. Dimension drawings, except diagrams and schematic drawings. Prepare drawings demonstrating interface with other trades to scale. Use the same unit of measure for shop drawings as indicated on the contract drawings. Identify materials and products for work shown.

0.4.1.2.1 Drawing Identification

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

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

Reserve a blank space, no smaller than 3x3 inches on the right-hand side of each sheet for the disposition stamp.

0.4.1.3 Format of Product Data

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

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

0.4.1.3.1 Product Information

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

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

0.4.1.3.2 Standards

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

complies with the specified organization's reference standard.

0.4.1.3.3 Data Submission

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

Submit the manufacturer's instructions before installation.

0.4.1.4 Format of Samples

0.4.1.4.1 Sample Characteristics

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

a. Sample of Equipment or Device: Full size.

b. Sample of Materials Less Than 2 by 3 inches: Built up to 8 1/2 by 11 inches.

c. Sample of Materials Exceeding 8 1/2 by 11 inches: Cut down to 8 1/2 by 11 inches and adequate to indicate color, texture, and material variations.

d. Sample of Linear Devices or Materials: 10 inch length or length to be supplied, if less than 10 inches. Examples of linear devices or materials are conduit and handrails.

e. Sample Volume of Nonsolid Materials: Pint. Examples of nonsolid materials are sand and paint.

f. Color Selection Samples: 2 by 4 inches. Where samples are specified for selection of color, finish, pattern, or texture, submit the full set of available choices for the material or product specified. Sizes and quantities of samples are to represent their respective standard unit.

g. Sample Panel: 4 by 4 feet.

h. Sample Installation: 100 square feet.

0.4.1.4.2 Sample Incorporation

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

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

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

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

0.4.1.5 Format of Design Data

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

0.4.1.6 Format of Test Reports

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

0.4.1.7 Format of Certificates

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

0.4.1.8 Format of Manufacturer's Instructions

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

Submit the manufacturer's instructions before installation.

0.4.1.8.1 Standards

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

0.4.1.9 Format of Manufacturer's Field Reports

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

0.4.1.10 Format of Operation and Maintenance Data (O&M)

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

0.4.1.11 Format of Closeout Submittals

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

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

0.5 QUANTITY OF SUBMITTALS

0.5.1 Number of Preconstruction Submittal Copies

Unless otherwise specified, submit two sets of administrative submittals.

0.5.2 Number of Samples

a. Submit two samples, or two sets of samples showing the range of variation, of each required item. One approved sample or set of samples will be retained by the approving authority and one will be returned to the Contractor.

b. Submit one sample panel or provide one sample installation where directed. Include components listed in the technical section or as directed.

c. Submit one sample installation, where directed.

d. Submit one sample of nonsolid materials.

0.6 INFORMATION ONLY SUBMITTALS

Approval of the Architect is not required on information only submittals. The Architect will mark "receipt acknowledged" on submittals for information and will return only the transmittal cover sheet to the Contractor. Normally, submittals for information only will not be returned. However, the Architect reserves the right to return unsatisfactory submittals and require the Contractor to resubmit any item found not to comply with the contract. This does not relieve the Contractor from the obligation to furnish material conforming to the plans and specifications and will not prevent the Architect from requiring removal and replacement of nonconforming material incorporated in the work.

-- END OF SECTION --

SECTION 00 40 00

QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 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.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for quality assurance and quality control.

B. 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 required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

C. Related Sections include the following:
1. Drawings and Divisions 2 through 16 Sections for specific test and inspection requirements.

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 used to verify selections made under sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Approved mockups establish the standard by which the Work will be judged.

D. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.

E. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.

F. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

G. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

H. 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. 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.

I. Experienced: When used with an entity, "experienced" means having successfully completed a minimum of five (5) previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.4 CONFLICTING REQUIREMENTS

A. General: 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.

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.

1.5 SUBMITTALS

A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

B. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification Section number and title.
2. Description of test and inspection.
3. Identification of applicable standards.
4. Identification of test and inspection methods.
5. Number of tests and inspections required.

6. Time schedule or time span for tests and inspections.
7. Entity responsible for performing tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

C. Reports: Prepare and submit certified written reports that include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

D. 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.

1.6 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. 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.

C. 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.

D. Fabricator Qualifications: A firm experienced in producing products 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.

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 to those indicated for this Project in material, design, and extent.

F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

1. Requirement for specialists shall not supersede building codes and regulations governing the Work.

G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 548; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.

1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

H. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

1.7 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
2. Payment for these services will be made from testing and inspecting allowances, as authorized by Change Orders.
3. 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**.**

B. Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.

1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.

   a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.

2. Notify testing agencies at least **24** hours in advance of time when Work that requires testing or inspecting will be performed.
3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 1 Section "Submittal Procedures."

D. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

E. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Architect 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, in duplicate, 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.

F. 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.

G. 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

A. Special Tests and Inspections: Owner will engage a qualified **testing agency** to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, and as follows:

1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
2. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.

5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. Retesting and reinspecting corrected work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 ACCEPTABLE TESTING AGENCIES

A. Carlson Testing Inc. 8430 Hunziker Road, Tigard OR 97223, 50.-684-3460

B. ACS Testing INC 7409 SW Tech Center Drive Suite 145, Tigard OR 97223, 503-443-3799

C. Mayes Testing Engineers Inc. 7911 NE 33rd Drive Suite 190, Portland OR 97211, 503-281-7515

D. Clair Company, 525 NW 2nd Street, Corvallis OR 97330, 503-758-1302

3.2 TEST AND INSPECTION LOG

A. Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Architect.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

3.3 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. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.
2. Comply with the Contract Document requirements for Division 1 Section "Cutting and Patching."

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

SECTION 01 45 35
SPECIAL INSPECTIONS

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

ASCE 7 (2017) Minimum Design Loads for Buildings and Other Structures

INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC (2018) International Building Code

OREGON STRUCTURAL SPECIALTY CODE (OSSC)

OSSC (2019) Oregon Structural Specialty Code.

1.2 GENERAL REQUIREMENTS

The Statement of Special Inspections and Schedule of Special Inspections are listed on the construction drawings.

Perform Special Inspections in accordance with the Schedule of Special Inspections and Chapter 17 of ICC IBC as modified by the Oregon Structural Specialty Code (OSSC) latest edition.

Special Inspections are to be performed by an independent third party and are intended to ensure that the work of the prime contractor is in accordance with the Contract Documents and applicable building codes. Special inspections do not take the place of any testing and inspections required by other sections of the specifications.

1.3 DEFINITIONS

1.3.1 Periodic Special Inspections

Periodic Special Inspections is Special Inspections by the special inspector who is intermittently present where the work to be inspected has been or is being performed.

1.3.2 Special Inspector (SI)

A qualified person retained by the contractor having the competence necessary to inspect a particular type of construction requiring Special Inspections. The SI must be an independent third party hired directly by the Prime Contractor.

1.3.3 Third Party

A third party inspector must not be company employee of the Contractor or any Sub Contractor performing the work to be inspected.

1.3.4 Designer of Record (DOR)

A registered design professional responsible for the overall design and review of submittal documents prepared by others. The DOR is registered or licensed to practice their respective design profession as defined by the statutory requirements of the professional registration laws in state in which the design professional works. The DOR may be also referred to as the Architect

or Engineer of Record (EOR) in design code documents.

1.4 SUBMITTALS

Test Reports
Special Inspections Daily Reports
Special Inspections Biweekly Reports

Closeout Submittals

Comprehensive Final Report of Special Inspections

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 RESPONSIBILITIES

3.1.1 Special Inspectors

a. Inspect all elements of the project for which the special inspector is qualified to inspect and are identified in the Schedule of Special Inspections.

b. Attend preparatory phase meetings related to the Work for which the

c. Submit a copy of the periodic and/or daily reports.

d. A report is required for each biweekly period in which Special Inspections activity occurs, and must include the following:

(1) A brief summary of the work performed during the reporting time frame.

(2) Changes and/or discrepancies with the drawings, specifications that were observed during the reporting period.

(3) Discrepancies which were resolved or corrected.

(4) A list of nonconforming items requiring resolution.

(5) All applicable test results.

e . At the completion of the project submit a final report of Special Inspections that documents the Special Inspections completed for the project and corrections of all discrepancies noted in the reports. The comprehensive final report of Special Inspections must be signed, dated and indicate the certification of the special inspector qualifying them to conduct the inspection.

3.2 DEFECTIVE WORK

Check work as it progresses, but failure to detect any defective work or materials must in no way prevent later rejection if defective work or materials are discovered, nor obligate acceptance of such work.

-- End of Section --

SECTION 01 50 00

TEMPORARY CONSTRUCTION FACILITIES AND CONTROLS

PART 1 GENERAL

1.1 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

Preconstruction Submittals
Construction Site Plan;

1.2 CONSTRUCTION SITE PLAN

Prior to the start of work, submit a site plan showing the locations and dimensions of temporary facilities (including layouts and details, equipment and material storage area (onsite and offsite), and access and haul routes, avenues of ingress/egress to the fenced area and details of the fence installation. Identify any areas which may have to be graveled to prevent the tracking of mud. Indicate if the use of a supplemental or other staging area is desired. Show locations of safety and construction fences, site trailers, construction entrances, trash dumpsters, temporary sanitary facilities, and worker parking areas.

PART 2 PRODUCTS

2.1 TEMPORARY SIGNAGE

2.1.1 Bulletin Board

Within one calendar day[s] of mobilization on site and prior to the commencement of work activities, provide a clear weatherproof covered bulletin board not less than 36 by 48 inches in size for displaying the Equal Employment Opportunity poster, a copy of the wage decision contained in the contract, Wage Rate Information poster, Safety and Health Information

2.2 TEMPORARY TRAFFIC CONTROL

2.2.1 Barricades

Erect and maintain temporary barricades to limit public access to hazardous areas. Whenever safe public access to paved areas such as roads, parking areas or sidewalks is prevented by construction activities or as otherwise necessary to ensure the safety of both pedestrian and vehicular traffic barricades will be required. Securely place barricades clearly visible with adequate illumination to provide sufficient visual warning of the hazard during both day and night.

2.3 FENCING

Provide fencing at all open excavations to control access by unauthorized personnel. Safety fencing must be highly visible to be seen by pedestrians and vehicular traffic.

2.3.1 Polyethylene Mesh Safety Fencing

Temporary safety fencing must be a high visibility orange colored, high density polyethylene grid, a minimum of 48 inches high and maximum mesh size of 2 inches. Fencing must extend from the grade to a minimum of 48 inches above the grade and be tightly secured to T-posts spaced as necessary to maintain a rigid and taut fence. Fencing must remain rigid and taut with a minimum of 200 pounds of force exerted on it from any direction with less than 4 inches of deflection.

PART 3 EXECUTION

3.1 EMPLOYEE PARKING

Construction contract employees will park privately owned vehicles in an area designated by the Owner's Representative. This area will be within reasonable walking distance of the construction site. Employee parking must not interfere with existing and established parking requirements.

3.2 TEMPORARY BULLETIN BOARD

Locate the bulletin board at the project site in a conspicuous place easily accessible to all employees, as approved Owners Representative.

3.3 AVAILABILITY AND USE OF UTILITY SERVICES

3.3.1 Temporary Utilities

Provide temporary utilities required for construction. Materials may be new or used, must be adequate for the required usage, not create unsafe conditions, and not violate applicable codes and standards.

3.3.2 Sanitation

a. Provide and maintain within the construction area minimum field-type sanitary facilities and periodically empty wastes into a municipal, district, or station sanitary sewage system, or remove waste to a commercial facility. Any penalties or fines associated with improper discharge will be the responsibility of the Contractor. Maintain these conveniences at all times. Include provisions for pest control and elimination of odors. Existing toilet facilities will not be available to Contractor's personnel.

3.3.3 Telephone

Make arrangements and pay all costs for telephone facilities desired.

3.3.4 Fire Protection

Provide temporary fire protection equipment for the protection of personnel and property during construction. Remove debris and flammable materials daily to minimize potential hazards.

3.4 TRAFFIC PROVISIONS

3.4.1 Maintenance of Traffic

a. Conduct work so as to minimize obstruction of traffic, and maintain traffic on at least half of the roadway width at all times. Obtain approval from the Owners Representative prior to starting any activity that will obstruct traffic.

3.4.2 Dust Control

Provide dust control of construction site as required. Dust control methods and procedures must be approved by the Owners Representative.

3.5 CONTRACTOR'S TEMPORARY FACILITIES

Contractor-owned or -leased trailers must be identified. Size and location of the trailers shall be approved by the Owner's Representative.

3.5.1 Safety Systems

Protect the integrity of any installed safety systems or personnel safety devices. Obtain prior approval from Owner's Representative if entrance into systems serving safety devices is required. If it is temporarily necessary to remove or disable personnel safety devices in order to accomplish contract requirements, provide alternative means of protection prior to removing or disabling any permanently installed safety devices or equipment and obtain approval from the Contracting Officer.

3.5.2 Supplemental Storage Area

Upon request, the Owner’s Representative will designate another or supplemental area for the use and storage of trailers, equipment, and materials. This area may not be in close proximity of the construction site but will be within the installation boundaries. The area will be maintained in an clean and orderly fashion and secured if needed to protect supplies and equipment.

3.5.3 Appearance of Trailers

a. Trailers which are rusted, have peeling paint or are otherwise in need of repair will not be allowed on the property. Trailers must present a clean and neat exterior appearance and be in a state of good repair. Failure to do so will be sufficient reason to require their removal.

3.5.4 Maintenance of Storage Area

a. Uunpaved areas, which are not established roadways, and will be traversed with construction equipment or other vehicles, will be covered with a layer of gravel as necessary to prevent rutting and the tracking of mud onto paved or established roadways, should the Contractor elect to traverse them with construction equipment or other vehicles.

3.5.5 Security Provisions

Provide adequate outside security lighting at the temporary facilities.

The Contractor will be responsible for the security of its own equipment.

3.5.6 Weather Protection of Temporary Facilities and Stored Materials

Take necessary precautions to ensure that roof openings and other critical openings in the building are monitored carefully. Take immediate actions required to seal off such openings when rain or other detrimental weather is imminent, and at the end of each workday. Ensure that the openings are completely sealed off to protect materials and equipment in the building from damage.

3.5.6.1 Building and Site Storm Protection

When a warning of high winds is issued, take precautions to minimize danger to persons, and protect the work and nearby property. Precautions must include, but are not limited to, closing openings; removing loose materials, tools and equipment from exposed locations; and removing or securing scaffolding and other temporary work. Close openings in the work when storms of lesser intensity pose a threat to the work or any nearby property.

3.6 CLEANUP

Remove construction debris, waste materials, packaging material and the like from the work site daily. Any dirt or mud which is tracked onto paved or surfaced roadways must be cleaned away. Store any salvageable materials resulting from demolition activities within the fenced area described above or at a supplemental storage area. Neatly stack stored materials not in trailers, whether new or salvaged.

3.7 RESTORATION OF STORAGE AREA

Upon completion of the project remove all temporary items from the site. Restore areas used during the performance of the contract to the original or better condition. Remove gravel used to traverse grassed areas and restore the area to its original condition, including top soil and seeding as necessary.

-- End of Section --

SECTION 01 60 00

PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 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.

1.2 SUMMARY

A. This 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; product substitutions; and comparable products.

B. Related Sections include the following:
   1. Division 1 Section "Alternates" for products selected under an alternate.
   2. Division 1 Section "Closeout Submittals" for submitting warranties for Contract closeout.
   3. Divisions 2 through 16 Sections for specific requirements for warranties on products and installations specified to be warranted.

1.3 DEFINITIONS

A. Products: Items purchased 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, that is current as of date of the Contract Documents.
   2. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, 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. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," 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 other named manufacturers.

1.4 SUBMITTALS

A. Product List: Submit a list, in tabular from, showing specified products. Include generic names of products required. Include manufacturer's name and proprietary product names for each product.

1. Coordinate product list with Contractor's Construction Schedule and the Submittals Schedule.
2. Form: Tabulate information for each product under the following column headings:

a. Specification Section number and title.
b. Generic name used in the Contract Documents.
c. Proprietary name, model number, and similar designations.
d. Manufacturer's name and address.
e. Supplier's name and address.
f. Installer's name and address.
g. Projected delivery date or time span of delivery period.
h. Identification of items that require early submittal approval for scheduled delivery date.

3. Initial Submittal: Within 30 days after date of commencement of the Work, submit 3 copies of initial product list. Include a written explanation for omissions of data and for variations from Contract requirements.

a. At Contractor's option, initial submittal may be limited to product selections and designations that must be established early in Contract period.

4. Completed List: Within 60 days after date of commencement of the Work, submit 3 copies of completed product list. Include a written explanation for omissions of data and for variations from Contract requirements.
5. Architect's Action: Architect will respond in writing to Contractor within 15 days of receipt of completed product list. Architect's response will include a list of unacceptable product selections and a brief explanation of reasons for this action. Architect's response, or lack of response, does not constitute a waiver of requirement to comply with the Contract Documents.

B. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Substitution Request Form: Use CSI Form 13.1A or a facsimile of form provided at end of Section .
2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

a. Statement indicating why specified material or product cannot be provided.
b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.

e. Samples, where applicable or requested.
f. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
h. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
i. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.
j. Cost information, including a proposal of change, if any, in the Contract Sum.
k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
l. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within 7 days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.

a. Form of Acceptance: Change Order.
b. Use product specified if Architect cannot make a decision on use of a proposed substitution within time allocated.

C. Comparable Product Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.

a. Form of Approval: Written approval with architect’s approval stamp on returned submittal.
b. Use product specified if Architect cannot make a decision on use of a comparable product request within time allocated.

D. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 1 Section "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.

1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. 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 ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project 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. Store cementitious products and materials on elevated platforms.
5. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
7. Protect stored products from damage and liquids from freezing.
8. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.7 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.

1. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final 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 appropriate form properly executed.
3. Refer to Divisions 2 through 16 Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Division 1 Section "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, that are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Where products are accompanied by the term "match sample," sample to be matched is Architect's.
6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.
7. Or Equal: Where products are specified by name and accompanied by the term "or equal" or "or approved equal" or "or approved," comply with provisions in Part 2 "Comparable Products" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures:

1. Product: Where Specifications name a single product and manufacturer, provide the named product that complies with requirements.
2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements.
3. Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.
4. Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.
5. Available Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product.
6. Available Manufacturers: Where Specifications include a list of manufacturers, provide a product by one of the manufacturers listed, or an unnamed manufacturer, that complies with requirements. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product.
7. Product Options: Where Specifications indicate that sizes, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide the specified

product or system. Comply with provisions in Part 2 "Product Substitutions" Article for consideration of an unnamed product or system.

8. Basis-of-Design Product: Where Specifications name a product and include a list of manufacturers, provide the specified 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 provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product by the other named manufacturers.
9. Visual Matching Specification: Where Specifications require matching an established Sample, select a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.

    a. If no product available within specified category matches and complies with other specified requirements, comply with provisions in Part 2 "Product Substitutions" Article for proposal of product.

10. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product that complies with other specified requirements.

    a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that does not include premium items.
    b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 PRODUCT SUBSTITUTIONS

A. Timing: Architect will consider requests for substitution if received within 60 days after the Notice of Award . Requests received after that time may be considered or rejected at discretion of Architect.

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

1. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
2. Requested substitution does not require extensive revisions to the Contract Documents.
3. Requested substitution is consistent with the Contract Documents and will produce indicated results.
4. Substitution request is fully documented and properly submitted.
5. Requested substitution will not adversely affect Contractor's Construction Schedule.
6. Requested substitution has received necessary approvals of authorities having jurisdiction.
7. Requested substitution is compatible with other portions of the Work.
8. Requested substitution has been coordinated with other portions of the Work.
9. Requested substitution provides specified warranty.
10. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

2.3 COMPARABLE PRODUCTS

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

1. Evidence that the proposed product does not require extensive revisions to the Contract Documents, that it 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 01600

SECTION 01 78 00

CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.1 DEFINITIONS

1.1.1 As-Built Drawings

As-built drawings are the marked-up drawings, maintained by the Contractor on-site, that depict actual conditions and deviations from the Contract Documents. These deviations and additions may result from coordination required by, but not limited to: contract modifications; official responses to submitted Requests for Information (RFI's); direction from the Architect or Owner, design that is the responsibility of the Contractor, and differing site conditions. Maintain the as-builts throughout construction as red-lined hard copies on site. These files serve as the basis for the creation of the record drawings.

1.2 SUBMITTALS

Product Data
- Warranty Tags
- Spare Parts Data

Manufacturer's Instructions
- Posted Instructions

Operation and Maintenance Data
- Operation and Maintenance Manuals;

Closeout Submittals
- As-Built Drawings;
- Final Approved Shop Drawings;

1.3 SPARE PARTS DATA

Submit two copies of the Spare Parts Data list.

a. Indicate manufacturer's name, part number, and stock level required for test and balance, pre-commissioning, maintenance and repair activities. List those items that may be standard to the normal maintenance of the system.

PART 2 PRODUCTS

Not used

PART 3 EXECUTION

3.1 AS-BUILT DRAWINGS

3.1.1 Markup Guidelines

Make comments and markup the drawings complete without reference to letters, memos, or materials that are not part of the As-Built drawing. Show what was changed, how it was changed, where item(s) were relocated and change related details. These working as-built markup prints must be neat, legible and accurate.

a. Add and denote any additional equipment or material facilities, service lines, incorporated under As-Built Revisions if not already shown in legend.

b. Use frequent written explanations on markup drawings to describe changes. Do not totally rely on graphic means to convey the revision.

c. Use legible lettering and precise and clear digital values when marking prints. Clarify ambiguities concerning the nature and application of change involved.

d. Wherever a revision is made, also make changes to related section views, details, legend, profiles, plans and elevation views, schedules, notes and call out designations, and mark accordingly to avoid conflicting data on all other sheets.

e. For deletions, cross out all features, data and captions that relate to that revision.

g. For changes on small-scale drawings and in restricted areas, provide large-scale inserts, with leaders to the applicable location.

h. Incorporate all shop and fabrication drawings into the markup drawings.

3.1.2 As-Built Drawings Content

Show on the as-built drawings, but not limited to, the following information:

a. The actual location, kinds and sizes of all sub-surface utility lines. In order that the location of these lines and appurtenances may be determined in the event the surface openings or indicators become covered over or obscured, show by offset dimensions to two permanently fixed surface features the end of each run including each change in direction on the record drawings. Locate valves, splice boxes and similar appurtenances by dimensioning along the utility run from a reference point. Also record the average depth below the surface of each run.

b. The location and dimensions of any changes within the building structure.

c. Layout and schematic drawings of electrical circuits and piping.

d. Correct grade, elevations, cross section, or alignment of roads, earthwork, structures or utilities if any changes were made fromcontract plans.

e. Changes in details of design or additional information obtained from working drawings specified to be prepared or furnished by the Contractor; including but not limited to shop drawings, fabrication, erection, installation plans and placing details, pipe sizes, insulation material, dimensions of equipment, and foundations.

f. The topography, invert elevations and grades of drainage installed or affected as part of the project construction.

g. Changes or Revisions which result from the final inspection.

h. Where contract drawings or specifications present options, show only the option selected for construction on the working as-built markup drawings.

j. Systems designed or enhanced by the Contractor, such as HVAC controls, fire alarm, fire sprinkler, and irrigation systems.

k. Changes in location of equipment and architectural features. l. Modifications.

m. Actual location of anchors, construction and control joints, etc., in concrete.

n. Unusual or uncharted obstructions that are encountered in the contract work area during construction.

3.2 OPERATION AND MAINTENANCE MANUALS

Provide project operation and maintenance manuals as specified in Section 01 78 23 OPERATION AND MAINTENANCE MANUALS DATA. Provide electronic copies of the Operation and Maintenance Manual files. Submit for approval within 30 calendar days of Substantial Completion.

3.3 CLEANUP

Leave premises "broom clean." Clean interior and exterior glass surfaces exposed to view; remove temporary labels, stains and foreign substances; polish transparent and glossy surfaces; vacuum carpeted and soft surfaces. Clean equipment and fixtures to a sanitary condition. Replace filters of operating equipment. Clean debris from roofs, gutters, downspouts and drainage systems. Sweep paved areas and rake clean landscaped areas. Remove waste and surplus materials, rubbish and construction facilities from the site.

-- End of Section --

SECTION 01 78 23

OPERATION AND MAINTENANCE DATA

PART 1 GENERAL

1.1 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

Operation and Maintenance Data & Manuals

1.2 OPERATION AND MAINTENANCE DATA

Submit Operation and Maintenance (O&M) Data for the provided equipment, product, or system, defining the importance of system interactions, troubleshooting, and long-term preventive operation and maintenance. Compile, prepare, and aggregate O&M data to include clarifying and updating the original sequences of operation to as-built conditions. Organize and present information in sufficient detail to clearly explain O&M requirements at the system, equipment, component, and subassembly level. Include an index preceding each submittal. Submit in accordance with this section and Section 01 33 00 SUBMITTAL PROCEDURES.

1.2.1 Package Quality

Documents must be fully legible. Operation and Maintenance data must be consistent with the manufacturer's standard brochures, schematics, printed instructions, general operating procedures, and safety precautions.

1.2.2 Package Content

Comply with the data package requirements specified in the individual technical sections, including the content of the packages and addressing each product, component, and system designated for data package submission, except as follows.

1.2.3 Changes to Submittals

Provide manufacturer-originated changes or revisions to submitted data if a component of an item is so affected subsequent to acceptance of the O&M Data. Submit changes, additions, or revisions required by the Contracting Officer for final acceptance of submitted data within 30 calendar days of the notification of this change requirement.

1.3 OPERATION AND MAINTENANCE MANUAL

Assemble data packages into electronic Operation and Maintenance Manuals. Assemble each manual into a composite electronically indexed file using the most current version of Adobe Acrobat or similar software capable of producing PDF file format. Provide compact disks (CD) or data digital versatile disk (DVD) as appropriate, so that each one contains operation, maintenance and record files, project record documents, and training videos. Include a complete electronically linked operation and maintenance directory.

1.3.1 Organization

Bookmark Product and Drawing Information documents using the current version of CSI Masterformat numbering system, and arrange submittals using the specification sections as a

structure. Use CSI Masterformat along with descriptive bookmarked titles that explain the content of the information that is being bookmarked.

1.3.2 CD or DVD Label and Disk Holder or Case

Provide the following information on the disk label and disk holder or case:

a. Building Number
b. Project Title
c. Activity and Location
d. Construction Contract Number
e. Prepared For: (Contracting Agency)
f. Prepared By: (Name, title, phone number and email address)
g. Include the disk content on the disk label
h. Date
i. Virus scanning program used

1.4 TYPES OF INFORMATION REQUIRED

1.4.1 Operating Instructions

Provide specific instructions, procedures, and illustrations for the following phases of operation for the installed model and features of each system:

1.4.1.1 Safety Precautions and Hazards

List personnel hazards and equipment or product safety precautions for operating conditions. Provide recommended safeguards for each identified hazard.

1.4.1.2 Operator Prestart

Provide procedures required to install, set up, and prepare each system for use.

1.4.1.3 Startup, Shutdown, and Post-Shutdown Procedures

Provide narrative description for Startup, Shutdown and Post-shutdown operating procedures including the control sequence for each procedure.

1.4.1.4 Normal Operations

Provide Control Diagrams with data to explain operation and control of systems and specific equipment. Provide narrative description of Normal Operating Procedures.

1.4.1.5 Emergency Operations

Provide Emergency Procedures for equipment malfunctions to permit a short period of continued operation or to shut down the equipment to prevent further damage to systems and equipment. Provide Emergency Shutdown Instructions for fire, explosion, spills, or other foreseeable contingencies. Provide guidance and procedures for emergency operation of utility systems including required valve positions, valve locations and zones or portions of systems controlled.

1.4.1.6 Operator Service Requirements

Provide instructions for services to be performed by the operator such as lubrication, adjustment, inspection, and recording gauge readings.

1.4.1.7 Environmental Conditions

Provide a list of Environmental Conditions (temperature, humidity, and other relevant data) that are best suited for the operation of each product, component or system. Describe conditions under which the item equipment should not be allowed to run.

1.4.1.8 Operating Log

Provide forms, sample logs, and instructions for maintaining necessary operating records.

1.4.1.9 Additional Requirements for HVAC Control Systems

Provide the following for control systems:

a. Narrative description on how to perform and apply functions, features, modes, and other operations, including unoccupied operation, seasonal changeover, manual operation, and alarms. Include detailed technical manual for programming and customizing control loops and algorithms.

b. Full as-built sequence of operations.

c. Copies of checkout tests and calibrations performed by the Contractor.

d. Full points list.

Provide a listing of rooms with the following information for each room:

(1) Floor
(2) Room number
(3) Room name
(4) Air handler unit ID
(5) Reference drawing number
(6) Air terminal unit tag ID
(7) Heating or cooling valve tag ID (8) Minimum cfm
(9) Maximum cfm

e. Full print out of all schedules and set points after testing and acceptance of the system.

f. Full as-built print out of software program.

g. Marking of system sensors and thermostats on the as-built floor plan and mechanical drawings with their control system designations.

1.4.2 Preventive Maintenance

Provide the following information for preventive and scheduled maintenance to minimize repairs for the installed model and features of each system. Include potential environmental and indoor air quality impacts of recommended maintenance procedures and materials.

1.4.2.1 Lubrication Data

Include the following preventive maintenance lubrication data, in addition to instructions for lubrication

required under paragraph OPERATOR SERVICE REQUIREMENTS:

a. A table showing recommended lubricants for specific temperature ranges and applications.

b. Charts with a schematic diagram of the equipment showing lubrication points, recommended types and grades of lubricants, and capacities.

c. A Lubrication Schedule showing service interval frequency.

1.4.2.2 Preventive Maintenance Plan, Schedule, and Procedures

Provide manufacturer's schedule for routine preventive maintenance, inspections, condition monitoring (predictive tests) and adjustments required to ensure proper and economical operation and to minimize repairs. Provide instructions stating when the systems should be retested. Provide manufacturer's projection of preventive maintenance work-hours on a daily, weekly, monthly, and annual basis including craft requirements by type of craft. For periodic calibrations, provide manufacturer's specified frequency and procedures for each separate operation.

a. Define the anticipated time required to perform each of each test (work-hours), test apparatus, number of personnel identified by responsibility, and a testing validation procedure permitting the record operation capability requirements within the schedule. Provide a remarks column for the testing validation procedure referencing operating limits of time, pressure, temperature, volume, voltage, current, acceleration, velocity, alignment, calibration, adjustments, cleaning, or special system notes. Delineate procedures for preventive maintenance, inspection, adjustment, lubrication and cleaning necessary to minimize repairs.

b. Repair requirements must inform operators how to check out, troubleshoot, repair, and replace components of the system. Include electrical and mechanical schematics and diagrams and diagnostic techniques necessary to enable operation and troubleshooting of the system after acceptance.

1.4.3 Repair

Provide manufacturer's recommended procedures and instructions for correcting problems and making repairs.

1.4.3.1 Troubleshooting Guides and Diagnostic Techniques

Provide step-by-step procedures to promptly isolate the cause of typical malfunctions. Describe clearly why the checkout is performed and what conditions are to be sought. Identify tests or inspections and test equipment required to determine whether parts and equipment may be reused or require replacement.

1.4.3.2 Wiring Diagrams and Control Diagrams

Provide point-to-point drawings of wiring and control circuits including factory-field interfaces. Provide a complete and accurate depiction of the actual job specific wiring and control work. On diagrams, number electrical and electronic wiring and pneumatic control tubing and the terminals for each type, identically to actual installation configuration and numbering.

1.4.3.3 Repair Procedures

Provide instructions and a list of tools required to repair or restore the product or equipment to proper condition or operating standards.

1.4.3.4 Removal and Replacement Instructions

Provide step-by-step procedures and a list of required tools and supplies for removal, replacement, disassembly, and assembly of components, assemblies, subassemblies, accessories, and attachments. Provide tolerances, dimensions, settings and adjustments required. Use a combination of text and illustrations.

1.4.3.5 Spare Parts and Supply Lists

Provide lists of spare parts and supplies required for repair to ensure continued service or operation without unreasonable delays. Special consideration is required for facilities at remote locations. List spare parts and supplies that have a long lead-time to obtain.

1.4.3.6 Repair Work-Hours

Provide manufacturer's projection of repair work-hours including requirements by type of craft. Identify, and tabulate separately, repair that requires the equipment manufacturer to complete or to participate.

1.4.4 Appendices

Provide information required below and information not specified in the preceding paragraphs but pertinent to the maintenance or operation of the product or equipment. Include the following:

1.4.4.1 Product Submittal Data

Provide a copy of Product Data submittals documented with the required approval.

1.4.4.2 Manufacturer's Instructions

Provide a copy of Manufacturer's Instructions submittals documented with the required approval.

1.4.4.3 Parts Identification

Provide identification and coverage for the parts of each component, assembly, subassembly, and accessory of the end items subject to replacement. Include special hardware requirements, such as requirement to use high-strength bolts and nuts. Identify parts by make, model, serial number, and source of supply to allow reordering without further identification. Provide clear and legible illustrations, drawings, and exploded views to enable easy identification of the items. When illustrations omit the part numbers and description, both the illustrations and separate listing must show the index, reference, or key number that will cross-reference the illustrated part to the listed part. Group the parts shown in the listings by components, assemblies, and subassemblies in accordance with the manufacturer's standard practice. Parts data may cover more than one model or series of equipment, components, assemblies, subassemblies, attachments, or accessories, such as typically shown in a master parts catalog.

1.4.4.4 Warranty Information

List and explain the various warranties and clearly identify the servicing and technical precautions prescribed by the manufacturers or contract documents in order to keep warranties in force. Include warranty information for primary components of the system. Provide copies of warranties required by Section 01 78 00 CLOSEOUT SUBMITTALS.

1.4.4.5 Extended Warranty Information

List all warranties for products, equipment, components, and sub-components whose duration exceeds one year. For each warranty listed, indicate the applicable specification section, duration, start date, end date, and the point of contact for warranty fulfillment. Also, list or reference the specific operation and maintenance procedures that must be performed to keep the warranty valid. Provide copies of warranties required by Section 01 78 00 CLOSEOUT SUBMITTALS.

1.4.4.6 Personnel Training Requirements

Provide information available from the manufacturers that is needed for use in training designated personnel to properly operate and maintain the equipment and systems.

1.4.4.7 Testing Equipment and Special Tool Information

Include information on test equipment required to perform specified tests and on special tools needed for the operation, maintenance, and repair of components. Provide final set points.

1.4.4.8 Testing and Performance Data

Include completed prefunctional checklists, functional performance test forms, and monitoring reports. Include recommended schedule for retesting and blank test forms. Provide final set points.

1.4.4.9 Field Test Reports

Provide a copy of Field Test Reports

1.4.4.10 Contractor Information

Provide a list that includes the name, address, and telephone number of the General Contractor and each Subcontractor who installed the product or equipment, or system. For each item, also provide the name address and telephone number of the manufacturer's representative and service organization that can provide replacements most convenient to the project site. Provide the name, address, and telephone number of the product, equipment, and system manufacturers.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 TRAINING

Prior to acceptance provide comprehensive training for the systems and equipment specified in the technical specifications. The training must be targeted for the building maintenance personnel, and applicable building occupants. Instructors must be well-versed in the particular systems that they are presenting.

-- End of Section --

SECTION 02 41 00

DEMOLITION

PART 1 GENERAL PROJECT DESCRIPTION

Definitions

Demolition

Demolition is the process of wrecking or taking out any load-supporting structural member of a facility together with any related handling and disposal operations.

Deconstruction

Deconstruction is the process of taking apart a facility with the primary goal of preserving the value of all useful building materials.

General Requirements

Do not begin demolition or deconstruction until authorization is received. Remove rubbish and debris daily from the project site; do not allow accumulations. The work includes demolition, deconstruction, salvage of identified items and materials, and removal of resulting rubbish and debris. Remove rubbish and debris from property daily, unless otherwise directed. Store materials that cannot be removed daily in areas specified.

ITEMS TO REMAIN IN PLACE

Take necessary precautions to avoid damage to existing items to remain in place, to be reused, or to remain the property of the Owner. Repair or replace damaged items. Coordinate the work of this section with all other work indicated. Construct and maintain shoring, bracing, and supports as required. Ensure that structural elements are not overloaded. Increase structural supports or add new supports as may be required as a result of any cutting, removal, deconstruction, or demolition work performed under this contract. Do not overload structural elements. Provide new supports and reinforcement for existing construction weakened by demolition, deconstruction, or removal work.

Existing Construction Limits and Protection

Do not disturb existing construction beyond the extent indicated or necessary for installation of new construction. Provide temporary shoring and bracing for support of building components to prevent settlement or other movement. Provide protective measures to control accumulation and migration of dust and dirt in all work areas. Remove dust, dirt, and debris from work areas daily.

Weather Protection

For portions of the building to remain, protect building interior and materials and equipment from the weather at all times. Where removal of existing roofing is necessary to accomplish work, have materials and workmen ready to provide adequate and temporary covering of exposed areas.

Utility Service

Maintain existing utilities indicated to stay in service and protect against damage during demolition and deconstruction operations. Prior to start of work.

Facilities

Protect electrical and mechanical services and utilities. Where removal of existing utilities and pavement is specified or indicated, provide approved barricades, temporary covering of exposed areas, and temporary services or connections for electrical and mechanical utilities. Floors, roofs, walls, columns, pilasters, and other structural components that are designed and constructed to stand without lateral support or shoring, and are determined to be in stable condition, must remain standing without additional bracing, shoring, or lateral support until demolished or deconstructed, unless directed otherwise. Ensure that no elements determined to be unstable are left unsupported and place and secure bracing, shoring, or lateral supports as may be required as a result of any cutting, removal, deconstruction, or demolition work performed under this contract.

BURNING

The use of burning at the project site for the disposal of refuse and debris is not permitted.

QUALITY ASSURANCE

Submit timely notification of demolition and renovation in writing 10 working days prior to the commencement of work Comply with Environmental Protection Agency requirements.

Dust Control

Prevent the spread of dust and debris to occupied portions of the building and avoid the creation of a nuisance or hazard in the surrounding area. Do not use water if it results in hazardous or objectionable conditions such as, but not limited to, ice, flooding, or pollution. Sweep or vacuum and dust the work area daily.

PROTECTION

Traffic Control Signs

a. Where safety is endangered in the area of removal work, use barricades.

Protection of Personnel

Before, during and after work continuously evaluate the condition of the structure and take immediate action to protect all personnel working in and around the project site. No area, section, or component of floors, roofs, walls, columns, pilasters, or other structural element will be allowed to be left standing without sufficient bracing, shoring, or lateral support to prevent collapse or failure while workmen remove debris or perform other work in the immediate area.

RELOCATIONS

Perform the removal and reinstallation of relocated items as indicated with workmen skilled in the trades involved. Repair or replace items to be relocated which are damaged by the Contractor with new undamaged items.

EXISTING CONDITIONS

Before beginning any demolition or deconstruction work, survey the site and examine the drawings and specifications to determine the extent of the work. Record existing conditions showing the condition of structures and other facilities adjacent to areas of alteration or removal. It is the Contractor's responsibility to verify and document all required outages which will be required during the course of work, and to note these outages on the record document. Submit survey results.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

EXISTING FACILITIES TO BE REMOVED

Inspect and evaluate existing materials indicated for reuse. Existing construction scheduled to be removed for reuse shall be disassembled. Dismantled and removed materials are to be separated, set aside, and prepared as specified, and stored or delivered to a collection point for reuse, remanufacture, recycling, or other disposal, as specified. Materials shall be designated for reuse onsite whenever possible.

Utilities and Related Equipment

General Requirements

Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing. Do not interrupt existing utilities serving facilities occupied except when approved in writing and then only after temporary utility services have been approved and provided. Do not begin demolition or deconstruction work until all utility disconnections have been made. Shut off and cap utilities for future use, as indicated.

Disconnecting Existing Utilities

Remove existing utilities and terminate in a manner conforming to the nationally recognized code covering the specific utility. When utility lines are encountered but are not indicated on the drawings, notify the Architect prior to further work in that area.

Paving and Slabs

Remove concrete and asphaltic concrete paving and slabs including aggregate base as indicated to a depth of 2 inches below grade. Provide neat sawcuts at limits of pavement removal as indicated. Pavement and slabs not to be used in this project shall be removed at Contractor's expense.

Concrete

Saw concrete along straight lines to a depth of a minimum 2 inch. Make each cut in walls perpendicular to the face and in alignment with the cut in the opposite face. Break out the remainder of the concrete provide that the broken area is concealed in the finished work, and the remaining concrete is sound. At locations where the broken face cannot be concealed, grind smooth or saw cut entirely through the concrete.

Carpentry

Salvage for reuse or recycle lumber, millwork items, and finished boards, and sort by type and size. Remove windows, doors, frames, and cabinets, and similar items as whole units, complete with trim and accessories. Do not remove hardware attached to units, except for door closers. Brace the open end of door frames to prevent damage.

Patching

Where removals leave holes and damaged surfaces exposed in the finished work, patch and repair these holes and damaged surfaces to match adjacent finished surfaces, using on-site materials when available. Where new work is to be applied to existing surfaces, perform removals and patching in a manner to produce surfaces suitable for receiving new work. Finished surfaces of patched area shall be flush with the adjacent existing surface and shall match the existing adjacent surface as closely as possible as to texture and finish. Patching shall be as specified and indicated, and shall include:

a. Concrete and Masonry: Completely fill holes and depressions, caused by previous physical damage or left as a result of removals in existing masonry walls to remain, with an approved masonry patching material, applied in accordance with the manufacturer's printed instructions.

b. Where existing partitions have been removed leaving damaged or missing resilient tile flooring, patch to match the existing floor tile.

c. Patch acoustic lay-in ceiling where partitions have been removed. The transition between the different ceiling heights shall be effected by continuing the higher ceiling level over to the first runner on the lower ceiling and closing the vertical opening with a painted sheet metal strip.

DISPOSITION OF MATERIAL

Title to Materials

Except for salvaged items indicated and materials or equipment scheduled for salvage, all materials and equipment removed and not reused or salvaged, shall become the property of the Contractor and shall be remove

Title to materials resulting from demolition and deconstruction, and materials and equipment to be removed, is vested in the Contractor.

Showing for sale or selling materials and equipment on site is prohibited.

Reuse of Materials and Equipment

Remove and store materials and equipment indicated to be reused or relocated to prevent damage, and reinstall as the work progresses.

CLEANUP

Remove debris and rubbish from basement and similar excavations. Remove and transport the debris in a manner that prevents spillage on streets or adjacent areas. Apply local regulations regarding hauling and disposal.

DISPOSAL OF REMOVED MATERIALS

Regulation of Removed Materials

Dispose of debris, rubbish, scrap, and other non-salvageable materials resulting from removal operations with all applicable federal, state and local regulations.

REUSE OF SALVAGED ITEMS

Recondition salvaged materials and equipment designated for reuse before installation. Replace items damaged during removal and salvage operations or restore them as necessary to usable condition.

-- End of Section --

SECTION 05 51 33
METAL LADDERS

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN LADDER INSTITUTE (ALI)

ALI A14.3	(2008; R 2018) Ladders - Fixed - Safety Requirements

AMERICAN SOCIETY OF SAFETY PROFESSIONALS (ASSP)

ASSP Z359.16	(2016) Safety Requirements for Climbing Ladder Fall Arrest Systems

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M	(2015; Errata 1 2015; Errata 2 2016) Structural Welding Code - Steel

ASTM INTERNATIONAL (ASTM)

ASTM A36/A36M	(2014) Standard Specification for Carbon Structural Steel
ASTM A47/A47M	(1999; R 2018; E 2018) Standard Specification for Ferritic Malleable Iron Castings
ASTM A53/A53M	(2018) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A123/A123M	(2017) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A153/A153M	(2016) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A500/A500M	(2018) Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A653/A653M	(2018) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

ASTM A780/A780M	(2009; R 2015) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM A924/A924M	(2018) Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
ASTM D1187/D1187M	(1997; E 2011; R 2011) Asphalt-Base Emulsions for Use as Protective Coatings for Metal

MASTER PAINTERS INSTITUTE (MPI)

MPI 79	(2012) Primer, Alkyd, Anti-Corrosive for Metal

SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC SP 3	(1982; E 2004) Power Tool Cleaning
SSPC SP 6/NACE No.3	(2007) Commercial Blast Cleaning

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

Shop Drawings
Ladders,
Installation Drawings

Product Data
Ladders

Certificates
Fabricator Certification for Ladder Assembly

1.3 CERTIFICATES

Provide fabricator certification for ladder assembly stating that the ladder and associated components have been fabricated according to the requirements of 29 CFR 1910.23.

1.4 QUALIFICATION OF WELDERS

Qualify welders in accordance with AWS D1.1/D1.1M. Use procedures, materials, and equipment of the type required for the work.

1.5 DELIVERY, STORAGE, AND PROTECTION

Protect from corrosion, deformation, and other types of damage. Store items in an enclosed area free from contact with soil and weather. Remove and replace damaged items with new

items.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Structural Carbon Steel

ASTM A36/A36M.

2.1.2 Structural Tubing

ASTM A500/A500M.

2.1.3 Steel Pipe

ASTM A53/A53M, Type E or S, Grade B.

2.1.4 Fittings for Steel Pipe

Standard malleable iron fittings ASTM A47/A47M.

2.2 FABRICATION FINISHES

2.2.1 Galvanizing

Hot-dip galvanize items specified to be zinc-coated, after fabrication where practicable. Galvanizing: ASTM A123/A123M, ASTM A153/A153M, ASTM A653/A653M or ASTM A924/A924M, G90, as applicable.

2.2.2 Galvanize

Anchor bolts, washers, and parts or devices necessary for proper installation, unless indicated otherwise.

2.2.3 Repair of Zinc-Coated Surfaces

Repair damaged surfaces with galvanizing repair method and paint conforming to ASTM A780/A780M or by application of stick or thick paste material specifically designed for repair of galvanizing. Clean areas to be repaired and remove slag from welds. Heat surfaces to which stick or paste material is applied, with a torch to a temperature sufficient to melt the metallics in stick or paste; spread molten material uniformly over surfaces to be coated and wipe off excess material.

2.2.4 Shop Cleaning and Painting

2.2.4.1 Surface Preparation

Blast clean surfaces in accordance with SSPC SP 6/NACE No.3. Surfaces that will be exposed in spaces above ceiling or in attic spaces, crawl spaces, furred spaces, and chases may be cleaned in accordance with SSPC SP 3 in lieu of being blast cleaned. Wash cleaned surfaces which become contaminated with rust, dirt, oil, grease, or other contaminants with solvents until thoroughly clean.

2.2.4.2 Pretreatment, Priming and Painting

Apply pretreatment, primer, and paint in accordance with manufacturer's printed instructions.[On surfaces concealed in the finished construction or not accessible for finish painting, apply an additional prime coat to a minimum dry film thickness of 1.0 mil. Tint additional prime coat with a small amount of tinting pigment.

2.3 LADDERS

Fabricate vertical ladders conforming to 29 CFR 1910.23 and Section 5 of ALI A14.3. Ladders shall be capable of supporting their maximum intended load. Use 2 1/2 by 3/8 inch steel flats for stringers and 3/4 inch diameter steel rods for rungs unless otherwise indicated. Ladder rungs, step and cleats must be spaced not less than 10 inches and not more than 16 inches wide (measured before installation of ladder safety system), spaced no more than 14 inches apart, plug welded or shouldered and headed into stringers. Install ladders so that the maximum perpendicular distance from the centerline of the steps or rungs, or grab bars, or both, to the nearest permanent object in the back of the ladder or to the finished wall surface will not be less than 7 inches, except for the elevator pit ladders, which have a minimum perpendicular distance of 4.5 inches. Provide heavy clip angles riveted or bolted to the stringer and drilled for not less than two 1/2 inch diameter expansion bolts as indicated. Provide intermediate clip angles not over 48 inches on centers. The top rung of the ladder must be level with the top of the access level, parapet or landing served by the ladder except for hatches or wells. Extend the side rails of through or side step ladders 42 inches above the access level. Provide ladder access protective swing gates at the top of access/egress level. The drawings must indicate ladder locations and details of critical dimensions and materials.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

Install items at locations indicated, according to manufacturer's instructions. Verify all measurements and take all field measurements necessary before fabrication. Provide Exposed fastenings of compatible materials, generally matching in color and finish, and harmonize with the material to which fastenings are applied. Include materials and parts necessary to complete each item, even though such work is not definitely shown or specified. Poor matching of holes for fasteners will be cause for rejection. Conceal fastenings where practicable. Thickness of metal and details of assembly and supports must provide strength and stiffness. Formed joints exposed to the weather to exclude water. Items listed below require additional procedures.

3.2 WORKMANSHIP

Metalwork must be well formed to shape and size, with sharp lines and angles and true curves. Drilling and punching must produce clean true lines and surfaces. Continuously weld along the entire area of contact. Do not tack weld exposed connections of work in place. Grid smooth exposed welds. Provide smooth finish on exposed surfaces of work in place, unless otherwise approved. Where tight fits are required, mill joints. Cope or miter corner joints, well formed, and in true alignment. Install in accordance with manufacturer's installation instructions and approved drawings, cuts, and details.

3.3 ANCHORAGE, FASTENINGS, AND CONNECTIONS

Provide anchorage where necessary for fastening metal items securely in place. Include for anchorage not otherwise specified or indicated slotted inserts, expansion anchors, and powder-

actuated fasteners, when approved for concrete; toggle bolts and through bolts for masonry; machine bolts, carriage bolts and powder-actuated threaded studs for steel; through bolts, lag bolts, and screws for wood. Do not use wood plugs in any material. Provide non-ferrous attachments for non-ferrous metal. Make exposed fastenings of compatible materials, generally matching in color and finish, to which fastenings are applied. Conceal fastenings where practicable.

3.4 WELDING

Perform welding, welding inspection, and corrective welding, in accordance with AWS D1.1/D1.1M. Use continuous welds on all exposed connections. Grind visible welds smooth in the finished installation.

3.5 FINISHES

3.5.1 Dissimilar Materials

Where dissimilar metals are in contact, protect surfaces with a coat conforming to MPI 79 to prevent galvanic or corrosive action. Where aluminum is in contact with concrete, plaster, mortar, masonry, wood, or absorptive materials subject to wetting, protect with ASTM D1187/D1187M, asphalt-base emulsion.

3.5.2 Field Preparation

Remove rust preventive coating just prior to field erection, using a remover approved by the rust preventive manufacturer. Surfaces, when assembled, must be free of rust, grease, dirt and other foreign matter.

3.5.3 Environmental Conditions

Do not clean or paint surface when damp or exposed to foggy or rainy weather, when metallic surface temperature is less than 5 degrees F above the dew point of the surrounding air, or when surface temperature is below 45 degrees F or over 95 degrees F.

3.6 LADDERS

Secure to the adjacent construction with the clip angles attached to the stringer. Secure to masonry or concrete with not less than two 1/2 inch diameter expansion bolts. Install intermediate clip angles not over 48 inches on center.Install brackets as required for securing of ladders welded or bolted to structural steel or built into the masonry or concrete. Ends of ladders must not rest upon floor.

-- End of Section --

SECTION 07 21 13

MINERAL FIBER BOARD
INSULATION

PART 1 GENERAL

1.1 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM C612	(2014) Mineral Fiber Block and Board Thermal Insulation
ASTM E84	(2018a) Standard Test Method for Surface Burning Characteristics of Building Materials

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

Product Data
Manufacturer's Standard Details;
Block or Board Insulation;
Accessories including sealants;

Certificates
Block or Board Insulation;

Manufacturer's Instructions
Block or Board Insulation

1.3 MANUFACTURER'S DETAILS

Submit manufacturer's standard details indicating methods of attachment and spacing, transition and termination details, and installation details. Include verification of existing conditions.

1.4 PRODUCT DATA

Include data for material descriptions, recommendations for product shelf life, requirements for protection board or coatings, and precautions for flammability and toxicity. Include data to verify compatibility of sealants with insulation.

1.5 DELIVERY, STORAGE, AND HANDLING

1.5.1 Delivery

Deliver materials to the site in original sealed wrapping bearing manufacturer's name and brand designation, specification number, type, grade, R-value, and class. Store and handle to protect from damage. Do not allow insulation materials to become wet, soiled, crushed, or covered with ice or snow. Comply with manufacturer's recommendations for handling, storing,

and protecting of materials before and during installation.

1.5.2 Storage

Inspect materials delivered to the site for damage and store out of weather in manufacturer's original packaging. Store only in dry locations, not subject to open flames or sparks, and easily accessible for inspection and handling. Keep materials wrapped and separated from off-gassing materials (such as drying paints and adhesives). Do not use materials that have visible moisture or biological growth. Comply with manufacturer's recommendations for handling, storage, and protection of materials before and during installation.

1.6 SPECIAL WARRANTIES

1.6.1 Guarantee

Guarantee insulation installation against failure due to ultraviolet light exposure for a period of three years from the date of Occupancy.

1.6.2 Warranty

Provide manufacturer's material warranty for all system components for a period of three years from the date of Completion.

PART 2 PRODUCTS

2.1 BLOCK OR BOARD INSULATION

Provide thermal insulating materials as recommended by manufacturer for each type of application indicated. Provide insulation with the following physical properties and in accordance with the following standards:

Mineral Fiber Block and Board: ASTM C612

Accecptable Products:
Thermafiber Rainbarrier 45 1-1/2 & 2" thick.
Roxul Comfortbord 80, 1-1/2 & 2" thick.

2.1.1 Fire Protection Requirements

a. Flame spread index of 0 or less when tested in accordance with ASTM E84.

b. Smoke developed index of 0 when tested in accordance with ASTM E84.

2.2 PROTECTION BOARD OR COATING

As recommended by insulation manufacturer.

2.3 ACCESSORIES

2.3.1 Adhesive

As recommended by insulation manufacturer.

2.3.2 Mechanical Fasteners

Corrosion resistant fasteners as recommended by the insulation manufacturer.

PART 3 EXECUTION

3.1 EXISTING CONDITIONS

Prior to installation, ensure all areas that are in contact with the insulation are dry and free of projections that could cause voids, compressed insulation, or punctured vapor retarders. For foundation perimeter or under slab applications, check that subsurface fill is flat, smooth, dry, and well tamped. Do not proceed with installation if moisture or other conditions are present, and notify the Contracting Officer of such conditions. Do not proceed with the work until conditions have been corrected and verified to be dry.

3.3 INSTALLATION

3.3.1 Installation and Handling

Provide insulation in accordance with the manufacturer's printed installation instructions. Keep material dry and free of extraneous materials.

3.3.2 Electrical Wiring

Do not install insulation in a manner that would enclose electrical wiring between two layers of insulation.

3.3.3 Continuity of Insulation

Butt tightly against adjoining boards, studs, rafters, joists, sill plates, headers and obstructions. Provide continuity and integrity of insulation at corners, wall to ceiling joint, roof, and floor. Avoid creating thermal bridges and voids. Provide and verify continuity of insulative barrier throughout the building enclosure.

3.3.4 Coordination

Verify final installed insulation thicknesses comply with thicknesses indicated, R-values pecified herein, and with the approved insulation submittal(s).

3.4 INSTALLATION ON WALLS

3.4.1 Installation using Furring Strips

Install insulation between members as recommended by insulation manufacturer.

3.4.2 Protection Board or Coating

Install protection board or coating in accordance with manufacturer's printed instructions. Install protection over all exterior exposed insulation and to 1 foot below grade.

-- End of Section --

SECTION 07 21 16

METAL BUILDING BLANKET INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Provide insulation system for pre-engineered metal buildings – new construction and existing construction.

B. Related Sections:
1. Division 21 - Fire Suppression
2. Division 22 - Plumbing; Rough-in utilities.
3. Division 23 - HVAC; Rough-in utilities.
4. Division 26 - Electrical; Rough-in utilities.

1.2 REFERENCES

A. Materials shall meet the property requirements of one or more of the following specifications as applicable to the specific product or end use:

1. American Society for Testing of Materials (ASTM):
   a. ASTM C991 - Standard Specification for Flexible Fibrous Glass Insulation for Metal Buildings.
   b. ASTM C1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.
   c. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
   d. ASTM E 96 - Standard Test Method for Water Vapor Transmission of Materials in Sheet Form (Procedure A).
2. North American Insulation Manufacturers Association (NAIMA):
   a. NAIMA 202-96(R) (Rev. 2000) STANDARD For Flexible Fiberglass Insulation to be Laminated for Use in Metal Buildings
3. National Fire Protection Association (NFPA):
   a. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.
4. Underwriters Laboratories (UL):
   a. UL 723 - Test for Surface Burning Characteristics of Building Materials.

1.3 DESIGN REQUIREMENTS

A. Insulation: +\- 6.75” thick with an R-Value of R21.

B. The installed roof and wall systems shall provide a continuous vapor barrier.

1.4 SUBMITTALS

A. Product Data: Provide manufacturer’s data for each of the following including:
1. Roof installation instructions
2. Wall installation instructions
3. Product data sheet

4. Design considerations guide
5. Recycle content certification for fiberglass insulation products – minimum 50% recycled content for all fiberglass insulation materials.

B. Shop Drawings: Provide shop drawings that indicate the following:
1. Liner fabric layout
2. Insulation Layout and cut list
3. Customer and project information

1.5 QUALITY ASSURANCE

A. All products shall be supplied by a single manufacturer for a complete building insulation system.

B. Installer Qualifications: Companies shall be familiar with the installation practices associated with banded liner systems.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store products indoors or in a dry, covered area.

B. Do not open products until ready to use.

C. Protect products from potential construction site damage.

D. Use care when opening products as pallets may shift during shipment.

E. Banding has sharp edges. Wear cut proof gloves when handling.

F. Wear safety glasses when unpacking materials.

1.7 PROJECT CONDITIONS

A. For best results, do not install this system outside of the temperature, humidity, ventilation and environmental limits recommended by the manufacturer. Products should be kept covered and dry at temperatures less than 100°F prior to installation.

PART 2 - PRODUCTS

2.1 Basis of Design Product: Owens Corning OptiLiner Banded Insulation System

A. Substitutions as outlined in Section 01 60 00 Products.

2.2 MANUFACTURER

A. Owens Corning Insulating Systems, LLC, Toledo, OH 43659; www.owenscorning.com.

2.3 MATERIALS

A. Provide a complete building insulation system consisting of the following materials:
1. Unfaced light density fiberglass metal building insulation:
a. Metal Building Insulation

1) Flame Spread Index <25 and Smoke Developed Index <50 when tested in accordance with ASTM E 84, NFPA 255 and UL 723.

2. Fabric liner facing/vapor barrier composed of woven high-density polyethylene coated on both sides with polyethylene. Complies with the following:
   a. ASTM C1136, Types I through Type VI
      1) Type I-IV exception for dimensional stability (value is < 2.0%.)
   b. Perm rating: ≤ 0.02 when tested in accordance with ASTM E 96 Procedure A.
   c. Flame Spread Index < 25 and Smoke Developed Index < 50 when tested in accordance with ASTM E 84.
   d. Color:
      1) White

3. Vapor barrier adhesive. Complies with the following:
   a. Application temperature 10°F to 110° F

4. Double sided vapor barrier tape. Complies with the following:
   a. Width 0.75”
   b. Rubber based and free film

5. Patch tape. Complies with the following:
   a. Adhesive added to one side
   b. Installation temperature from 10°F to 110°F
   c. 3" width
   d. Color - Exposed color to match vapor barrier

6. Metal Banding/Straps. Complies with the following:
   a. Coated steel
   b. 1.0" wide
   c. Structural Steel Grade 50 per ASTM C 653
   d. Color - Exposed color to match vapor barrier
   e. Backing – manufacturer’s standard

7. Light gage steel fasteners
   a. Zinc plated cold forged steel
   b. Head color to match vapor barrier
   c. Contain rubber sealing washer

8. Heavy gage steel fasteners
   a. Zinc plated cold forged steel
   b. Head color to match vapor barrier
   c. Contain rubber sealing washer

9. Insulation Accessories
   a. Other accessories as recommended by manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which work of this section will be installed. Verify that adjacent materials are dry and ready to receive insulation. Verify structure, bracing, and concealed building systems have been tested and inspected.

B. Provide written report listing conditions detrimental to performance of work in this section. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install liner system in accordance with manufacturer's installation instructions and approved Shop Drawings.

B. Purlin and girt attachment surfaces should be clean and dry prior to attaching two-faced tape or sealing adhesive.

C. Installed fiberglass insulation should fit snugly against purlin and girt walls in the cavity space. Avoid gaps, voids and any excess compression.

3.3 CLEANING

A. Clean dirt from vapor barrier fabric using a soft cloth with soap and water or non-abrasive household cleaner. Solvent-based cleaners and abrasive pads should be avoided.

3.4 SAFETY PRECAUTIONS

A. Installation contractor must have a site-specific safety plan and comply with all OSHA applicable local rules and regulations when installing this system.

B. Workers must use OSHA required fall protection when installing the banded liner system at heights (see OSHA regulations at 29 CFR 1926, Subpart M).

C. Banding has sharp edges, cut proof gloves should be worn when handling.

END OF SECTION

SECTION 07 27 19

SELF-ADHERING AIR BARRIERS (Weather Resistive Barrier - WRB)

PART 1 GENERAL

1.1 REFERENCES

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

AIR BARRIER ASSOCIATION OF AMERICA (ABAA)

ABAA Accreditation	Accreditation
ABAA QAP	Quality Assurance Program

ASTM INTERNATIONAL (ASTM)

ASTM D146/D146M	(2004; E 2012; R 2012) Sampling and Testing Bitumen-Saturated Felts and Woven Fabrics for Roofing and Waterproofing
ASTM D412	(2016) Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension
ASTM D570	(1998; E 2010; R 2010) Standard Test Method for Water Absorption of Plastics
ASTM D903	(1998; R 2017) Standard Test Method for Peel or Stripping Strength of Adhesive Bonds
ASTM D1876	(2008; R 2015; E 2015) Standard Test Method for Peel Resistance of Adhesives (T-Peel Test)
ASTM D4541	(2017) Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
ASTM E84	(2018a) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM E96/E96M	(2016) Standard Test Methods for Water Vapor Transmission of Materials
ASTM E283	(2004; R 2012) Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
ASTM E331	(2000; R 2016) Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors,

	and Curtain Walls by Uniform Static Air Pressure Difference
ASTM E2178	(2013) Standard Test Method for Air Permeance of Building Materials
ASTM E2357	(2017) Standard Test Method for Determining Air Leakage of Air Barrier Assemblies

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 285	(2012) Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components

1.2 RELATED REQUIREMENTS

Coordinate the requirements of this Section and other building enclosure sections to provide a complete building air barrier system. Submit all materials, components, and assemblies of the air barrier system together as one complete submittal package.

1.3 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

Preconstruction Submittals
- Qualifications of Manufacturer;
- Qualifications of Installer;

Product Data
- Self-adhering Air Barrier;
- Primers, Adhesives, and Mastics;
- Safety Data Sheets;

Samples
- Self-adhering Air Barrier Mockup;

Test Reports
- Field Peel Adhesion Test;

Manufacturer's Instructions
- Self-adhering Air Barrier;
- Primers,
- Adhesives, and Mastics;

1.4 MISCELLANEOUS REQUIREMENTS

For self-adhering air barrier provide the following:

1.4.1 Shop Drawings

Submit self-adhering air barrier shop drawings showing locations and extent of air barrier assemblies and details of all typical conditions, intersections with other building enclosure assemblies and materials, and membrane counter flashings. Show details for bridging of gaps in construction, treatment of inside and outside corners, expansion joints, methods of attachment of materials covering the self-adhered barrier without compromising the barrier. Indicate how miscellaneous penetrations

such as conduit, pipes, electric boxes, brick ties, and similar items will be sealed.

1.4.2 Product Data

Submit manufacturer's technical data indicating compliance with performance and environmental requirements, manufacturer's printed instructions for evaluating, preparing, and treating substrates, temperature and other limitations of installation conditions, safety requirements for installation, and Safety Data Sheets. Indicate flame and smoke spread ratings for all products.

1.4.3 Mockup

Provide a mockup of the self-adhering air barrier system specified. Apply an area of not less than 54 square feet. Include all components specified as representative of the complete system. Notify the Architect a minimum of 48 hours prior to the test application. Select a test area representative of conditions to be covered including window or door openings, wall to ceiling transitions, flashings, and penetrations, as applicable.

1.5 DELIVERY, STORAGE, AND HANDLING

1.5.1 Delivery

Deliver and store materials in sufficient quantity to allow for uninterrupted flow of work. Inspect materials delivered to the site for damage and store out of weather. Deliver materials to the jobsite in their original unopened packages, clearly marked with the manufacturer's name, brand designation, description of contents, and shelf life of containerized materials. Store and handle to protect from damage.

1.5.2 Storage

Inspect materials delivered to the site for damage; unload and store out of weather in manufacturer's original packaging. Store only in dry locations, not subject to open flames or sparks, and easily accessible for inspection and handling. Protect stored materials from direct sunlight. Keep materials sealed and separated from absorptive materials, such as wood and insulation.

1.6 FIELD PEEL ADHESION TEST

Perform a field peel-adhesion test on the construction mockup. Test the self-adhering air barrier for adhesion in accordance with ASTM D4541 using a Type II pull tester except use a disk that is 4 inches in diameter and cut through the membrane to separate the material attached to the dish from the surrounding material. Perform test after curing period in accordance with manufacturer's written recommendations. Record mode of failure and area which failed in accordance with ASTM D4541. Compare adhesion values with the manufacturer's established minimum values for the particular combination of material and substrate. Indicate on the inspection report whether the manufacturer's requirement has been met. Where the manufacturer has not declared a minimum adhesion value for their product and substrate combination, the inspector must record actual values.

1.7 QUALITY ASSURANCE

1.7.1 Qualifications of Manufacturer

Submit documentation verifying that the manufacturer of the self-adhering air barrier is currently accredited by Air Barrier Association of America (ABAA Accreditation https://www.airbarrier.org/).

1.7.2 Qualifications of Installer

Submit documentation verifying that installers of the self-adhering air barrier are currently certified in accordance with the ABAA QAP Quality Assurance Program (https://www.airbarrier.org/qap/).

1.8 PRECONSTRUCTION MEETING

Conduct a preconstruction meeting a minimum of two weeks prior to commencing work specified in this Section. Agenda must include, at a minimum, construction and testing of mockup, sequence of construction, coordination with substrate preparation, materials approved for use, compatibility of materials, coordination with installation of adjacent and covering materials, and details of construction. Attendance is required by representatives of related trades including covering materials, substrate materials, adjacent materials, and materials and components of the air barrier system.

1.9 ENVIRONMENTAL CONDITIONS

1.9.1 Temperature

Install air barrier within the range of ambient and substrate temperatures as recommended in writing by the air barrier manufacturer. Verify that the surface to receive self-adhering air barrier is dry for a minimum of 48 hours prior to the installation of the barrier. Do not apply air barrier to damp or wet substrates. Do not apply during inclement weather or when ice, frost, surface moisture, or visible dampness is present on surfaces to be covered, or when precipitation is imminent.

1.9.2 Exposure to Weather and Ultraviolet Light

Protect air barrier products from direct exposure to rain, snow, sunlight, mist, and other extreme weather conditions. Replace, at no additional cost to the government, barrier products that have been exposed to ultraviolet (sun)light longer than allowed by manufacturer's written requirements.

PART 2 PRODUCTS

2.1 SELF ADHERING AIR BARRIER (WEATHER RESISTANT BARRIER - WRB)

Provide minimum 0.040 inch thick self-adhering, vaporpermeable, air barrier membrane consisting of a cross-laminated high density polyethylene (HDPE) film, fully coated with rubberized asphalt adhesive. Provide membrane in rolls of various widths interleaved with disposable silicone release paper. Self-adhering air barrier must exhibit no visible water leakage when tested in accordance with ASTM E331 and must perform as a liquid water drainage plane flashed to discharge to the exterior any incidental condensation or water penetration. Use regular or low temperature formulation depending on site conditions, within temperature ranges specified by manufacturer.

2.1.1 Physical Properties

a. Air Permeance (ASTM E2178): Less than 0.004 CFM per sf at 1.57 psf.

b. Air Leakage (ASTM E2357, ASTM E283): less than 0.004 CFM per sf at 1.57 psf at one inch.

c. Tensile Strength (ASTM D412 die C modified): Not less than 400 psi.

d. Tensile Elongation (ASTM D412 die C modified): Not less than 200 percent.

e. Puncture Resistance (ASTM E154/E154M): Not less than 40 lbs.

f. Pliability (ASTM D146/D146M): Unaffected at minus 25 degrees F, 0.063 inch mandrel.

g. Lap Adhesion (ASTM D1876 modified): Not less than 4.0 lbs per inch.

h. Peel Adhesion (ASTM D903): Not less than 5.0 lbs per inch.

i. Water Vapor Permeance Vapor Permeable Air Barrier (ASTM E96/E96M, desiccant method B): greater than 10.0 perms.

j. Water Absorption (ASTM D570): Not to exceed 0.12 percent by weight.

k. Flame propagation of wall assemblies (NFPA 285): Pass

l. Surface Burning Characteristics (ASTM E84):

(1) Flame Spread Index Rating not higher than 75 .

(2) Smoke Developed Index Rating not higher than 150 .

2.2 PRIMERS, ADHESIVES, AND MASTICS

Provide primers, adhesives, mastics and other accessory materials as recommended in writing by the manufacturer of the self-adhering air barrier for adequate bonding to each type of substrate.

2.3 SHEET METAL PANELS & FLASHING

Provide as specified in Section 07 41 13 METAL ROOF & WALL PANELS.

2.4 JOINT SEALANTS

Provide as specified in Section 07 92 00 JOINT SEALANTS. Verify compatibility with adjacent products that are or will be in contact with one another.

PART 3 EXECUTION

3.1 EXAMINATION

Before installing air barrier, examine substrates, areas, and conditions under which air barrier assemblies will be applied, with Installer present, for compliance with requirements. Ensure the following conditions are met:

a. Surfaces are sound, dry, even, and free of oil, grease, dirt, excess mortar or other contaminants.

b. Verify sealants used in sheathing are compatible with membrane proposed for use. Perform field peel adhesion test on materials to which sealants are adhered.

3.2 PREPARATION

Clean, prepare, and treat substrate in accordance with manufacturer's written instructions. Ensure clean, dust-free, and dry substrate for air barrier application.

a. Prime masonry and concrete substrates with conditioning primer.

b. Prime gypsum sheathing an adequate number of coats to achieve required bond, with adequate drying time between coats.

c. Prime wood, metal, and painted substrates with primer.

d. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through air barrier and at protrusions.

3.3 INSTALLATION

3.3.1 Installation of Self-adhering Air Barrier

Install materials in accordance with manufacturer's recommendations and the following:

a. Apply primer at rate recommended by manufacturer prior to membrane installation. Allow primer to dry completely before membrane application. Apply as many coats as necessary for proper adhesion.

b. When membrane is properly positioned, press into place and roll membrane with roller immediately after placement.

c. Apply membrane sheets to shed water naturally without interception by a sheet edge, unless that edge is sealed with permanently flexible termination mastic.

d. Position subsequent sheets of membrane applied above so that membrane overlaps the membrane sheet below by a minimum of 2-1/2 inches, unless greater overlap is recommended by manufacturer. Roll into place with roller.

e. Make all side laps a minimum of 2-1/2 inches and all end laps a minimum of 5 inches, unless greater overlap is recommended by manufacturer. Roll seams with roller.

f. Roll membrane to adhere to substrate. Cover corners and joints with two layers of reinforcement by first applying a 12 inch width of membrane centered along the axis. Flash drains and projections with a second ply of membrane for a distance of 6 inches from the drain or projection.

g. Seal around all penetrations through the air barrier resulting from pipes, vents, conduit, electrical fixtures, structural members, or other construction passing through it. Seal with termination mastic, extruded silicone sealant, membrane counterflashing or other sealing methods in accordance with manufacturer's written recommendations.

h. Continuously connect the air barrier between walls, roof, floor and below grade assemblies to form a continuous integrated air barrier system around the entire building enclosure. Extend the air barrier membrane into rough openings such as doors, windows, louvers, and other exterior penetrations. Seal edges of barrier at junctures with rough openings.

i. At changes in substrate plane, provide transition material (e.g. bead of sealant, mastic, extruded silicone sealant, membrane counterflashing or other material recommended by manufacturer) under membrane to eliminate all sharp 90 degree inside corners and to make a smooth transition from one plane to another.

j. Provide mechanically fastened non-corrosive metal sheet to span gaps in substrate plane and to make a smooth transition from one plane to the other. Continuously support membrane with substrate.

k. At deflection and control joints, provide backup for the membrane to accommodate anticipated movement.

l. At expansion and seismic joints provide transition to the joint assemblies.

m. Apply a bead or trowel coat of mastic along membrane seams at reverse lapped seams, rough cuts, and as recommended by the manufacturer.

n. At end of each working day, seal top edge of membrane to substrate with termination mastic.

o. Do not allow materials to come in contact with chemically incompatible materials.

p. Counterflash upper edge of thru-wall flashing and air barrier.

3.4 FIELD PEEL ADHESION TEST

Conduct in accordance with test protocol indicated in Part 1, paragraph FIELD PEEL ADHESION TEST.

3.5 PROTECTION AND CLEANING

3.5.1 Protection

3.5.1.1 Adjacent Surfaces

Protect exposed adjacent surfaces that could be damaged by primers and adhesives associated with air barrier membrane. Provide protection during application and the remainder of construction in accordance with manufacturer's written instructions.

3.5.1.2 The Air Barrier Assembly

Protect finished portions of the air barrier assembly from damage during ongoing application and throughout the remainder of the construction period in accordance with manufacturer's written instructions. Coordinate timing of installation of materials that will cover the air barrier membrane to ensure the exposure period does not exceed that recommended by the air barrier manufacturer's written installation instructions. Remove and replace, at no additional cost membrane products that exceed the manufacturer's allowed exposure limits.

3.5.2 Cleaning

Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction and as acceptable to the primary material manufacturer.

-- End of Section --

SECTION 07 41 13

METAL ROOF & WALL PANELS

PART 1 GENERAL

1.1 REFERENCES

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

ALUMINUM ASSOCIATION (AA)

AA ADM	(2015) Aluminum Design Manual

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC 341	(2016) Seismic Provisions for Structural Steel Buildings

AMERICAN IRON AND STEEL INSTITUTE (AISI)

AISI S100	(2012) North American Specification for the Design of Cold-Formed Steel Structural Members
AISI SG03-3	(2002; Suppl 2001-2004; R 2008) Cold-Formed Steel Design Manual Set

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

ASCE 7	(2017) Minimum Design Loads for Buildings and Other Structures

ASTM INTERNATIONAL (ASTM)

ASTM A755/A755M	(2018) Standard Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products
ASTM A792/A792M	(2010) Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process
ASTM A924/A924M	(2018) Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
ASTM A1008/A1008M	(2016) Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable
ASTM C552	(2017; E 2018) Standard Specification for Cellular Glass Thermal Insulation

ASTM C553	(2013) Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications
ASTM C792	(2004; R 2008) Effects of Heat Aging on Weight Loss, Cracking, and Chalking of Elastomeric Sealants
ASTM C920	(2018) Standard Specification for Elastomeric Joint Sealants
ASTM D226/D226M	(2017) Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing
ASTM D522/D522M	(2014) Mandrel Bend Test of Attached Organic Coatings
ASTM D523	(2014; R 2018) Standard Test Method for Specular Gloss
ASTM D714	(2002; R 2017) Standard Test Method for Evaluating Degree of Blistering of Paints
ASTM D822	(2013) Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings
ASTM D968	(2017) Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive
ASTM D1056	(2014) Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber
ASTM D1308	(2013) Effect of Household Chemicals on Clear and Pigmented Organic Finishes
ASTM D2244	(2016) Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates
ASTM D2247	(2015) Testing Water Resistance of Coatings in 100% Relative Humidity
ASTM D2794	(1993; R 2019) Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)
ASTM D3359	(2017) Standard Test Methods for Rating Adhesion by Tape Test
ASTM D3363	(2005; E 2011; R 2011; E 2012) Film Hardness by Pencil Test
ASTM D4214	(2007; R 2015) Standard Test Method for Evaluating the Degree of Chalking of Exterior Paint Films
ASTM D4587	(2011) Standard Practice for Fluorescent UV-Condensation Exposures of Paint and Related Coatings

ASTM D5894	(2016) Standard Practice for Cyclic Salt Fog/UV Exposure of Painted Metal, (Alternating Exposures in a Fog/Dry Cabinet and a UV/Condensation Cabinet)
ASTM E84	(2018a) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM E1592	(2005; R 2012) Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference
ASTM E2140	(2001; R 2017) Standard Test Method for Water Penetration of Metal Roof Panel Systems by Static Water Pressure Head

METAL BUILDING MANUFACTURERS ASSOCIATION (MBMA)

MBMA RSDM	(2012) Metal Roofing Systems Design Manual

NATIONAL ROOFING CONTRACTORS ASSOCIATION (NRCA)

NRCA 0420	(2010) Architectural Metal Flashing, Condensation Control and Reroofing NRCA RoofMan (2017) The NRCA Roofing Manual

SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)

SMACNA 1793	(2012) Architectural Sheet Metal Manual, 7th Edition

1.2 DESCRIPTION OF METAL ROOF SYSTEM

1.2.1 Performance Requirements

Steel panels and accessory components must conform to the following standards:

ASTM A1008/A1008M
ASTM A123/A123M
ASTM A36/A36M

1.3 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

Shop Drawings
Roof & Wall Panels; Flashing and Accessories; Gutter/Downspout Assembly;
Product Data

Submit manufacturer's catalog data for the following items: Roof Panels;

Factory-Applied Color Finish;
Accessories;

Fasteners;
Pressure Sensitive Tape;
Underlayments;
Gaskets and Sealing/Insulating Compounds;

Samples
Roof Panels;

Certificates
Roof Panels;

Closeout Submittals
Warranties;

1.4 QUALITY ASSURANCE

1.4.1 Qualification of Manufacturer

Submit documentation verifying metal roof panel manufacturer has been in the business of manufacturing metal roof panels for a period of not less than 5 years.

Manufacturer must also provide engineering services by an authorized engineer, currently licensed in the geographic area of the project, with a minimum of five (5) years experience as an engineer knowledgeable in roof
wind design analysis, protocols and procedures for MBMA RSDM, ASCE 7, UL 580, and FM 4471. Engineer must provide certified engineering calculations for the project conforming to the stated references.

1.4.1.1 Single Source

Provide roofing panels, clips, closures, and other accessories that are standard products of the same manufacturer, and the most recent design of the manufacturer to operate as a complete system for the intended use.

1.4.2 Qualification of Applicator

Metal roof system applicator must be approved, authorized, or licensed in writing by the roof panel manufacturer and have a minimum of 5 years experience as an approved, authorized, or licensed applicator with that manufacturer, approved at a level capable of providing the specified warranty. Supply the names, locations and client contact information of 5 projects of similar size and scope constructed by applicator using the manufacturer's roofing products submitted for this project within the previous three years.

1.4.3 Field Verification

Prior to the preparation of drawings and fabrication, verify location of roof framing, roof openings and penetrations, and any other special conditions. Indicate all special conditions and measurements on final shop drawings.

1.4.4 Pre-roofing Conference

After approval of submittals and before performing roofing system installation work, hold a pre-roofing conference to review the following:

a. Drawings, specifications, and submittals related to the roof work. Submit, as a minimum; sample profiles of roofing panels, with factory-applied color finish samples, flashing and accessories, gutter / downspout assembly samples, typical fasteners and pressure sensitive tape, sample gaskets and sealant/insulating compounds. Also include technical data on coil stock and coil stock compatibility, and

manufacturer's installation manual.

b. Roof system components installation;

c. Procedure for the roof manufacturer's technical representative's onsite inspection and acceptance of the roofing substrate, the name of the manufacturer's technical representatives, the frequency of the onsite visits, distribution of copies of the inspection reports from the manufacturer's technical representative;

d. Contractor's plan for coordination of the work of the various trades involved in providing the roofing system and other components secured to the roofing; and

e. Quality control plan for the roof system installation;

f. Safety requirements.

Coordinate pre-roofing conference scheduling with the Architect. Attendance is mandatory for the Contractor, the Architect's designated personnel, personnel directly responsible for the installation of metal roof system, flashing and sheet metal work, mechanical and electrical work, other trades interfacing with the roof work, and representative of the metal roofing manufacturer. Before beginning roofing work, provide a copy of meeting notes and action items to all attending parties. Note action items requiring resolution prior to start of roof work.

1.5 DELIVERY, HANDLING, AND STORAGE

Deliver, store, and handle panel materials, bulk roofing products, accessories, and other manufactured items in a manner to prevent damage and deformation, as recommended by the manufacturer, and as specified.

1.5.1 Delivery

Package and deliver materials to the site in undamaged condition. Provide adequate packaging to protect materials during shipment. Do not uncrate materials until ready for use, except for inspection. Immediately upon arrival of materials at jobsite, inspect materials for damage, deformation, dampness, and staining. Remove affected materials from the site and immediately replace. Remove moisture from wet materials not otherwise affected, restack and protect from further moisture exposure.

1.5.2 Handling

Handle materials in a manner to avoid damage. Select and operate material handling equipment so as not to damage materials or applied roofing.

1.5.3 Storage

Stack materials stored on site on platforms or pallets, and cover with tarpaulins or other weathertight covering which prevents trapping of water or condensation under the covering. Store roof panels so that water which may have accumulated during transit or storage will drain off. Do not store panels in contact with materials that might cause staining. Secure coverings and stored items to protect from wind displacement.

1.6 PROJECT CONDITIONS

Weather Limitations: Proceed with installation only when existing and forecast weather conditions permit metal roof panel work to be performed according to manufacturer's written instructions and warranty requirements, and specified safety requirements.

1.7 FABRICATION

Fabricate and finish metal roof panels and accessories on a factory stationary industrial type rolling mill to the greatest extent possible, per manufacturer's standard procedures and processes, and as necessary to fulfill indicated performance requirements. Comply with indicated profiles, dimensional and structural requirements.

Provide panel profile, as indicated on drawings for full length of panel. Fabricate panel side laps with factory installed gaskets providing a weather tight seal and preventing metal-to metal contact, and minimizing noise from movements within the panel assembly.

1.7.1 Finishes

Finish quality and application processes must conform to the related standards specified within this section. Noticeable variations within the same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved samples and are assembled or installed to minimize any contrasting variations.

1.7.2 Accessories

Fabricate flashing and trim to comply with recommendations in SMACNA 1793 as applicable to the design, dimensions, metal, and other characteristics of the item indicated.

a. Form exposed sheet metal accessories which are free from excessive oil canning, buckling, and tool marks, and are true to line and levels indicated, with exposed edges folded back to form hems.

b. End Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer.

c. Sealed Joints: Form non-expansion, but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA 1793.

d. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.

e. Fabricate cleats and attachments devices of size and metal thickness recommended by SMACNA or by metal roof panel manufacturer for application, but not less than the thickness of the metal being secured.

1.8 WARRANTIES

Provide metal roof system material and workmanship warranties meeting specified requirements. Provide revision or amendment to manufacturer's standard warranty as required to comply with the specified requirements.

1.8.1 Metal Roof Panel Manufacturer Warranty

Furnish the metal roof panel manufacturer's 10-year no dollar limit roof system materials and installation workmanship warranty, including flashing, components, trim, and accessories necessary for a watertight roof system construction. The warranty must state that:

a. If within the warranty period, the metal roof system, as installed for its intended use in the normal climatic and environmental conditions of the facility, becomes non-watertight, shows evidence of moisture intrusion within the assembly, displaces, corrodes, perforates, separates at the seams, or shows evidence of excessive weathering due to defective materials or installation workmanship, the repair or replacement of the defective and damaged materials of the metal roof system and correction of defective workmanship is the responsibility of the metal roof panel

manufacturer. All costs associated with the repair or replacement work are the responsibility of the metal roof panel manufacturer.

b. If the manufacturer or his approved applicator fail to perform the repairs within 72 hours of notification, emergency temporary repairs performed by others does not void the warranty.

1.8.2 Manufacturer's Finish Warranty

Provide a manufacturer's no-dollar-limit 20 year warranty for the roofing system warranting that the factory color finish, under normal atmospheric conditions at the site, will not crack, peel, or delaminate; chalk in excess of a numerical rating of 8 when measured in accordance with ASTM D4214; or fade or change colors in excess of 5 NBS units as measured in accordance with ASTM D2244.

1.8.3 Continuance of Warranty

Repair or replacement work that becomes necessary within the warranty period must be approved, as required, and accomplished in a manner so as to restore the integrity of the system assembly and validity of the metal system manufacturer warranty for the remainder of the manufacturer warranty period.

1.9 CONFORMANCE AND COMPATIBILITY

Provide the entire metal roofing and flashing system in accordance with specified and indicated requirements, including wind resistance and seismic per AISC 341 requirements. Perform work not specifically addressed and any deviation from specified requirements in general accordance with recommendations of the MBMA RSDM, NRCA Roof Man, the metal panel manufacturer's published recommendations and details, and compatible with surrounding components and construction. Submit any deviation from specified or indicated requirements to the Contracting Officer for approval prior to installation.

PART 2 PRODUCTS

2.1 ROOF PANELS

2.1.1 Steel Sheet Panels

Basis of Design Product: Panels shall be of a profile matching the following PAC-CLAD products.

1. TITE-LOC PLUS panel - 2" high standing seam rib panels, width of panels to be determined by architect.

2. 7.2 Panel - 36" wide panels with 1-1/2" high ribs @ 7.2" oc

Roll-form steel sheet roof panels to the specified profile, from 24 gauge material.

Provide steel panels with a minimum recycled content of 30 percent. Provide data indicating percentage of recycled content for steel roof panels.

Material must be plumb and true, and within the tolerances listed:

a. Galvanized steel sheet conforming to ASTM A653/A653M and AISI SG03-3.

b. Individual panels to have continuous length sufficient to cover the entire length of any unbroken roof slope with no joints or seams and formed without warping, waviness, or ripples that are not a part of the panel profile and free from damage to the finish coating system.

c. Provide panels with thermal expansion and contraction consistent with the type of system specified, and the following profile:

2.2 FACTORY FINISH AND COLOR PERFORMANCE REQUIREMENTS

All panels are to receive a factory applied finish consisting of a baked topcoat with a manufacturer's recommended prime coat conforming to the following:

a. Metal Preparation: All metal is to have the surfaces carefully prepared for painting on a continuous process coil coating line by alkali cleaning, hot water rinsing, application of chemical conversion coating, cold water rinsing, sealing with an acid rinse, and thorough drying.

b. Prime Coating: A base coat of epoxy paint, specifically formulated to interact with the top-coat, is to be applied to the prepared surfaces by roll coating to a dry film thickness of 0.20 plus 0.05 mils. Oven cure the prime coat prior to application of the finish coat.

c. Exterior Finish Coating: Apply the exterior finish coating over the primer by roll coating to a dry film thickness of 0.80 plus 0.05 mils (3.80 plus 0.05 mils for Vinyl Plastisol) for a total dry film thickness of 1.00 plus 0.10 mils (4.00 plus 0.10 mils for Vinyl Plastisol). Oven cure this exterior finish coat.

d. Interior finish coating: Apply a wash coat on the reverse side over primer by roll coating to a dry film thickness of 0.30 plus 0.05 mils for a total dry film thickness of 0.50 plus 0.10 mils. Oven cure the wash coat.

e. Color: The exterior finish chosen from the manufacturer's standard color chart.

f. Physical Properties: Coating must conform to the industry and manufacturer's standard performance criteria as listed by the following certified test reports:

General:	ASTM D5894 and ASTM D4587
Abrasion:	ASTM D968
Adhesion:	ASTM D3359
Chalking:	ASTM D4214
Chemical Pollution:	ASTM D1308
Color Change and Conformity:	ASTM D2244
Creepage:	ASTM D1654
Cyclic Corrosion Test:	ASTM D5894
Flame Spread:	ASTM E84
Flexibility:	ASTM D522/D522M
Formability:	ASTM D522/D522M

Gloss at 60 and 85 degrees:	ASTM D523
Humidity:	ASTM D2247 and ASTM D714
Oxidation:	ASTM D610
Pencil Hardness:	ASTM D3363
Reverse Impact:	ASTM D2794
Salt Spray:	ASTM B117
Weatherometer:	ASTM G152, ASTM G153 and ASTM D822

2.3 MISCELLANEOUS METAL FRAMING

2.3.1 General

Provide cold formed metallic-coated steel sheet conforming to ASTM A653/A653M, AISI S100, unless otherwise indicated.

2.3.2 Fasteners and Miscellaneous Metal Framing

Provide compatible type, corrosion resistant, of sufficient size and length to penetrate the supporting element a minimum of one inch with other required properties to fasten miscellaneous metal framing members to substrates in accordance with the roof panel manufacturer's and ASCE 7 requirements.

2.3.2.1 Exposed Fasteners

Provide corrosion resistant fasteners for roof panels, compatible with the sheet panel or flashing material and of the type and size recommended by the manufacturer to meet the performance requirements and design loads. Provide fasteners for accessories that are the manufacturer's standard. Provide an integral metal washer, matching the color of attached material with compressible sealing EPDM gasket approximately 3/32 inch thick for exposed fasteners.

2.3.2.2 Screws

Provide corrosion resistant screws, of the type and size recommended by the manufacturer to meet the performance requirements.

2.3.2.3 Rivets

Provide closed-end type rivets, corrosion resistant where watertight connections are required.

2.3.2.4 Attachment Clips

Provide hot-dip galvanized, conforming to ASTM A653/A653M, clips. Size, shape, thickness and capacity must meet the thickness and design load criteria specified.

2.4 ACCESSORIES

Provide accessories compatible with the metal roof panels. Sheet metal flashing, trim, metal closure strips, caps, and similar metal accessories must be not less than the minimum thicknesses specified for

roof panels. Provide exposed metal accessories to match the panels furnished. Provide molded foam rib, ridge and other closure strips that are closed-cell or solid-cell synthetic rubber or neoprene premolded to match configuration of the panels and not absorb or retain water.

2.4.1 Pre-manufactured Accessories

Provide pre-manufactured accessories that are manufacturer's standard for intended purpose, compatible with the metal roof system and approved for use by the metal roof panel manufacturer.

2.4.2 Metal Closure Strips

Provide factory fabricated closure strips of same color, finish and profile as the specified roof panel.

2.4.3 Rubber Closure Strips

Provide closed-cell, expanded cellular rubber closure strips conforming to ASTM D1056 and ASTM D1667, extruded or molded to the configuration of the specified roof panel profile and in lengths supplied by roof panel manufacturer.

2.5 JOINT SEALANTS

2.5.1 Sealants

Sealants are to be an approved gun type for use in hand or air pressure caulking guns at temperatures above 40 degrees F (or frost-free application at temperatures above 10 degrees F) with a minimum solid content of 85 percent of the total volume. Ensure sealant dries with a tough, durable surface skin which permits it to remain soft and pliable underneath, providing a weather tight joint. No migratory staining, in conformance with to ASTM C792, is permitted on painted or unpainted metal, stone, glass, vinyl or wood.

Prime all joints to receive sealants with a compatible one-component or two-component primer as recommended by the roof panel manufacturer.

2.5.1.1 Field Applied Sealants

Provide sealants for field-applied caulking that is an approved gun grade, non-sag on-component polysulfide or two component polyurethane with an initial maximum Shore A durometer hardness of 25, conforming to ASTM C920, Type II. Color to match panel color.

2.5.1.2 Tape Sealants

Provide pressure sensitive, 100 percent solid tape sealant with a release paper backing; permanently elastic, non-sagging, non-toxic and non-staining as approved by the roof panel manufacturer.

2.5.2 Sheet Metal Flashing and Trim

2.5.2.1 Fabrication, General

Custom fabricate sheet metal flashing and trim to comply with recommendations within the SMACNA 1793 that apply to design, dimensions, metal type, and other characteristics of design indicated. Shop fabricate items to the greatest extent possible. Obtain and verify field measurements for accurate fit prior to shop fabrication. Fabricate flashing and trim without excessive oil canning, buckling, and tool marks, true to line and levels indicated, with exposed edges folded back to form hems.

2.5.2.2 Roof Drainage Sheet Metal Fabrications

Gutters: Fabricate to cross section indicated, with riveted and soldered joints, complete with end pieces, outlet tubes, and other special accessories as required. Fabricate in minimum 96 inch long sections. Fabricate expansion joints and accessories from the same metal as gutters, unless otherwise indicated.

Downspouts: Fabricate square downspouts complete with mitered elbows. Furnish with metal hangers of same material as downspouts and anchors.

2.6 GASKETS AND SEALING/INSULATING COMPOUNDS

Provide gaskets and sealing/insulating compounds that are nonabsorptive and suitable for insulating contact points of incompatible materials. Utilize sealing/insulating compounds that are non-running after drying.

PART 3 EXECUTION

3.1 EXAMINATION

Examine substrates, areas, and conditions, with installer present, for compliance with requirements for installation tolerances, metal roof panel supports, and other conditions affecting performance of the work. Ensure surfaces are suitable, dry and free of defects and projections which might affect the installation.

Examine primary and secondary roof framing to verify that rafters, purlins, angels, channels, and other structural support members for panels and anchorages have been installed within alignment tolerances required by metal roof panel manufacturer, UL, ASTM, and ASCE 7 requirements.

Examine solid roof sheathing to verify that sheathing joints are supported by framing or blocking; and that installation is within flatness tolerances required by metal roof panel manufacturer.

Examine rough-in for components and systems penetrating metal roof panels to verify actual locations of penetrations relative to seam locations of panels prior to installation.

Submit a written report to the Contracting Officer, endorsed by the installer, listing conditions detrimental to the performance of the work. Proceed with installation only after defects have been corrected.

Do not install items that show visual evidence of biological growth.

3.2 INSTALLATION

Perform installation meeting specified requirements and in accordance with the manufacturer's installation instructions and approved shop drawings. Do not install damaged materials. Insulate dissimilar materials which are not compatible when contacting each other by means of gaskets or sealing/insulating compounds. Keep all exposed surfaces and edges clean and free from sealant, metal cuttings, hazardous burrs, and other foreign material. Remove stained, discolored, or damaged materials from the site.

3.2.1 Preparation

Clean all substrate substances which may be harmful to insulation, and panels including removing projections capable of interfering with insulation, and panel attachment.

Install sub-purlins, eave angles, furring, and other miscellaneous roof panel support members and anchorage according to metal roof panel manufacturer's written instructions.

3.3 PROTECTION OF APPLIED MATERIALS

Do not permit storing, walking, wheeling, and trucking directly on applied roofing/insulation materials. Provide temporary walkways, runways, and platforms of smooth clean boards or planks as necessary to avoid damage to applied roofing/insulation materials, and to distribute weight to conform to indicated live load limits of roof construction.

3.4 FASTENER INSTALLATION

Anchor metal roof panels and other components of the Work securely in place, using approved fasteners according to manufacturer's written instructions.

3.5 FLASHING, TRIM, AND CLOSURE INSTALLATION

3.5.1 General Requirements

Comply with performance requirements, manufacturer's written installation instructions, and SMACNA 1793. Provide concealed fasteners where possible. Set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently water tight and weather resistant. Work is to be accomplished to form weather tight construction without waves, warps, buckles, fastening stresses or distortion, and to allow for expansion and contraction. Perform cutting, fitting, drilling, and other operations in connection with sheet metal required to accomplish the work in conformance with the manufacturers written instructions.

3.5.2 Metal Flashing

Install metal flashing at building corners, rakes, eaves, junctions between metal siding and roofing, valleys and changes off slope or direction in metal, heads, jambs, sills of openings and at ends of wall panels, building expansion joints and gutters.

Utilize exposed metal flashing that is the same material, color, and finish as the specified metal roofing panels unless otherwise specified by by architect. Furnish flashing in minimum 8 foot lengths. Exposed flashing must have 1 inch locked and blind soldered end joints, with expansion joints at intervals of no greater than 16 feet.

Fasten flashing at not more than 8 inches on center for roofs, except where flashing is held in place by the same screws used to secure panels. Bed exposed flashing and flashing subject to rain penetration in specified joint sealant. Isolate flashing which is in contact with dissimilar metals by means of the specified asphalt mastic material to prevent electrolytic deterioration.

Form drips to the profile indicated, with the edge folded back 1/2 inch to form a reinforced drip edge.

3.6 ROOF PANEL INSTALLATION

Provide metal panels of maximum lengths recommended my manufacturer unless otherwise indicated or restricted by shipping limitations. Anchor metal panels or other components of the Work securely in place, with provisions for thermal and structural movement in accordance with NRCA 0420.

Anchor Clips: Anchor metal panels and other components of the Work securely in place, using approved fasteners according to manufacturer's written instructions. Provide all blocking and nailers as required.

Metal Protection: Where dissimilar metals contact each other or possibly corrosive substrates, protect against galvanic action by permanent separation as recommended by the metal roof panel manufacturer.

Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and required for weatherproof performance of metal panel system. Provide types of gaskets, fillers, and

sealants indicated or, if not indicated, types recommended by metal roof panel manufacturer.

3.6.1 Handling and Erection

Erect system in accordance with the approved erection drawings, printed instructions and safety precautions of the manufacturer.

Do not subject panels to overloading, abuse, or undue impact. Do not apply bent, chipped, or defective panels. Replace and remove from the site any damaged panels at the Contractor's expense. Erect panels true, plumb, and in exact alignment with the horizontal and vertical edges of the building, securely anchored, and with indicated rake, eave, and curb overhang. Allow for thermal movement of the panels, movement of the building structure, and provide permanent freedom from noise due to wind pressure.

Do not permit storage, walking, wheeling or trucking directly on applied roofing materials. Provide temporary walkways, runways, and platforms of smooth clean boards or planks as necessary to avoid damage to the installed roofing materials, and to distribute weight to conform to the indicated live load limits of the roof construction.

Lay roof panels with corrugations in the direction of the roof slope. Lap ends not less than 8 inches; lap sides of standard exterior corrugated panels not less than 2-1/2 corrugations.

Field cutting by torch is not permitted. Field cut only as recommended by manufacturer's written instructions.

3.6.2 Closure Strips

Install metal closure strips at open ends of metal ridge rolls; open ends of corrugated or ribbed pattern panels, and at intersection of wall and roof, unless open ends are concealed with formed flashing; rake of metal roof unless open end has a formed flashing member; and in other required areas. Install closure strips at intersection of the wall with metal roofing; top and bottom of metal siding; heads of wall openings; and in other required locations.

3.6.3 Workmanship

Make lines, arises, and angles sharp and true. Free exposed surfaces from any visible wave, warp, buckle and tool marks. Fold back exposed edges neatly to form a 1/2 inch hem on the concealed side. Make sheet metal exposed to the weather watertight with provisions for expansion and contraction.

Make surfaces to receive sheet metal plumb and true, clean, even, smooth, dry, and free of defects and projections which might affect the application. For installation of items not shown in detail or not covered by specifications conform to the applicable requirements of SMACNA 1793. Provide sheet metal flashing in the angles formed where roof decks abut walls, curbs, ventilators, pipes, or other vertical surfaces and wherever indicated and as necessary to make the work watertight.

3.7 ACCEPTANCE PROVISIONS

3.7.1 Erection Tolerances

Erect metal roofing straight and true with plumb vertical lines correctly lapped and secured in accordance with the manufacturer's written instructions. Horizontal lines must not vary more than 1/8 inch in 40 feet.

3.7.2 Repairs to Finish

Scratches, abrasions, and minor surface defects of finish may be repaired with the specified repair

materials and as recommended by the metal roof panel manufacturer. Finished repaired surfaces must be uniform and free from variations of color and surface texture. Repaired metal surfaces that are not acceptable to the project requirements are to be immediately removed and replaced with new material.

3.8 CLEAN UP AND DISPOSAL

Clean exposed sheet metal work at completion of installation. Remove metal shavings, filings, nails, bolts, and wires from roofs. Remove grease and oil films, excess sealants, handling marks, contamination from steel wool, fittings and drilling debris and scrub the work clean. Exposed metal surfaces must be free of dents, creases, waves, scratch marks, solder or weld marks, and damage to the finish coating. Touch up scratches in panel finish with manufacturer supplied touch-up paint system to match panel finish. Treat exposed cut edges. coat.

Collect all scrap/waste materials and place in containers. Promptly dispose of demolished and scrap materials. Do not allow scrap/waste materials to accumulate on-site; transport immediately from the property and legally dispose of them.

-- End of Section --

SECTION 07 42 00

PHENOLIC (HPL) WALL PANELS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. The extent of the panel and installation system work is indicated on the drawings and in these specifications.

B. The cladding panels and installation system includes the following components.

1. Solid phenolic wall cladding, fascia, horizontal soffit, and storefront panels with installation systems. Panel installation systems include, but are not limited to: phenolic panels, panel fasteners, rail anchors, aluminum sub-frame, joint closure, and certain aluminum perimeter closure pieces as required for a complete drained and back ventilated rain screen system.
2. Interior panel system work that basically matches the color and/or design intent of the exterior panel system.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract including General and Supplementary Conditions, Division 1 Specifications, and Technical Specification Divisions 2 through 16 apply to this Section.

1.3 RELATED SECTIONS

A. Section 07 – Insulation, Air Barrier (WRB), Joint Sealants.

1.4 REFERENCES

A. ISO 178 – Determination of Flexural Properties

B. ISO 527-3 – Determination of Tensile Properties

C. EN 438-2 – Decorative High Pressure Laminate (HPL) Sheets Based on Thermosetting Resins – Determination of Properties

D. ASTM E330 – Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors Under the Influence of Wind Loads

E. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials

F. ASTM D1929 – Standard Test Method for Ignition Temperature

G. ASTM D635 – Standard Test Method for Small Scale Burning

H. ASTM E119 – Standard Test Method for Fire Rated or Fire Resistive Construction

I. NFPA 285 (USA) – Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components

J. NFPA 268 – Standard Test Method for Determining Ignitibility of Exterior Wall Assemblies Using a Radiant Heat Energy Source

1.5 SUBMITTALS

A. Submit under provisions of Section 01 33 00

B. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Preparation instructions and recommendations
2. Storage and handling requirements and recommendations
3. Installation methods

C. Statement certifying that the material meets the requirements specified

D. Shop Drawings: Submit plan, section, elevation and other drawings necessary to describe and convey the layout, profiles and product components, including edge conditions, panel joints, fixture location, anchorage, accessories, finish colors, patterns and textures.

E. Certifications: Documents showing product compliance with local building code. These documents shall include, but not be limited to, appropriate Evaluation Reports and/or test reports supporting the use of the product.

F. Engineering Calculations: Submit engineering calculations as required by the local building code, showing that the installed panels and attachments system meets the wind load requirements for the project.

G. Verification Samples: For each finish product specified, two samples a minimum of 3.5 inches by 3.5 inches (89mm x 89mm) representing actual product, color, and patterns. Sample edges may vary from field panel edges.

H. Closeout Submittals:

1. Operation and Maintenance Data: Submit operation, maintenance, and cleaning information for products covered under this section.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: All primary panel products specified in this section will be supplied by a single manufacturer with a minimum of ten (10) years experience.

B. Installer Qualifications: All products listed in this section are to be installed by a single installer trained and approved by the manufacturer or representative with a minimum (5) years of experience.

C. Mock-Up: Provide a mock-up for evaluation of the product and application workmanship, mock up may be incorporated into the work.

D. Pre-installation Meetings: Conduct pre-installation conference to verify project requirements, substrate conditions, manufacturer’s installation instructions and manufacturer’s warranty

requirements.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Delivery:

1. During transportation, use stable, flat pallets that are at least the same dimension as the sheets.
2. Materials shall be packaged to minimize or eliminate the possibility of damage during shipping. Items such as wooden side boards, wooden lid, and spacers or protective sheeting between panels shall be used to protect the panels from surface and/or edge damage.

B. Storage:

1. Store products in an enclosed area protected from direct sunlight, moisture and heat. Maintain a consistent temperature and humidity.
2. Store products in manufacturer's unopened packaging until ready for installation.
3. Stack panels using protective dividers to avoid damage to decorative surface.
4. For horizontal storage, store sheets on pallets of equal or greater size as the sheets with a protective layer between the pallet and sheet and on top of the uppermost sheet.
5. Do not store sheets, or fabricated panels vertically.

C. Handling:

1. Remove protective film within 24 hours of the panels being removed from the pallet.
2. When moving sheets, lift evenly to avoid dragging panels across each other and scratching the decorative surface.
3. Remove all labels and stickers immediately after installation.

1.8 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

B. Field Measurements: Verify actual measurements/openings by field measurements performed by the installer prior to release for fabrication. Recorded measurements to be indicated on shop drawings based on field measurements provided by the installer. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

C. WARRANTY: At project closeout, provide Manufacturer’s limited ten (10) year warranty covering defects in materials. Warranty only available when material installed by an installation contractor trained and approved by the manufacturer’s representative.

PART 2 PRODUCTS

2.1 BASIS OF DESIGN PRODUCTS:

A. Acceptable Material Manufacturers

i) Trespa North America Ltd. 350 Fifth Avenue, Ste 4610, New York, NY 10118 United States,

Telephone: 310-341-5311

ii) Fundermax GmbH; Klagenfurter StraBe 87 – 89, 9300 St. Veit/Glan, Austria; www.fundermax.com North American Representative: Fundermax North America; 311 Vickery Road, Auburn, ME 04210, USA; Robert Pea; Tel: 1-207-576-1764; Email: robert.pea@fundermax.biz; www.fundermax.com

B. Substitutions as allowed under Section 01 60 00 PRODUCTS.

C. Items of the same function and performance which have received prior approval from the architect shall be allowed for this project. Approval shall be based on documentation submitted showing the adequacy of the proposed material to meet the performance requirements of this specification.

2.2 SCOPE / APPLICATION

Plans, elevations, details, characteristics, and other requirements indicated are based upon standards by a single manufacturer. Alternate material manufacturers, receiving prior approval, may be acceptable provided their details and characteristics comply with the material/performance standards of the project.

A. Exposed fastening on fixed depth aluminum sub-framing tested and meeting the fire performance requirements of NFPA 285.

B. Concealed fastening over fixed depth aluminum sub-framing tested and meeting the fire performance requirements of NFPA 285.

C. Other installation systems - Include test documentation showing compliance with the performance criteria set forth in the specification and in accordance with the local building code.

2.3 SOLID PHENOLIC EXTERIOR WALL PANELS

A. Product Description:

1. Material: Solid phenolic resin, fire-retardant exterior grade.

2. Panel Finish: as selected by Architect from Manufacturer’s standard color range.

3. Panel Core: Manufacturer’s Standard.

4. Panel Thickness: 10mm.

C. Physical Properties:

1. Smoke Development Index: Less than 40 per ASTM E-84.

2. Flame Spread Index: Less than 10 per ASTM E-84.

3. Panels shall have UV and weather resistance performance with a grey scale rating minimum of 4-5 per ISO 4892-2, 4892-3.

4. Panels shall be impact resistant per EN-ISO 178

5. Panels shall be scratch resistant per EN-438-6

6. Panels shall be FSC Certified.

7. Panels shall be ICC AC92 compliant and have ICC Evaluation Services Report.

2.4 ACCESSORIES

A. Secondary Framing - Aluminum sub-structure designed to withstand structural loading due to wind load and the dead load of the panel painted as required to conceal behind the open joinery of the attachment system

1. Extrusions, formed members, sheet, and plate shall conform with the recommendations of the manufacturer.

B. Extruded Aluminum Trim - color to match panel unless otherwise selected by Archtitect.

C. Fasteners (concealed/exposed) – Fasteners shall be non-corrosive and as recommended by panel manufacturer. Exposed fasteners shall be colored to match panels where required by the architect.

2.5 FABRICATION

A. Solid phenolic impregnated Kraft paper wall panels with no voids, air spaces or foamed insulation in the core material

B. Accessory items in accordance with manufacturer's recommendations and approved submittals

C. Panel Dimensions – All fabrication shall be done under controlled shop conditions. Field fabrication shall be allowed where necessary, but shall be kept to an absolute minimum.

D. Panel lines, breaks, and angles shall be sharp, true, and surfaces free from warp and buckle

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. Surfaces to receive panels shall be even, smooth, dry, and free from defects detrimental to the installation of the panel system. Notify contractor in writing of conditions detrimental to proper and timely completion of the work.

C. Confirm exterior sheathing is plumb and level, with no deflection greater than 1/4 inch (6mm) in 20 feet (6096mm).

D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install solid phenolic wall panels and sub-frame system in accordance with manufacturer's instructions.

B. Install solid phenolic wall panels plumb and level and accurately spaced in accordance with manufacturer’s recommendations and approved submittals and drawings.

C. Anchor panels and sub-framing securely per engineering recommendations and in accordance with approved shop drawings to allow for necessary movement and structural support.

D. Fasten solid phenolic wall panels with fasteners approved for use with supporting substrate.

E. Do not install panels or component parts which are observed to be defective or damaged including, but not limited to: warped, bowed, abraded, scratched, and broken members.

F. Do not cut or trim component parts during installation in a manner that would damage the finish, decrease the strength, or result in visual imperfection or a failure in performance. Return component parts with require alteration to the shop for re-fabrication or replacement.

G. Accessory Items: Install corner profiles and trim with fasteners appropriate for use with adjoining construction as indicated on the Contract Drawings and as recommended by manufacturer.

3.4 ADJUSTING AND CLEANING

A. Adjust final panel installation so that all joints are true and even throughout the installation. Panels out of plane shall be adjusted with the surrounding panels to minimize any imperfection.

B. Remove and replace panels damaged beyond repair as a direct result of the panel installation. After installation, panel repair and replacement shall become the responsibility of the General Contractor.

C. Repair panels with minor damage.

D. Remove any masking or panel protection as soon as possible after installation. Any masking intentionally left in place after panel installation on an elevation, shall become the responsibility of the General Contractor.

E. Final cleaning shall not be part of the work of this section

3.5 FIELD QUALITY REQUIREMENTS

A. Manufacturer’s Field Services: Upon Owner’s request, provide manufacturer’s field service consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer’s instructions.

END OF SECTION

SECTION 07 92 00

JOINT SEALANTS

PART 1 GENERAL

1.1 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM C509	(2006; R 2015) Elastomeric Cellular Preformed Gasket and Sealing Material
ASTM C734	(2015) Low-Temperature Flexibility of Latex Sealants After Artificial Weathering
ASTM C834	(2017) Standard Specification for Latex Sealants
ASTM C919	(2012; R 2017) Standard Practice for Use of Sealants in Acoustical Applications
ASTM C920	(2018) Standard Specification for Elastomeric Joint Sealants
ASTM C1193	(2013) Standard Guide for Use of Joint Sealants
ASTM C1311	(2014) Standard Specification for Solvent Release Agents
ASTM C1521	(2013) Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints
ASTM D217	(2017) Standard Test Methods for Cone Penetration of Lubricating Grease
ASTM D1056	(2014) Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber
ASTM D1667	(2017) Standard Specification for Flexible Cellular Materials - Poly (Vinyl Chloride) Foam (Closed-Cell)
ASTM D2452	(2015) Standard Test Method for Extrudability of Oil- and Resin-Base Caulking Compounds
ASTM D2453	(2015) Standard Test Method for Shrinkage and Tenacity of Oil- and Resin-Base Caulking Compounds

ASTM E84	(2018a) Standard Test Method for Surface Burning Characteristics of Building Materials

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

CDPH SECTION 01350	(2010; Version 1.1) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS	SCS Global Services (SCS) Indoor Advantage

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1168	(2017) Adhesive and Sealant Applications

UNDERWRITERS LABORATORIES (UL)

UL 2818	(2013) GREENGUARD Certification Program For Chemical Emissions For Building Materials, Finishes And Furnishings

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

ProductData Sealants;
Primers;
Bond Breakers; Backstops;
Indoor Air Quality For Interior Sealants;

1.3 PRODUCT DATA

Include storage requirements, shelf life, curing time, instructions for mixing and application, and accessories. Provide manufacturer's Safety Data Sheets (SDS) for each solvent, primer and sealant material proposed.

1.4 CERTIFICATIONS

1.4.1 Indoor Air Quality Certifications

Submit required indoor air quality certifications in one submittal package.

1.4.1.1 Adhesives and Sealants

Provide products certified to meet indoor air quality requirements by UL 2818 (Greenguard) Gold, SCS Global Services Indoor Advantage Gold or provide certification or validation by other third-party program that products meet the requirements of this Section. Provide current product certification documentation from certification body.. When product does not have certification, provide validation that product meets the indoor air quality product requirements cited herein.

1.5 ENVIRONMENTAL CONDITIONS

Apply sealant when the ambient temperature is between 40 and 90 degrees F.

1.6 DELIVERY AND STORAGE

Deliver materials to the jobsite in unopened manufacturers' sealed shipping containers, with brand name, date of manufacture, color, and material designation clearly marked thereon. Label elastomeric sealant containers to identify type, class, grade, and use. Handle and store materials in accordance with manufacturer's printed instructions. Prevent exposure to foreign materials or subjection to sustained temperatures exceeding 90 degrees F or lower than 0 degrees F. Keep materials and containers closed and separated from absorptive materials such as wood and insulation.

1.7 QUALITY ASSURANCE

1.7.1 Compatibility with Substrate

Verify that each sealant is compatible for use with each joint substrate in accordance with sealant manufacturer's printed recommendations for each application.

1.7.2 Joint Tolerance

Provide joint tolerances in accordance with manufacturer's printed instructions.

1.7.4 Adhesion

Provide in accordance with ASTM C1193 or ASTM C1521.

PART 2 PRODUCTS

2.1 SEALANTS

Provide sealant products that have been tested, found suitable, and documented as such by the manufacturer for the particular substrates to which they will be applied.

2.1.1 Interior Sealants

Provide ASTM C834 or ASTM C920, Type S or M, Grade NS, Class 12.5, Use NT. Provide sealant products used on the interior of the building meeting either emissions requirements of CDPH SECTION 01350 or VOC content requirements of SCAQMD Rule 1168. Provide certification validation of indoor air quality for interior sealants.

Color to be selected from manufacturer's full range of color options.

2.1.2 Exterior Sealants

For joints in vertical surfaces, provide ASTM C920, Type S or M, Grade NS, Class 25, Use NT. For joints in horizontal surfaces, provide ASTM C920, Type S or M, Grade P, Class 25, Use T. Provide location(s) and color(s) of sealant as follows.

Color to be selected from manufacturer's full range of color options.

2.1.3 Floor Joint Sealants

ASTM C920, Type S or M, Grade P, Class 25, Use T. Provide sealant products used on the interior of the building (defined as inside of the weatherproofing system) meeting either emissions requirements of
CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of

space type) or VOC content requirements of SCAQMD Rule 1168. Provide certification or validation of indoor air quality for interior floor joint sealants.

Color to be selected from manufacturer's full range of color options.

2.1.4 Acoustical Sealants

Rubber or polymer based acoustical sealant in accordance with ASTM C919 to have a flame spread of 25 or less and a smoke developed rating of 50 or less when tested in accordance with ASTM E84. Provide non-staining acoustical sealant with a consistency of 250 to 310 when tested in accordance with ASTM D217. Acoustical sealant must remain flexible and adhesive after 500 hours of accelerated weathering as specified in ASTM C734. Provide sealant products used on the interior of the building (defined as inside of the weatherproofing system) meeting either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of SCAQMD Rule 1168. Provide certification or validation of indoor air quality for interior acoustical sealants.

2.1.5 Preformed Sealants

Provide preformed sealants of polybutylene or isoprene-butylene based pressure sensitive weather resistant tape or bead sealants capable of sealing out moisture, air and dust when installed as recommended by the manufacturer. At temperatures from minus 30 to plus 160 degrees F, sealants must be non-bleeding and have no loss of adhesion.

2.2 PRIMERS

Non-staining, quick drying type and consistency as recommended by the sealant manufacturer for the particular application. Provide primers for interior applications that meet the indoor air quality requirements of the paragraph SEALANTS above.

2.3 BOND BREAKERS

Type and consistency as recommended by the sealant manufacturer to prevent adhesion of the sealant to the backing or to the bottom of the joint. Provide bond breakers for interior applications that meet the indoor air quality requirements of the paragraph SEALANTS above.

2.4 BACKSTOPS

Provide glass fiber roving, neoprene, butyl, polyurethane, or polyethylene foams free from oil or other staining elements as recommended by sealant manufacturer. Provide 25 to 33 percent oversized backing for closed cell and 40 to 50 percent oversized backing for open cell material, unless otherwise indicated. Provide backstop material that is compatible with sealant. Do not use oakum or other types of absorptive materials as backstops.

2.5 CAULKING

For interior use and only where there is little or no anticipated joint movement. Provide in accordance with ASTM D2452 and ASTM D2453. Provide products used on the interior of the building (defined as inside of the weatherproofing system) meeting either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of SCAQMD Rule 1168. Provide certification or validation of indoor air quality for interior caulking.

2.6 CLEANING SOLVENTS

Provide type(s) recommended by the sealant manufacturer and in accordance with environmental requirements herein. Protect adjacent metal surfaces from solvents. Provide

solvents for interior applications that meet the indoor air quality requirements of the paragraph SEALANTS above.

PART 3 EXECUTION

3.1 FIELD QUALITY CONTROL

Perform a field adhesion test in accordance with manufacturer's instructions and ASTM C1193, Method A or ASTM C1521, Method A, Tail Procedure. Remove sealants that fail adhesion testing; clean substrates, reapply sealants, and re-test. Test sealants adjacent to failed sealants. Submit field adhesion test report indicating tests, locations, dates, results, and remedial actions taken.

3.2 SURFACE PREPARATION

Prepare surfaces according to manufacturer's printed installation instructions. Clean surfaces from dirt, frost, moisture, grease, oil, wax, lacquer, paint, or other foreign matter that would destroy or impair adhesion. Remove oil and grease with solvent; thoroughly remove solvents prior to sealant installation. Wipe surfaces dry with clean cloths. When resealing an existing joint, remove existing caulk or sealant prior to applying new sealant. For surface types not listed below, provide in accordance with sealant manufacturer's printed instructions for each specific surface.

3.2.1 Steel Surfaces

Remove loose mill scale by sandblasting or, if sandblasting is impractical or would damage finished work, scraping and wire brushing. Remove protective coatings by sandblasting or using a residue free solvent. Remove resulting debris and solvent residue prior to sealant installation.

3.2.2 Metal Surfaces

Remove temporary protective coatings from surfaces that will be in contact with sealant. When masking tape is used as a protective coating, remove tape and any residual adhesive prior to sealant application. For removing protective coatings and final cleaning, use non-staining solvents recommended by the manufacturer of item(s) containing metal surfaces.

3.2.3 Concrete and Masonry Surfaces

Where surfaces have been treated with curing compounds, oil, or other such materials, remove materials by sandblasting or wire brushing. Remove laitance, efflorescence and loose mortar from the joint cavity. Remove resulting debris prior to sealant installation.

3.2.4 Wood Surfaces

Ensure wood surfaces that will be in contact with sealants are free of splinters, sawdust and other loose particles.

3.3 SEALANT PREPARATION

Do not add liquids, solvents, or powders to sealants. Mix multicomponent elastomeric sealants in accordance with manufacturer's printed instructions.

3.4 APPLICATION

3.4.1 Joint Width-To-Depth Ratios

Acceptable Ratios:

JOINT WIDTH	JOINT DEPTH	
	Minimum	Maximum
For metal, glass, or other nonporous surfaces:		
1/4 inch (minimum)	1/4 inch	1/4 inch
over 1/4 inch	1/2 of width	Equal to width
For wood, concrete, masonry, stone, or [_____]:		
1/4 inch (minimum)	1/4 inch	1/4 inch
over 1/4 inch to 1/2 inch	1/4 inch	Equal to width
over 1/2 inch to 1 inch	1/2 inch	5/8 inch
Over 1 inch	prohibited	

Unacceptable Ratios: Where joints of acceptable width-to-depth ratios have not been provided, clean out joints to acceptable depths and grind or cut to acceptable widths without damage to the adjoining work. Grinding is prohibited at metal surfaces.

3.4.2 Unacceptable Sealant Use

Do not install sealants in lieu of other required building enclosure weatherproofing components such as flashing, drainage components, and joint closure accessories, or to close gaps between walls, floors, roofs, windows, and doors, that exceed acceptable installation tolerances. Remove sealants that have been used in an unacceptable manner and correct building enclosure deficiencies to comply with contract documents requirements.

3.4.3 Masking Tape

Place masking tape on the finished surface on one or both sides of joint cavities to protect adjacent finished surfaces from primer or sealant smears. Remove masking tape within 10 minutes of joint filling and tooling.

3.4.4 Backstops

Provide backstops dry and free of tears or holes. Tightly pack the back or bottom of joint cavities with backstop material to provide joints in specified depths. Provide backstops where indicated and where backstops are not indicated but joint cavities exceed the acceptable maximum depths specified in JOINT WIDTH-TO-DEPTH RATIOS Table.

3.4.5 Primer

Clean out loose particles from joints immediately prior to application of. Apply primer to joints in concrete masonry units, wood, and other porous surfaces in accordance with sealant manufacturer's printed instructions. Do not apply primer to exposed finished surfaces.

3.4.6 Bond Breaker

Provide bond breakers to surfaces not intended to bond in accordance with, sealant

manufacturer's printed instructions for each type of surface and sealant combination specified.

3.4.7 Sealants

Provide sealants compatible with the material(s) to which they are applied. Do not use a sealant that has exceeded its shelf life or has jelled and cannot be discharged in a continuous flow from the sealant gun. Apply sealants in accordance with the manufacturer's printed instructions with a gun having a nozzle that fits the joint width. Work sealant into joints so as to fill the joints solidly without air pockets. Tool sealant after application to ensure adhesion. Apply sealant uniformly smooth and free of wrinkles. Upon completion of sealant application, roughen partially filled or unfilled joints, apply additional sealant, and tool smooth as specified. Apply sealer over sealants in accordance with the sealant manufacturer's printed instructions.

3.5 PROTECTION AND CLEANING

3.5.1 Protection

Protect areas adjacent to joints from sealant smears. Masking tape may be used for this purpose if removed 5 to 10 minutes after the joint is filled and no residual tape marks remain.

3.5.2 Final Cleaning

Upon completion of sealant application, remove remaining smears and stains and leave the work in a clean and neat condition.

a. Masonry and Other Porous Surfaces: Immediately remove fresh sealant that has been smeared on adjacent masonry, rub clean with a solvent, and remove solvent residue, in accordance with sealant manufacturer's printed instructions. Allow excess sealant to cure for 24 hour then remove by wire brushing or sanding. Remove resulting debris.

b. Metal and Other Non-Porous Surfaces: Remove excess sealant with a solvent moistened cloth. Remove solvent residue in accordance with solvent manufacturer's printed instructions.

-- End of Section --

SECTION 08 11 13

STEEL DOOR FRAMES

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M	(2015; Errata 1 2015; Errata 2 2016) Structural Welding Code - Steel

ASTM INTERNATIONAL (ASTM)

ASTM A653/A653M	(2018) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A879/A879M	(2012) Standard Specification for Steel Sheet, zinc Coated by the Electrolytic Process for Applications Requiring Designation of the Coating Mass on Each Surface
ASTM A924/A924M	(2018) Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
ASTM E283	(2004; R 2012) Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

ANSI/BHMA A156.115	(2016) Hardware Preparation in Steel Doors and Steel Frames

NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS

(NAAMM) NAAMM HMMA 810	(2009) Hollow Metal Doors

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 80	(2016; TIA 16-1) Standard for Fire Doors and Other Opening Protectives

NFPA 105	(2016; TIA 16-1) Standard for Smoke Door Assemblies and Other Opening Protectives
NFPA 252	(2017) Standard Methods of Fire Tests of Door Assemblies

STEEL DOOR INSTITUTE (SDI/DOOR)

SDI/DOOR 111	(2009) Recommended Selection and Usage Guide for Standard Steel Doors, Frames and Accessories
SDI/DOOR 113	(2001; R2006) Standard Practice for Determining the Steady State Thermal Transmittance of Steel Door and Frame Assemblies
SDI/DOOR A250.3	(2007; R 2011) Test Procedure and Acceptance Criteria for Factory Applied Finish Painted Steel Surfaces for Steel Doors and Frames
SDI/DOOR A250.4	(2011) Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors and Hardware Reinforcing
SDI/DOOR A250.6	(2003; R2009) Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames
SDI/DOOR A250.8	(2003; R2008) Recommended Specifications for Standard Steel Doors and Frames
SDI/DOOR A250.11	(2001) Recommended Erection Instructions for Steel Frames

UNDERWRITERS LABORATORIES (UL)

UL 10C	(2016) UL Standard for Safety Positive Pressure Fire Tests of Door Assemblies

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

Shop Drawings
Frames;
Accessories
Show elevations, construction details, metal gages, hardware provisions, method of glazing, and installation details.
Schedule of Frames;
Submit door and frame locations.

Product Data Frames;
Accessories

Submit manufacturer's descriptive literature for doors, frames, and accessories. Include data and details on door construction, panel reinforcement, insulation, and door edge construction. When "custom hollow metal doors" are provided in lieu of "standard steel doors," provide additional details and data sufficient for comparison to SDI/DOOR A250.8 requirements.

1.3 DELIVERY, STORAGE, AND HANDLING

Deliver doors, frames, and accessories undamaged and with protective wrappings or packaging. Strap knock-down frames in bundles. Store doors and frames on platforms under cover in clean, dry, ventilated, and accessible locations, with 1/4 inch airspace between doors. Remove damp or wet packaging immediately and wipe affected surfaces dry. Replace damaged materials with new.

PART 2 PRODUCTS

2.1 STANDARD STEEL FRAMES

SDI/DOOR A250.8, Level 2, except as otherwise specified. Form frames to sizes and shapes indicated, with knock-down field-assembled corners. Provide steel frames for doors, transoms, sidelights, interior glazed panels, unless otherwise indicated. Provide frame product that uses a minimum of 25 percent recycled content. Provide data indicating percentage of recycled content for steel frame product.

2.1.1 Knock-Down Frames

Design corners for simple field assembly by concealed tenons, splice plates, or interlocking joints that produce square, rigid corners and a tight fit and maintain the alignment of adjoining members. Provide locknuts for bolted connections.

2.1.2 Mullions and Transom Bars

Provide mullions and transom bars of closed or tubular construction with heads and jambs butt-welded together or knock-down for field assembly. Bottom of door mullions must have adjustable floor anchors and spreader connections.

2.1.3 Stops and Beads

Form stops and beads from 20 gage steel. Provide for glazed and other openings in standard steel frames. Secure beads to frames with oval-head, countersunk Phillips self-tapping sheet metal screws or concealed clips and fasteners. Space fasteners approximately 12 to 16 inch on center. Miter molded shapes at corners. Butt or miter square or rectangular beads at corners.

2.1.4 Terminated Stops

Where indicated, terminate interior door frame stops 6 inch above floor.

2.1.5 Cased Openings

Fabricate frames for cased openings of same material, gage, and assembly as specified for metal door frames, except omit door stops and preparation for hardware.

2.1.6 Anchors

Provide anchors to secure the frame to adjoining construction. Provide steel anchors, zinc-coated or painted with rust-inhibitive paint, not lighter than 18 gage.

2.1.6.1 Wall Anchors

Provide at least three anchors for each jamb. For frames which are more than 7.5 feet in height, provide one additional anchor for each jamb for each additional 2.5 feet or fraction thereof.

2.1.6.2 Floor Anchors

Provide floor anchors drilled for 3/8 inch anchor bolts at bottom of each jamb member.

2.2 FIRE AND SMOKE DOORS AND FRAMES

The requirements of NFPA 80 and/or NFPA 105 takes precedence over details indicated or specified.

2.2.1 Labels

Provide fire doors and frames bearing the label of Underwriters Laboratories (UL), Factory Mutual Engineering and Research (FM), or Warnock Hersey International (WHI) attesting to the rating required. Testing must be in accordance with NFPA 252 or UL 10C. Provide labels that are metal with raised letters, bearing the name or file number of the door and frame manufacturer.

Labels must be permanently affixed at the factory to frames and to the hinge edge of the door. Do not paint door and labels.

2.3 HARDWARE PREPARATION

Provide minimum hardware reinforcing gages as specified in SDI/DOOR A250.6. Drill and tap doors and frames to receive finish hardware. Prepare doors and frames for hardware in accordance with the applicable requirements of SDI/DOOR A250.8 and SDI/DOOR A250.6. For additional requirements refer to ANSI/BHMA A156.115. Drill and tap for surface-applied hardware at the project site. Build additional reinforcing for surface-applied hardware into the door at the factory. Locate hardware in accordance with the requirements of SDI/DOOR A250.8, as applicable. Punch door frames to receive a minimum of two rubber or vinyl door silencers on lock side of single doors and one silencer for each leaf at heads of double doors. Set lock strikes out to provide clearance for silencers.

2.4 FINISHES

2.4.1 Factory-Primed Finish

Thoroughly clean all surfaces of doors and frames then chemically treat and factory prime with a rust inhibiting coating as specified in SDI/DOOR A250.8.

2.5 FABRICATION AND WORKMANSHIP

Provide finished doors and frames that are strong and rigid, neat in appearance, and free from defects, waves, scratches, cuts, dents, ridges, holes, warp, and buckle. Provide molded

members that are clean cut, straight, and true, with joints coped or mitered, well formed, and in true alignment. Dress exposed welded and soldered joints smooth. Design door frame sections for use with the wall construction indicated. Corner joints must be well formed and in true alignment. Conceal fastenings where practicable.

2.6 PROVISIONS FOR GLAZING

Materials are specified in Section 08 81 00, GLAZING.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Frames

Set frames in accordance with SDI/DOOR A250.11. Plumb, align, and brace securely until permanent anchors are set. Anchor bottoms of frames with expansion bolts or powder-actuated fasteners. Build in or secure wall anchors to adjoining construction.

3.1.2 Doors

Hang doors in accordance with clearances specified in SDI/DOOR A250.8. After erection and glazing, clean and adjust hardware.

3.1.3 Fire and Smoke Doors and Frames

Install rated doors and frames in accordance with NFPA 80 and NFPA 105.

3.2 PROTECTION

Protect doors and frames from damage. Repair damaged doors and frames prior to completion and acceptance of the project or replace with new, as directed. Wire brush rusted frames until rust is removed. Clean thoroughly. Apply an all-over coat of rust-inhibitive paint of the same type used for shop coat.

3.3 CLEANING

Upon completion, clean exposed surfaces of doors and frames thoroughly. Remove mastic smears and other unsightly marks.

-- End of Section --

SECTION 08 14 00

WOOD DOORS

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN FOREST FOUNDATION (AFF)

ATFS STANDARDS	(2015) American Tree Farm System Standards of Sustainability 2015-2020

ASTM INTERNATIONAL (ASTM)

ASTM E90	(2009; R2016) Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
ASTM E283	(2004; R 2012) Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
ASTM E2226	(2015a2015; R 2019b) Standard Practice for Application of Hose Stream

CALIFORNIA AIR RESOURCES BOARD (CARB)

CARB 93120	(2007) Airborne Toxic Control Measure (ATCM) to Reduce Formaldehyde Emissions from Composite Wood Products

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 80	(2016; TIA 16-1) Standard for Fire Doors and Other Opening Protectives
NFPA 252	(2017) Standard Methods of Fire Tests of Door Assemblies

UNDERWRITERS LABORATORIES (UL)

UL 10B	(2008; Reprint Feb 2015) Fire Tests of Door Assemblies

WINDOW AND DOOR MANUFACTURERS ASSOCIATION (WDMA)

ANSI/WDMA I.S.1A	(2013) Interior Architectural Wood Flush Doors

WOODWORK INSTITUTE (WI)

NAAWS 3.1 (2017; 2018 Errata Edition) North American Architectural Woodwork Standards

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

Shop Drawings
Doors;

Submit drawings or catalog data showing each type of door unit. Indicate within drawings and data the door types and construction, sizes, thickness, methods of assembly, and glazing.

Product Data
Doors;
Door Finish Colors;
Submit manufacturer's full range of standard colors and finishes for selection by the Architect.
Accessories
Water-resistant Sealer
Sample Warranty
Sound Transmission Class Rating;
Fire Resistance Rating;

Samples
Doors
Prior to the delivery of wood doors, submit a sample section of each type of door which shows the veneer, finish, and core construction.

Test Reports
Cycle-Slam
Hinge Loading Resistance
Submit cycle-slam test report for doors tested in accordance with ANSI/WDMA I.S.1A, and hinge loading resistance test report for doors tested in accordance with ANSI/WDMA I.S.6A.

Certificates
Certificates of Grade
Indoor Air Quality for Particleboard and Agrifiber Door Cores: Closeout Submittals

Warranty

1.3 CERTIFICATIONS

1.3.1 Certified Wood Grades

Provide certificates of grade from the grading agency on fire doors.

1.3.2 Indoor Air Quality Certification

1.3.2.1 Composite Wood, Wood Structural Panel and Agrifiber Products

For purposes of this specification, composite wood and agrifiber products include particleboard, medium density fiberboard (MDF), wheatboard, strawboard, panel substrates, and door cores. Provide products certified to meet requirements of both 40 CFR 770 and CARB 93120. Provide current product certification documentation from certification body.

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver doors to the site in an undamaged condition and protect against damage and dampness. Stack doors flat under cover. Support on blocking, a minimum of 4 inch thick, located at each end and at the midpoint of the door. Store doors in a well-ventilated building so that they will not be exposed to excessive moisture, heat, dryness, direct sunlight, or extreme changes of temperature and humidity. Replace defective or damaged doors with new ones.

1.5 WARRANTY

Warrant doors free of defects as set forth in the door manufacturer's standard door warranty.

PART 2 PRODUCTS

2.1 DOORS

Provide doors of the types, sizes, and designs indicated free of urea-formaldehyde resins.

2.1.1 Flush Doors

Conform to ANSI/WDMA I.S.1A for flush doors. Hardwood stile edge bands of doors receives a natural finish, compatible with face veneer. No visible finger joints will be accepted in stile edge bands. When used, locate finger-joints under hardware.

2.1.1.1 Interior Flush Doors

Provide particleboard core, Type II flush doors conforming to ANSI/WDMA I.S.1A with faces of premium natural maple. Hardwood veneers must be quarter sliced book matched. Products must contain no added urea-formaldehyde resins. Provide certification of indoor air quality for particleboard door cores.

2.1.2 Fire Doors

Provide doors specified or indicated to have a fire resistance rating conforming to the requirements of UL 10B, ASTM E2226, or NFPA 252 for the class of door indicated. Affix a permanent metal label with raised or incised markings indicating testing agency's name and approved hourly fire rating to hinge edge of each door.

2.2 ACCESSORIES

2.2.1 Door Light Openings

Provide glazed openings with the manufacturer's standard wood moldings. Provide moldings for doors to receive natural finish of the same wood species and color as the wood face veneers.

2.3 FABRICATION

2.3.1 Marking

Stamp each door with a brand, stamp, or other identifying mark indicating quality and construction of the door.

2.3.2 Quality and Construction

Identify the standard on which the construction of the door was based [, identify the standard under which preservative treatment was made,] and identify doors having a Type I glue bond.

2.3.3 Preservative Treatment

Treat doors scheduled for restrooms, janitor closets and other possible wet locations including exterior doors with a water-repellent preservative treatment and so marketed at the manufacturer's plant.

2.3.4 Adhesives and Bonds

ANSI/WDMA I.S.1A. Use Type I bond for exterior doors and Type II bond for interior doors. Provide a nonstaining adhesive on doors with a natural finish.

2.3.5 Prefitting

Provide factory finished and factory prefitted doors for the specified hardware, door frame and door-swing indicated. Machine and size doors at the factory by the door manufacturer in accordance with the standards under which the doors are produced and manufactured. The work includes sizing, beveling edges, mortising, and drilling for hardware and providing necessary beaded openings for glass and louvers. Provide the door manufacturer with the necessary hardware samples, and frame and hardware schedules to coordinate the work.

2.3.6 Finishes

2.3.6.1 Factory Finish

Provide doors finished at the factory by the door manufacturer with the manufacturer’s standard finish as selected by the architect for use on the specified wood species.

Use stain when required to produce the finish specified for color. Seal edges, cutouts, trim, and wood accessories, and apply two coats of finish compatible with the door face finish. Touch-up finishes that are scratched or marred, or where exposed fastener holes are filled, in accordance with the door manufacturer's instructions. Match color and sheen of factory finish using materials compatible for field application.

2.3.6.2 Color

Provide manufacturer's standard door finish color as selected by architect from the manufacturer’s full range of standard colors.

2.3.7 Water-Resistant Sealer

Provide manufacturer's standard water-resistant sealer compatible with the specified finish.

2.4 SOURCE QUALITY CONTROL

Meet or exceed the following minimum performance criteria of stiles of "B" and "C" label fire doors

utilizing standard mortise leaf hinges:

a. Cycle-slam: Standard Duty Doors: 250,000 cycles with no loose hinge screws or other visible signs of failure when tested in accordance with the requirements of ANSI/WDMA I.S.1A.

b. Hinge loading resistance: Averages of ten test samples not less than Standard Duty doors: 400 pounds force when tested for direct screw withdrawal in accordance with ANSI/WDMA I.S.6A using a No. 12, 1-1/4 inch long, steel, fully threaded wood screw. Drill 5/32 inch pilot hole, use 1-1/2 inch opening around screw for bearing surface, and engage screw full, except for last 1/8 inch. Do not use a steel plate to reinforce screw area.

PART 3 EXECUTION

3.1 INSTALLATION

Do not install building construction materials that show visual evidence of biological growth. Before installation, seal top and bottom edges of doors with the approved water-resistant sealer. Seal cuts made on the job immediately after cutting using approved water-resistant sealer. Fit, trim, and hang doors with a 1/16 inch minimum, 1/8 inch maximum clearance at sides and top, and a 3/16 inch minimum, 1/4 inch maximum clearance over thresholds. Provide 3/8 inch minimum, 7/16 inch maximum clearance at bottom where no threshold occurs. Bevel edges of doors at the rate of 1/8 inch in 2 inch. Door warp must not exceed 1/4 inch when measured in accordance with ANSI/WDMA I.S.1A.

3.1.1 Fire Doors

Install fire doors in accordance with NFPA 80. Do not paint over labels.

-- End of Section --

SECTION 08 36 13

SECTIONAL OVERHEAD DOORS

PART 1 GENERAL

1.1 REFERENCES

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

ALUMINUM ASSOCIATION (AA)

AA DAF45	(2003; Reaffirmed 2009) Designation System for Aluminum Finishes

ASTM INTERNATIONAL (ASTM)

ASTM A36/A36M	(2014) Standard Specification for Carbon Structural Steel
ASTM A123/A123M	(2017) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A227/A227M	(2017) Standard Specification for Steel Wire, Cold-Drawn for Mechanical Springs
ASTM A229/A229M	(2017) Standard Specification for Steel Wire, Quenched and Tempered for Mechanical Springs
ASTM A653/A653M	(2018) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM B209	(2014) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM B209M	(2014) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric)
ASTM B221	(2014) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM B221M	(2013) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric)
ASTM E330/E330M	(2014) Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference

DOOR AND ACCESS SYSTEM MANUFACTURERS ASSOCIATION

(DASMA) ANSI/DASMA 102	(2011) Specifications for Sectional Overhead-Type Doors
ANSI/DASMA 108	(2012) Standard Method for Testing Sectional Garage Doors and Rolling Doors: Determination of Structural Performance Under Uniform Static Air Pressure Difference

NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS

(NAAMM) NAAMM AMP 500	(2006) Metal Finishes Manual

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA ICS 1	(2000; R 2015) Standard for Industrial Control and Systems: General Requirements
NEMA ICS 2	(2000; R 2005; Errata 2008) Industrial Control and Systems Controllers, Contactors, and Overload Relays Rated 600 V
NEMA ICS 6	(1993; R 2016) Industrial Control and Systems: Enclosures
NEMA MG 1	(2016; SUPP 20162018) Motors and Generators
NEMA ST 20	(1992; R 19972014) Standard for Dry-Type Transformers for General Applications

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2017; ERTA 1-2 2017; TIA 17-1; TIA 17-2; TIA 17-3; TIA 17-4; TIA 17-5; TIA 17-6; TIA 17-7; TIA 17-8; TIA 17-9; TIA 17-10; TIA 17-11; TIA 17-12; TIA 17-13; TIA 17-14; TIA 17-15; TIA 17-16; TIA 17-17) National Electrical Code

UNDERWRITERS LABORATORIES (UL)

UL 325	(2017) UL Standard for Safety Door, Drapery, Gate, Louver, and Window Operators and Systems

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL ROCEDURES.

Shop Drawings

Doors;
Show types, sizes, locations, metal gages including minimum metal decimal thickness, hardware provisions, installation details, and other details of construction. [For electrically-operated doors, include supporting brackets for motors, location, type, and ratings of motors, switches, and safety devices.]

Product Data
Doors;
Electric operators;
For electrically motor-operated doors, submit manufacturer's wiring diagrams for motor and controls.

Manufacturer's Instructions
Doors
Electric operators;

Operation and Maintenance Data
Doors;
Electric operators;

1.3 DELIVERY, STORAGE, AND HANDLING

Protect doors and accessories from damage during delivery, storage, and handling. Clearly mark manufacturer's brand name. Store doors in dry locations with adequate ventilation, free from dust and water. Remove damaged items and provide new. Provide easy access for inspection and handling of overhead doors prior to installation.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Hard-Drawn Springwire

ASTM A227/A227M.

2.1.2 Oil-Tempered Springwire

ASTM A229/A229M.

2.1.3 Steel Sheet

ASTM A653/A653M.

2.1.4 Steel Shapes

ASTM A36/A36M.

2.1.5 Aluminum Extrusions

ASTM B221, Alloy 6063-T5.

2.1.6 Aluminum Sheets and Strips

ASTM B209, alloy and temper best suited for the purpose.

2.2 DOORS

Doors shall comply with ANSI/DASMA 102. Metal doors to have horizontal sections hinged together which operate in a system of tracks to completely close the door opening in the closed position and make the full width and height of the door opening available for use in the open position. Provide a permanent label on the door indicating the name and address of the manufacturer. Provide doors with [standard lift type designed to slide up and back into a horizontal overhead position and requiring a maximum of 16 inch of headroom for 2 inch tracks and 21 inch of headroom for 3 inch tracks. Doors operate by electric power with auxiliary hand chain operation.

2.3 DESIGN REQUIREMENTS

Design wind load shall conform to the design wind load of door area without damage. Doors shall be tested in accordance with either ASTM E330/E330M or ANSI/DASMA 108 and shall meet the acceptance criteria of ANSI/DASMA 108.

2.4 FABRICATION

2.4.1 Steel Overhead Doors

Form door sections of hot-dipped galvanized steel. Install sections not less than **3 inch** in thickness. Meeting rails to have interlocking joints to ensure a weathertight closure and alignment for full width of the door. Provide sections of the height indicated or the manufacturer's standard. Do not exceed thick 24 inch height for intermediate sections. Bottom sections may be varied to suit door height. Do not exceed 30 inch height for bottom section.

2.4.1.1 Insulated Sections

Insulate door sections with plastic foam or other material providing a **"U" factor of 0.038** or less. Cover interior of door sections with steel sheets of not lighter than 27 gage to completely enclose the insulating material.

2.4.2 Tracks

Provide galvanized steel tracks not lighter than 14 gage thick for 2 inch tracks and not lighter than 12 gage thick for 3 inch tracks. Provide galvanized steel vertical tracks with continuous galvanized steel angle not lighter than 13 gage for installation to walls. Incline vertical track through use of adjustable brackets to obtain a weathertight closure at jambs. Reinforce horizontal track with galvanized steel angle; support from track ceiling construction with galvanized steel angle and cross bracing to provide a rigid installation.

2.4.3 Hardware

Provide hinges, brackets, rollers, locking devices, and other hardware required for complete installation. Install roller brackets and hinges with 14 gage galvanized steel. Provide rollers with ball bearings and case-hardened races. Provide reinforcing on doors where roller hinges are connected. Provide a positive locking device and cylinder lock with two keys on manually operated doors.

2.4.4 Counterbalancing

Counterbalance doors with an oil-tempered, helical-wound torsional spring mounted on a steel shaft. Provide adjustable spring tension, connect spring to doors with cable through cable drums. Provide cable safety factor of at least 5 to 1.

2.6 ELECTRIC OPERATORS

2.6.1 Operator Features

Operators shall be labeled and listed to the requirements of UL 325. Provide operators of the drawbar type or side mount (jack shaft) type as recommended by the manufacturer. Include operators with electric motor, machine-cut reduction gears, steel chain and sprockets, magnetic brake, brackets, pushbutton controls, limit switches, magnetic reversing contactor, a manual chain hoist operator for emergency use, and other accessories necessary for operation. Design electric operator so motor may be removed without disturbing the limit switch timing and without affecting the manual operator. Provide the operator with slipping clutch coupling to prevent stalling the motor. Provide a clutch controlled emergency manual operator so that it may be engaged and disengaged from the floor; do not affect limit switch timing by operation. The manual operator is not required if door can be manual-pushup operated with a force not to exceed 25 pounds. Provide an electrical or mechanical device that disconnects the motor from the operating mechanism when the manual operator is engaged.

2.6.2 Motors

NEMA MG 1, high-starting torque, reversible type with sufficient horsepower and torque output to move the door in either direction from any position. Provide a motor to produce a door travel speed of not less than 8 inch or more than one foot per second without exceeding the rated capacity. Motors shall be operate on current of the characteristics indicated at not more than 3600 rpm.

2.6.3 Controls

Provide a motor for each door with an enclosed, across-the-line type, magnetic reversing contactor, thermal overload and undervoltage protection, solenoid-operated brake, limit switches, and control switches. Locate control switches at least 5 feet above the floor so the operator will have complete visibility of the door at all times. Provide control equipment to conform to NEMA ICS 1 and NEMA ICS 2. Provide control enclosures with NEMA ICS 6, Type 12 or Type 4, except that contactor enclosures may be Type 1.

Provide a three-button type control switch stations with buttons marked "OPEN," "CLOSE," and "STOP." The "OPEN" and "STOP" buttons shall require only momentary pressure to operate. The "CLOSE" button shall require constant pressure to maintain the closing motion of the door. If the door is in motion and the "STOP" button is pressed or the "CLOSE" button released, the door shall stop instantly and remain in the stop position; from the stop position, the door may be operated in either direction by the "OPEN" or "CLOSE" button. Pushbuttons shall be full-guarded to prevent accidental operation.

Provide limit switches to automatically stop doors at the fully open and closed positions. Limit switch positions shall be readily adjustable.

2.6.4 Entrapment Protection Devices

Entrapment protection devices shall be provided for electrically-operated doors in accordance with UL 325. These devices shall immediately stop and reverse the door in its closing travel upon sensing an obstruction in the door opening or upon failure of the device or any component of the control system. Any momentary door-closing circuit shall be automatically locked out and the door shall be operable manually or with constant pressure controls until the failure or damage has been corrected. No entrapment protection device shall be used as a limit switch, unless its function is specifically intended to do so.

2.6.5 Control Transformers

NEMA ST 20. Provide transformers in power circuits as necessary to reduce the voltage on the control circuits to 120 volts or less.

2.6.6 Electrical Components

NFPA 70. Furnish manual or automatic control and safety devices, including extra flexible Type SO cable and spring-loaded automatic takeup reel or equivalent device, for operation of the doors. Conduit wiring and mounting of controls are specified in the corresponding electrical specification section.

2.7 WEATHER SEALS AND SENSING EDGES

Provide exterior doors with weatherproof joints between sections by means of tongue-and-groove joints, rabbetted joints, shiplap joints, or wool pile, vinyl or rubber weatherstripping; a rubber, or vinyl adjustable weatherstrip at the top and jambs; and a compressible neoprene or rubber weather seal attached to the bottom of the door. On exterior doors that are electrically operated, where a sensing edge is employed, the bottom seal shall be combination compressible weather seal and sensing edge for stopping and reversing door movement.

2.8 FINISHES

Hot-dip galvanize concealed metal surfaces and tracks in accordance with ASTM A123/A123M. Hot-dip galvanized and other ferrous metal surfaces, except rollers and lock components, which are galvanized or plated shop primed.

2.8.1 Galvanized and Shop Primed

Provide a zinc coating on specified surfaces, a phosphate treatment, and a shop prime coat of rust-inhibitive paint. Conform to ASTM A653/A653M for galvanized coating, coating designation G60, for steel sheets, and ASTM A123/A123M for assembled steel products. The weight of coatings forassembled products shall be as designated in Table I of ASTM A123/A123M for the class of material to be coated. Provide a prime coat especially developed for materials treated by phosphates and adapted to application by dipping or spraying. Repair damaged zinc-coated surfaces with galvanizing repair paint and spot prime. At the Contractor's option, a two-part system including bonderizing, baked-on epoxy primer, and baked-on enamel topcoat may be applied in lieu of prime coat specified.

PART 3 EXECUTION

3.1 INSTALLATION

NFPA 70. Install doors in accordance with approved shop drawings and manufacturer's written installation instructions. Lubricate and adjust doors to operate freely.

Provide a weathertight installation and free from warp, twist, or distortion. Adjust and lubricate doors to operate freely.

Provide all items and accessories for a complete installation in every respect.

3.2 ELECTRICAL WORK

NFPA 70. Conduit, wiring, and mounting of controls.

3.3 TESTING

After installation is complete, operate doors to demonstrate installation and function of operators, safety features, and controls. Correct deficiencies.

-- End of Section --

SECTION 08 45 23
TRANSLUCENT WALL SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes the insulated translucent sandwich panel system and accessories as shown and specified. Work includes providing and installing:

1. Flat factory prefabricated structural insulated translucent sandwich panels
2. Aluminum installation system
3. Aluminum sill flashing

B. Related Sections:

1. Metal Wall and Roof Panels: Section 07 41 13
2. Joint Sealants: Section 07 92 00

1.2 SUBMITTALS

A. Submit manufacturer's product data. Include construction details, material descriptions, profiles and finishes of components.

B. Submit shop drawings. Include elevations and details.

C. Submit manufacturer's color charts showing the full range of colors available for factory-finished aluminum.

1. Submit samples for each exposed finish required, in same thickness and material indicated for the work and in size indicated below. If finishes involve normal color variations, include sample sets consisting of two or more units showing the full range of variations expected.

a. Sandwich panels: 14" x 28" units
b. Factory finished aluminum: 5" long sections

D. Submit Installer Certificate, signed by installer, certifying compliance with project qualification requirements.

E. Submit product reports from a qualified independent testing agency indicating each type and class of panel system complies with the project performance requirements, based on comprehensive testing of current products. Previously completed reports will be acceptable if for current manufacturer and indicative of products used on this project.

1. Reports required are:

a. International Building Code Evaluation Report
b. Flame Spread and Smoke Developed (UL 723) – Submit UL Card

c. Burn Extent (ASTM D 635)
d. Color Difference (ASTM D 2244)
e. Impact Strength (UL 972)
f. Bond Tensile Strength (ASTM C 297 after aging by ASTM D 1037)
g. Bond Shear Strength (ASTM D 1002)
h. Beam Bending Strength (ASTM E 72)
i. Insulation U-Factor (NFRC 100)
j. NFRC System U-Factor Certification (NFRC 700)
k. Solar Heat Gain Coefficient (NFRC or Calculations)
l. Condensation Resistance Factor (AAMA 1503)
m. Air Leakage (ASTM E 283)
n. Structural Performance (ASTM E 330)
o. Water Penetration (ASTM E 331)
p. 1200°F Fire Resistance (SWRI)

1.3 QUALITY ASSURANCE

A. Manufacturer's Qualifications

1. Material and products shall be manufactured by a company continuously and regularly employed in the manufacture of specified materials for a period of at least ten consecutive years and which can show evidence of those materials being satisfactorily used on at least six projects of similar size, scope and location. At least three of the projects shall have been in successful use for ten years or longer.
2. Panel system must be listed by an ANSI accredited Evaluation Service, which requires quality control inspections and fire, structural and water infiltration testing of sandwich panel systems by an accredited agency.
3. Quality control inspections shall be conducted at least once each year and shall include manufacturing facilities, sandwich panel components and production sandwich panels for conformance with AC177 “Translucent Fiberglass Reinforced Plastic (FRP) Faced Panel Wall, Roof and Skylight Systems” as issued by the ICC-ES.

B. Installer’s Qualifications: Installation shall be by an experienced installer, which has been in the business of installing specified panel systems for at least two consecutive years and can show evidence of satisfactory completion of projects of similar size, scope and type.

1.4 PERFORMANCE REQUIREMENTS

A. The manufacturer shall be responsible for the configuration and fabrication of the complete panel system.

1. When requested, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
2. Standard panel system shall have less than 0.01 cfm/ft^2 air leakage by ASTM E 283 at 6.24 PSF (50 mph) and no water penetration by ASTM E 331 at 15 PSF; and structural testing by ASTM E 330.
3. Structural Loads; Provide system capable of handling loads for the project location and as required by the Oregon Structural Specialty Code latest edition:
   Seismic; Risk Cat II, Ie = 1.0, • Sds = 0.692
   Wind Risk Cat II, Iw = 1.0 Exposure C: Ultimate design wind speed, VULT is equal to 120 mph (Columbia County special wind region per 2019 OSSC Table 1609.3)

1.5 DELIVERY STORAGE AND HANDLING

A. Deliver panel system, components and materials in manufacturer's standard protective packaging.

B. Store panels on the long edge; several inches above the ground, blocked and under cover in accordance with manufacturer's storage and handling instructions.

1.6 WARRANTY

A. Submit manufacturer's and installer's written warranty agreeing to repair or replace panel system work, which fails in materials or workmanship within one year of the date of delivery. Failure of materials or workmanship shall include leakage, excessive deflection, deterioration of finish on metal in excess of normal weathering, defects in accessories, insulated translucent sandwich panels and other components of the work.

B. Extended Warranty:
- 5 years for Materials and Workmanship.
- 10 years Limited Warranty covering separation of faces from grid core, and/or abnormal color change of the exterior face.

PART 2 – PRODUCTS: Basis of Design Product – Kalwall 2.75” panel

2.1 MANUFACTURER

A. Kalwall Corporation, Tel: (800) 258-9777 – Fax: (603) 627-7905 – Email: info@kalwall.com

B. For substitutions see Section 01 60 00 Products.

2.2 PANEL COMPONENTS

A. Face Sheets

1. Translucent faces: Manufactured from glass fiber reinforced thermoset resins, formulated specifically for architectural use.
   a. Thermoplastic (e.g. polycarbonate, acrylic) faces are not acceptable.
   b. Face sheets shall not deform, deflect or drip when subjected to fire or flame.

2. Interior face sheets:

   a. Flame spread: Underwriters Laboratories (UL) listed, which requires periodic unannounced retesting, with flame spread rating no greater than 25 and smoke developed no greater than 250 when tested in accordance with UL 723.
   b. Burn extent by ASTM D 635 shall be no greater than 1”.

3. Exterior face sheets:

a. Color stability: Full thickness of the exterior face sheet shall not change color more than 3 CIE Units DELTA E by ASTM D 2244 after 5 years outdoor South Florida weathering at 5° facing south, determined by the average of at least three white samples with and without a protective film or coating to ensure long-term color stability. Color stability shall be unaffected by abrasion or scratching.
b. Strength: Exterior face sheet shall be uniform in strength, impenetrable by hand held pencil and repel an impact minimum of 70 ft. lbs. without fracture or tear when impacted by a 3-1/4" diameter, 5 lb. free-falling ball per UL 972.

4. Appearance:

a. Exterior face sheets: Smooth .070 thick.
b. Interior face sheets: Smooth .045 thick.
c. Color of interior and exterior face sheets shall be selected from manufacturer's standard colors.
d. Face sheets shall not vary more than ± 10% in thickness and be uniform in color.

B. Grid Core

1. Thermally Broken Composite I-beam grid core shall be of 6063-T6 or 6005-T5 alloy and temper with provisions for mechanical interlocking of muntin-mullion and perimeter. Width of I-beam shall be no less than 7/16".
2. I-beam Thermal break: Minimum 1", thermoset fiberglass composite.

C. Laminate Adhesive

1. Heat and pressure resin type adhesive engineered for structural sandwich panel use, with minimum 25-years field use. Adhesive shall pass testing requirements specified by the International Code Council "Acceptance Criteria for Sandwich Panel Adhesives".
2. Minimum tensile strength of 750 PSI when the panel assembly is tested by ASTM C 297 after two exposures to six cycles each of the aging conditions prescribed by ASTM D 1037.
3. Minimum shear strength of the panel adhesive by ASTM D 1002 after exposure to four separate conditions:

a. 50% Relative Humidity at 68° F: 540 PSI
b. 182° F: 100 PSI
c. Accelerated Aging by ASTM D 1037 at room temperature: 800 PSI
d. Accelerated Aging by ASTM D 1037 at 182° F: 250 PSI

2.3 PANEL CONSTRUCTION

A. Provide sandwich panels of flat fiberglass reinforced translucent face sheets laminated to a grid core of mechanically interlocking I-beams. The adhesive bonding line shall be straight, cover the entire width of the I-beam and have a neat, sharp edge.

1. Thickness: 2-3/4"
2. Light transmission: to be determined in consultation with Architect based on selected interior and exterior panels.
3. Solar heat gain coefficient shall be no greater than required by local code.

4. Panel U-factor by NFRC certified laboratory: 2-3/4" thermally broken grid .
5. Complete insulated panel system shall have NFRC certified U-factor no greater than required by local code.
6. Grid pattern: Nominal size12"x24" pattern Shoji.

B. Standard panels shall deflect no more than 1.9" at 30 PSF in 10' 0" span without a supporting frame by ASTM E 72.

C. Standard panels shall withstand 1200° F fire for minimum one hour without collapse or exterior flaming.

D. Thermally broken panels: Minimum Condensation Resistance Factor of 80 by AAMA 1503 measured on the bond line.

2.4 BATTENS AND PERIMETER CLOSURE SYSTEM

A. Closure system: Thermally Broken extruded aluminum 6063-T6 and 6063-T5 alloy and temper clamp-tite screw type closure system.

B. Sealing tape: Manufacturer's standard, pre-applied to closure system at the factory under controlled conditions.

C. Fasteners: 300 series stainless steel screws for aluminum closures, excluding final fasteners to the building.

D. Finish:

1. Manufacturer's factory applied finish, which meets the performance requirements of AAMA 2604.
2. Color to be selected from manufacturer's full range of standard colors.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Installer shall examine substrates, supporting structure and installation conditions.

B. Do not proceed with panel installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Metal Protection:

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.
2. Where aluminum will contact concrete, masonry or pressure treated wood, protect against corrosion by painting contact surfaces with bituminous paint or method recommended by manufacturer.

3.3 INSTALLATION

A. Install the panel system in accordance with the manufacturer's suggested installation recommendations and approved shop drawings.

   1. Anchor component parts securely in place by permanent mechanical attachment system.
   2. Accommodate thermal and mechanical movements.
   3. Set perimeter framing in a full bed of sealant compound, or with joint fillers or gaskets to provide weather-tight construction.

B. Install joint sealants at perimeter joints and within the panel system in accordance with manufacturer's installation instructions.

3.4 CLEANING

A. Clean the panel system interior and exterior, immediately after installation.

B. Refer to manufacturer's written recommendations.

END OF SECTION 08 45 23

SECTION 08 51 13

ALUMINUM WINDOWS

PART 1 GENERAL

1.1 REFERENCES

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

ALUMINUM ASSOCIATION (AA)

AA DAF45	(2003; Reaffirmed 2009) Designation System for Aluminum Finishes

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION

(AAMA) AAMA 611	(2014) Voluntary Specification for Anodized Architectural Aluminum
AAMA 701/702	(2011) Voluntary Specification for Pile Weatherstripping and Replaceable Fenestration Weatherseals
AAMA 901	(2016) Voluntary Specification for Rotary & Linear Operators in Window Applications
AAMA 902	(2016) Voluntary Specification for Sash Balance s
AAMA 907	(2015) Voluntary Specification for Corrosion Resistant Coatings on Carbon Steel Components Used in Windows, Doors and Skylights
AAMA 1302.4	(1973) Specifications for Forced-Entry Resistant Aluminum Prime Windows
AAMA 1503	(2009) Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections
AAMA 2603	(2017a) Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels
AAMA 2604	(2017a) Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels

AAMA 2605	(2017a) Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels
AAMA WSG.1	(1995) Window Selection Guide
AAMA/WDMA/CSA 101/I.S.2/A440	(2011; Update 1 2014) North American Fenestration Standard/Specification for Windows, Doors, and Skylights

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)

ASHRAE 169	(2013) Climate Data for Building Design Standards

ASTM INTERNATIONAL (ASTM)

ASTM A276/A276M	(2017) Standard Specification for Stainless Steel Bars and Shapes
ASTM D3656/D3656M	(2013) Standard Specification for Insect Screening and Louver Cloth Woven from Vinyl-Coated Glass Yarns
ASTM E90	(2009; R2016) Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
ASTM E413	(2016) Classification for Rating Sound Insulation
ASTM E1300	(2016) Standard Practice for Determining Load Resistance of Glass in Buildings
ASTM E1332	(2016) Standard Classification for Rating Outdoor-Indoor Sound Attenuation
ASTM E1886	(2013a) Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials
ASTM F2912	(2017) Standard Specification for Glazing and Glazing Systems Subject to Airblast Loadings

NATIONAL FENESTRATION RATING COUNCIL (NFRC)

NFRC 100	(2014) Procedure for Determining Fenestration Product U-Factors

NFRC 200	(2014) Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 101	(2018; TIA 18-1; TIA 18-2; TIA 18-3) Life Safety Code

SCREEN MANUFACTURERS ASSOCIATION (SMA)

SMA 1004	(1987; R 1998) Aluminum Tubular Frame Screens for Windows
SMA 1201	(R 2013) Specifications for Insect Screens for Windows, Sliding Doors and Swinging Doors

U.S. DEPARTMENT OF ENERGY (DOE)

Energy Star	(1992; R 2006) Energy Star Energy Efficiency Labeling System (FEMP)

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

- Shop Drawings
  - Windows;
- Product Data
  - Windows;
  - Hardware;
  - Fasteners;
  - Window Performance;
  - Thermal-Barrier Windows;
  - Mullions;
  - Screens;
  - Weatherstripping;
  - Accessories;
  - Adhesives
  - Thermal Performance;
- Samples
  - Finish Sample
  - Window Sample

1.3 QUALITY ASSURANCE

1.3.1 Qualification of Manufacturer

Window manufacturer must specialize in designing and manufacturing the type of aluminum

windows specified in this section, and have a minimum of 5 years of documented successful experience. Manufacturer must have the facilities capable of meeting contract requirements, single-source responsibility and warranty.

1.3.2 Shop Drawing Requirements

Take field measurements prior to preparation of drawings and fabrications. Provide drawings that indicate elevations of windows, full-size sections, thickness and gages of metal, fastenings, proposed method of anchoring,size and spacing of anchors, details of construction, method of glazing, details of operating hardware, installation details, and other related items.

1.3.3 Sample Requirements

1.3.3.1 Finish Sample Requirements

Submit color chart of standard factory color coatings.

1.3.3.2 Window Sample Requirements

Submit one full-size corner of each window type proposed for use. Where screens or weatherstripping is required, fit sample with such items that are to be used.

1.3.4 Test Report Requirements

Submit test reports for each type of window attesting that identical windows have been tested and meet the requirements specified herein for conformance to AAMA/WDMA/CSA 101/I.S.2/A440.

1.4 DELIVERY AND STORAGE

Deliver windows to project site in an undamaged condition. Use care in handling and hoisting windows during transportation and at the jobsite. Store windows and components out of contact with the ground, under a weathertight covering, so as to prevent bending, warping, or otherwise damaging the windows. Repair damaged windows to an "as new" condition as approved. If windows cannot be repaired, provide a new unit.

1.5 DRAWINGS

Submit the Fabrication Drawings for aluminum window units showing complete window assembly including hardware, weatherstripping, and subframe assembly details.

1.6 WINDOW PERFORMANCE

Aluminum windows must meet the following performance requirements. Perform testing requirements by an independent testing laboratory or agency.

1.6.1 Structural Performance

Structural test pressures on window units must be for positive load (inward) and negative load (outward). After testing, there will be no glass breakage, permanent damage to fasteners, hardware parts, support arms or actuating mechanisms or any other damage which could cause window to be

inoperable. There must be no permanent deformation of any main frame, sash or ventilator member in excess of the requirements established by AAMA/WDMA/CSA 101/I.S.2/A440 for the window types and classification specified in this section.

1.6.2 Air Infiltration

Air infiltration must not exceed the amount established by AAMA/WDMA/CSA 101/I.S.2/A440 for each window type.

1.6.3 Water Penetration

Water penetration must not exceed the amount established by AAMA/WDMA/CSA 101/I.S.2/A440 for each window type.

1.6.4 Thermal Performance

Windows (including frames and glass) will be independently tested and certified with a Solar Heat Gain Coefficient (SHGC) determined according to NFRC 200 procedures and a whole window U-factor determined in accordance with NFRC 100 and according to the ASHRAE 169 Climate Zone of the project location.

1.7 WARRANTY

Provide Manufacturer's standard performance guarantees or warranties that extend beyond a 1 year period.

PART 2 PRODUCTS

2.1 WINDOWS

Provide prime windows that comply with AAMA/WDMA/CSA 101/I.S.2/A440 and the requirements specified herein. In addition to compliance with AAMA/WDMA/CSA 101/I.S.2/A440, window framing members for each individual light of glass must not deflect to the extent that deflection perpendicular to the glass light exceeds L/175 of the glass edge length when subjected to uniform loads at specified design pressures. Provide documentation to substantiate compliance with deflection requirements. Provide windows of types, performance classes, performance grades, combinations, and sizes indicated or specified. Design windows to accommodate hardware, glass, weatherstripping, screens, and accessories to be furnished. Each window must be a complete factory assembled unit with or without glass installed. Dimensions shown are minimum. Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with adjacent materials; designed to smoothly operate, tightly close, and securely lock windows, and sized to accommodate sash weight and dimensions.

2.1.1 Fixed Windows (F)

Basis of Design Product:
Oldcastle Building Envelope - Series 1200 windows -4" frame

2.1.2 Glass and Glazing

Glazing: windows shall be factory glazed unless too large or unsafe for handling.

2.1.3 Caulking and Sealing

Are specified in Section 07 92 00 JOINT SEALANTS.

2.1.4 Weatherstripping

AAMA/WDMA/CSA 101/I.S.2/A440. Provide for all ventilating (operable) sash for all windows. Provide woven wool pile weatherstripping 0.210 inch thick, conforming to AAMA 701/702, or polypropylene multifilament fiber weatherstripping installed in an integral weatherstripping groove in the sash or frame, and flexible polyvinylchloride weatherstripping installed in the sill member.

2.2 FABRICATION

Fabrication of window units must comply with AAMA/WDMA/CSA 101/I.S.2/A440.

2.2.1 Provisions for Glazing

Design windows and rabbets suitable for glass thickness indicated to meet thermal requirements.

2.2.2 Fasteners

Use window manufacturer's standard for windows, trim, and accessories. Self-tapping sheet-metal screws are not acceptable for material more than
1/16 inch thick.

2.2.3 Adhesives

Provide joint sealants as specified in Section 07 92 00 JOINT SEALANTS. For interior application of joint sealants, comply with applicable regulations regarding reduced VOC's, and as specified in Section 07 92 00
JOINT SEALANTS.

2.2.4 Drips and Weep Holes

Provide continuous drips over heads of top ventilators. Where fixed windows adjoin ventilators, drips must be continuous across tops of fixed windows. Provide drips and weep holes as required to return water to the outside.

2.2.5 Combination Windows

Windows used in combination must be factory assembled of the same class and grade. Where factory assembly of individual windows into larger units is limited by transportation considerations, refabricate, match mark, transport, and field assemble.

2.2.6 Mullions and Transom Bars

Provide mullions with a thermal break. Secure mullions and transom bars to adjoining construction and window units in such a manner as to permit expansion and contraction and to form a weathertight joint. Provide mullion covers on the interior and exterior to completely close exposed joints and recesses between window units and to present a neat appearance.

2.2.7 Accessories

Provide windows complete with necessary hardware, fastenings, clips, fins, anchors, glazing beads, and other appurtenances necessary for complete installation and proper operation.

2.2.7.1 Hardware

AAMA/WDMA/CSA 101/I.S.2/A440. The item, type, and functional characteristics must be the manufacturer's standard for the particular window type.

2.2.7.2 Fasteners

Provide concealed anchors of the type recommended by the window manufacturer for the specific type of construction. Anchors and fasteners must be compatible with the window and the adjoining construction. Provide a minimum of three anchors for each jamb located approximately 6 inches from each end and at midpoint.

2.2.7.3 Window Anchors

Anchoring devices for installing windows must be made of aluminum, cadmium-plated steel, stainless steel, or zinc-plated steel conforming to AAMA/WDMA/CSA 101/I.S.2/A440.

2.2.8 Finishes

Comply with NAAMM's "Metal Finishes Manual" for applying and designating finishes. Exposed aluminum surfaces must be factory finished with an anodic coating. Color as selected by architect from manufacturer's standard colors.

2.3 MULLIONS

Provide mullions between multiple-window units where indicated.

Provide profiles for mullions and mullion covers, reinforced as required for the specified wind loading, and securely anchored to the adjoining construction. Mullion extrusion will include serrations or pockets to receive weatherstripping, sealant, or tape at the point of contact with each window flange.

Mullion assembly must include aluminum window clamps or brackets screwed or bolted to the mullion and the mullion cover.

Mullion cover must be screw-fastened to the mullion unless otherwise indicated.

Mullion reinforcing members must be fabricated of the materials specified in AAMA/WDMA/CSA 101/I.S.2/A440 and meet the specified design loading.

PART 3 EXECUTION

3.2 INSTALLATION

3.2.1 Method of Installation

Install in accordance with the window manufacturer's printed instructions and details. Build in windows as the work progresses or install without forcing into prepared window openings.

Set windows at proper elevation, location, and reveal; plumb, square, level, and in alignment; and brace, strut, and stay properly to prevent distortion and misalignment.

Protect ventilators and operating parts against accumulation of dirt and building materials by keeping ventilators tightly closed and locked to frame. Bed screws or bolts in sill members, joints at mullions, contacts of windows with sills, built-in fins, and subframes in mastic sealant of a type recommended by the window manufacturer. Install and caulk windows in a manner that will prevent entrance of water and wind. Fasten insect screens securely in place.

Any materials that show visual evidence of biological growth due to the presence of moisture must not be installed on the building project.

3.2.2 Dissimilar Materials

Where aluminum surfaces are in contact with, or fastened to masonry, concrete, wood, or dissimilar metals, except stainless steel or zinc, protect the aluminum surface from dissimilar materials as recommended in the Appendix to AAMA/WDMA/CSA 101/I.S.2/A440. Do not coat surfaces in contact with sealants after installation with any type of protective material. Do not apply coatings or lacquers to surfaces to which caulking and glazing components must adhere.

3.2.3 Anchors and Fastenings

Make provision for securing units to each other, to masonry, and to other adjoining construction. Windows installed in masonry walls must have head and jamb members designed to recess into masonry wall not less than 7/16 inch.

3.2.4 Adjustments After Installation

After installation of windows and completion of glazing and field painting, adjust all ventilators and hardware to operate smoothly and to provide weathertight sealing when ventilators are closed and locked. Lubricate hardware and operating parts as necessary. Verify that products are properly installed, connected, and adjusted.

3.3 CLEANING

Clean interior and exterior surfaces of window units of mortar, plaster, paint spattering spots, and other foreign matter to present a neat appearance, to prevent fouling of weathering surfaces and weather-stripping, and to prevent interference with the operation of hardware.

Replace all stained, discolored, or abraded windows that cannot be restored to their original condition with new windows.

-- End of Section --

SECTION 08 71 00

DOOR HARDWARE

PART 1 GENERAL

1.1 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM E283	(2004; R 2012) Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
ASTM F883	(2013) Padlocks

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION

(BHMA) ANSI/BHMA A156.1	(2016) Butts and Hinges
ANSI/BHMA A156.2	(2017) Bored and Preassembled Locks and Latches
ANSI/BHMA A156.3	(2014) Exit Devices
ANSI/BHMA A156.4	(2013) Door Controls - Closers
ANSI/BHMA A156.5	(2014) Cylinder and Input Devices for Locks
ANSI/BHMA A156.6	(2015) Architectural Door Trim
ANSI/BHMA A156.7	(2016) Template Hinge Dimensions
ANSI/BHMA A156.8	(2015) Door Controls - Overhead Stops and Holders
ANSI/BHMA A156.10	(2017) Power Operated Pedestrian Doors ANSI/BHMA
A156.12	(2013) Interconnected Locks & Latches ANSI/BHMA
A156.13	(2017) Mortise Locks & Latches Series 1000
ANSI/BHMA A156.14	(2013) Sliding and Folding Door Hardware
ANSI/BHMA A156.15	(2015) Release Devices Closer Holder, Electromagnetic and Electromechanical
ANSI/BHMA A156.16	(2018) Auxiliary Hardware

ANSI/BHMA A156.17	(2014) Self Closing Hinges & Pivots
ANSI/BHMA A156.18	(2016) Materials and Finishes
ANSI/BHMA A156.19	(2013) Power Assist & Low Energy Power Operated Doors
ANSI/BHMA A156.21	(2014) Thresholds
ANSI/BHMA A156.22	(2017) Door Gasketing and Edge Seal Systems
ANSI/BHMA A156.23	(2010) Electromagnetic Locks
ANSI/BHMA A156.24	(2012) Delayed Egress Locking Systems
ANSI/BHMA A156.25	(2013) Electrified Locking Devices ANSI/BHMA
A156.26	(2012) Continuous Hinges
ANSI/BHMA A156.27	(2011) Power and Manual Operated Revolving Pedestrian Doors
ANSI/BHMA A156.29	(2012) Exit Locks, Exit Alarms, Alarms for Exit Devices
ANSI/BHMA A156.30	(2014) High Security Cylinders
ANSI/BHMA A156.31	(2013) Electric Strikes and Frame Mounted Actuators
ANSI/BHMA A156.36	(2010) Auxiliary Locks

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2017; ERTA 1-2 2017; TIA 17-1; TIA 17-2; TIA 17-3; TIA 17-4; TIA 17-5; TIA 17-6; TIA 17-7; TIA 17-8; TIA 17-9; TIA 17-10; TIA 17-11; TIA 17-12; TIA 17-13; TIA 17-14; TIA 17-15; TIA 17-16; TIA 17-17) National Electrical Code
NFPA 72	(2019; TIA 19-1; ERTA 2019) National Fire Alarm and Signaling Code
NFPA 80	(2016; TIA 16-1) Standard for Fire Doors and Other Opening Protectives
NFPA 101	(2018; TIA 18-1; TIA 18-2; TIA 18-3) Life Safety Code
NFPA 252	(2017) Standard Methods of Fire Tests of Door Assemblies

STEEL DOOR INSTITUTE (SDI/DOOR)

SDI/DOOR A250.8	(2003; R2008) Recommended Specifications for Standard Steel Doors and Frames

UNDERWRITERS LABORATORIES (UL)

UL 14C	(2006; Reprint Jul 2017) UL Standard for Safety Swinging Hardware for Standard Tin-Clad Fire Doors Mounted Singly and in Pairs
UL Bld Mat Dir	(updated continuously online) Building Materials Directory

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

Shop Drawings
Manufacturer's Detail Drawings;
Hardware Schedule;
Keying System;

Product Data
Hardware Items;

Manufacturer's Instructions
Installation

Operation and Maintenance Data
Hardware Schedule Items

Closeout Submittals
Key Bitting

1.3 SHOP DRAWINGS

Submit manufacturer's detail drawings indicating all hardware assembly components and interface with adjacent construction. Indicate power components and wiring coordination for electrified hardware. Base shop drawings on verified field measurements and include verification of existing conditions.

1.4 PRODUCT DATA

Indicate fire-ratings at applicable components. Provide documentation of ABA/ADA accessibility compliance of applicable components.

1.5 HARDWARE SCHEDULE

Prepare and submit hardware schedule in the following form:

Hardware Item	Quantity	Size	Reference Publi- cation Type No.	Finish	Mfr Nam e and Catalog No.	Key Control Symbols	UL Mark (If fire-rated and listed	BHMA Finish Desig-nation

1.6 KEY BITTING CHART REQUIREMENTS

1.6.1 Requirements

Submit key bitting charts prior to completion of the work.
Include:
a. Complete listing of all keys (e.g. AA1 and AA2).
b. Complete listing of all key cuts (AA1-123456, AA2-123458).
c.Tabulation showing which key fits which door.
d. Copy of floor plan showing doors and door numbers.

1.7 QUALITY ASSURANCE

1.7.1 Hardware Manufacturers and Modifications

Provide, as far as feasible, locks, hinges, pivots, and closers of one lock, hinge, pivot, or closer manufacturer's make. Modify hardware as necessary to provide features indicated or specified.

1.7.2 Key Shop Drawings Coordination Meeting:
Prior to the submission of the key shop drawing, the Owner’s Representative(s), Contractor, Door Hardware Subcontractor, using Activity and Base Locksmith must meet to discuss and coordinate key requirements for the facility.

1.8 DELIVERY, STORAGE, AND HANDLING

Deliver hardware in original individual containers, complete with necessary appurtenances including fasteners and instructions. Mark each individual container with item number as shown on hardware schedule. Deliver permanent keys and removable cores, either directly or by certified mail. Deliver construction master keys with the locks.

PART 2 PRODUCTS

2.0 For Basis of Design hardware schedule see hardware sets indicated on drawings.

2.1 TEMPLATE HARDWARE

Hardware applied to metal or to prefinished doors must be manufactured using a template. Provide templates to door and frame manufacturers in accordance with ANSI/BHMA A156.7 for template hinges. Coordinate hardware items to prevent interference with other hardware.

2.2 HARDWARE FOR FIRE DOORS AND EXIT DOORS

Provide all hardware necessary to meet the requirements of NFPA 72 for door alarms, NFPA 80 for fire doors, NFPA 101 for exit doors, NFPA 252 for fire tests of door assemblies, ABA/ADA accessibility requirements, and all other requirements indicated, even if such hardware is not specifically

mentioned in paragraph HARDWARE SCHEDULE. Provide Underwriters Laboratories, Inc. labels for such hardware in accordance with UL Bld Mat Dir or equivalent labels in accordance with another testing laboratory approved in writing.

2.3 HARDWARE ITEMS

Clearly and permanently mark with the manufacturer's name or trademark, hinges, pivots, locks, latches, exit devices, bolts and closers where the identifying mark is visible after the item is installed. For closers with covers, the name or trademark may be beneath the cover. Coordinate electrified door hardware components with corresponding electrical components.

2.3.1 Hinges

Provide in accordance with ANSI/BHMA A156.1. Provide hinges that are 4-1/2 by 4-1/2 inch unless otherwise indicated. Construct loose pin hinges for interior doors and reverse-bevel exterior doors so that pins are non-removable when door is closed. Other anti-friction bearing hinges may be provided in lieu of ball bearing hinges.

2.3.1.1 Protection Devices

Provide full height hand and finger protection device at the hinge-side area opening of doors and gates. Provide hinge-side protection devices on both sides of doors and gates, covering hinges and space between door and frame when doors are in the open position. The installed device must push hand and fingers out of the opening and away from a crushing hazard.

2.3.2 Locks and Latches

a. At exterior locations provide locksets of full stainless steel type 302 or 304 construction including fronts, strike, escutcheons, knobs, bolts and all interior working parts. Marine Grade I, fully non-ferrous.

b. In non-air-conditioned interior environments or humid interior environments, provide interior locksets on the same Marine Grade I, fully non-ferrous as exterior locksets.

2.3.2.1 Bored Locks and Latches

Provide in accordance with ANSI/BHMA A156.2, Series 4000, Grade 1

2.3.2.2 Interconnected Locks and Latches

Provide in accordance with ANSI/BHMA A156.12. Provide F96 or F97, unless otherwise specified.

2.3.2.3 Auxiliary Locks

Provide in accordance with ANSI/BHMA A156.36, Grade 1.

2.3.3 Exit Devices

Provide in accordance with ANSI/BHMA A156.3, Grade 1. Provide adjustable strikes for rim type and vertical rod devices. Provide open back strikes for pairs of doors with mortise and vertical rod devices. Provide touch bars in lieu of conventional crossbars and arms.

2.3.4 Cylinders and Cores

Provide cylinders and cores for new locks, including locks provided under other sections of this specification. Provide cylinders from the products of one manufacturer, and provide cores from the products of one manufacturer. Rim cylinders, mortise cylinders, and knobs of bored locksets have interchangeable cores which are removable by special control keys. Stamp each interchangeable core with a key control symbol in a concealed place on the core.

2.3.5 Push Button Mechanisms

Provide in accordance with ANSI/BHMA A156.5, Grade 1.

2.3.6 Electrified Hardware

Comply with the requirements of NFPA 70 for wiring of electrified hardware.

2.3.6.1 Electric Strikes and Frame Mounted Actuators

Provide in accordance with ANSI/BHMA A156.31, Grade 1. Provide electric strikes and actuators as required to meet operational requirements. Provide electric strikes that release automatically during power failure. Provide battery backup for continued operation during power failure. Provide Strikes and actuators with a minimum opening force of 2300 pounds.

Provide facility interface devices that use direct current (dc) power to energize the solenoids. Provide electric strikes and actuators that incorporate end-of-line resistors to facilitate line supervision by the system. If not incorporated into the electric strike or local controller, provide metal oxide resistors (MOVs) to protect the controller from reverse current surges.

2.3.6.1.1 Solenoid

Provide actuating solenoid for strikes and actuators that are rated for continuous duty, cannot dissipate more than 12 Watts and must operate on 12 or 24 Volts dc. Inrush current cannot exceed 1 ampere and the holding current cannot be greater than 500 milliamperes. Actuating solenoid must move from fully secure to fully open positions in less than 500 milliseconds.

2.3.6.1.2 Signal Switches

Provide strikes and actuators with signal switches to indicate to the system when the bolt is not engaged or the strike mechanism is unlocked. Signal switches must report a forced entry to the system.

2.3.6.1.3 Tamper Resistance

Provide strike guards that prevent tampering with the latch bolt of the locking hardware or the latch bolt keeper of the electric strike. Strike guards to bolt through the door using tamper resistant screws. Provide strike guards made of 1/8 inch thick brass and that are 11-1/14 inch high by 1-5/8 inch wide, with a minimum 5/32 inch wide offset.

2.3.6.1.4 Coordination

Provide electric strikes and actuators of a size, weight and profile compatible with each specified door frame. Field verify installation clearances prior to procurement.

2.3.6.1.5 Mounting Method

Provide electric strikes and actuators suitable for use with single and double doors, with mortise or rim type hardware specified, and for right or left hand mounting as specified. In double door installations, locate the lock in the active leaf and monitor the fixed leaf.

2.3.6.2 Electrified Mortise Locks

Provide in accordance with ANSI/BHMA A156.25, Grade 1. Provide electrified mortise locks that release automatically during power failure. Provide facility interface devices that use dc power to energize solenoids. Provide solenoids, resisters, and signal switches in accordance with paragraph ELECTRIC STRIKES AND FRAME MOUNTED ACTUATORS.

2.3.6.2.1 Power Transfer Hinges

Provide power transfer hinges with each electrified lock that route power and monitoring signals from the lockset to the door frame. Coordinate power transfer hinges with door frames.

2.3.6.3 Card Readers and Keypad Access Control Hardware

Provide in accordance with ANSI/BHMA A156.5 and ANSI/BHMA A156.25, Grade 1 components. Provide devices that are tamper alarmed, tamper and vandal resistant, solid state, and do not contain electronics which could compromise the access control subsystem should the subsystem be attacked. Provide surface, semi-flush, pedestal, or weatherproof mountable devices as specified for each individual location. Each device to contain a visual display, either mounted on the face, or on an integral part of the device, to indicate access or exit request processing, request approval, and request denial. Provide proximity type card readers. Coordinate access control hardware with corresponding devices and systems specified in Division 28 ELECTRONIC SECURITY SYSTEMS.

2.3.6.4 Power Operated Pedestrian Door Hardware

Provide in accordance with ANSI/BHMA A156.10, Grade 1.

2.3.6.5 Power Assist and Low Energy Power Operated Doors

Provide in accordance with ANSI/BHMA A156.19, Grade 1.

2.3.6.6 Electromagnetic Locks

Provide in accordance with ANSI/BHMA A156.23, Grade 1. Provide electromagnetic locks that do not contain any moving parts and depend solely upon electromagnetism to secure a portal by generating at least 1200 pounds of holding force. The lock must interface with the local processors without external, internal or functional alteration of the local processor. The electromagnetic lock must incorporate an end of line resistor to facilitate line supervision by the system. Provide metal-oxide resistors (MOVs) to protect controllers from reverse current surges, if not incorporated into the electromagnetic lock or local controller.

2.3.6.7.1 Armature

Provide electromagnetic locks with internal circuitry to eliminate residual magnetism and inductive kickback. Provide atuating armature that operates on 12 or 24 Volts dc and cannot dissipate more than 12 Watts. Holding current must be less than 500 milliamperes. Actuating armature must take less than 300 milliseconds to change the status of the lock from fully secure to fully open or fully open to fully secure.

2.3.6.7.2 Tamper Resistance

Provide lock mechanism encased in hardened guard barriers to deter forced entry.

2.3.6.7.3 Mounting Method

Provide electromagnetic lock suitable for use with single and double door with mortise or rim type hardware and compatible with right or left hand mounting.

2.3.7 Keying System

Provide a master keying system that incorporates existing locks if possible. Provide cylinders of Grade 1 products from one manufacturer. Notify the Architect and Owner 90 days prior to the required delivery of the cylinders. Provide temporary cores and keys for the Contractor's use during construction, and for testing of locksets.

2.3.8 Lock Trim

Provide cast, forged, or heavy wrought construction and commercial plain design for lock trim.

2.3.8.1 Knobs and Roses

Provide in accordance with ANSI/BHMA A156.2 and ANSI/BHMA A156.13 for knobs, roses, and escutcheons. For unreinforced knobs, roses, and escutcheons, provide a 0.050 inch thickness. For reinforced knobs, roses, and escutcheons, provide an outer shell thickness of 0.035 inch and a combined total thickness of 0.070 inch, except at knob shanks. Provide knob shanks 0.060 inch thick.

2.3.8.2 Lever Handles

Provide lever handles that meet current ADA requirements.

2.3.8.3 Texture

Provide knurled or abrasive coated knobs or lever handles for doors which are accessible to blind persons and which lead to dangerous areas.

2.3.9 Keys

Provide one file key, one duplicate key, and one working key for each key change and for each master. Furnish one additional working key for each lock of each keyed-alike group. Do not place room number on keys.

2.3.10 Door Bolts

Provide in accordance with ANSI/BHMA A156.16. Provide dustproof strikes for bottom bolts, except at doors having metal thresholds. Provide automatic latching flush bolts in accordance with ANSI/BHMA A156.3, Type 25.

2.3.11 Closers

Provide in accordance with ANSI/BHMA A156.4, Series C02000, Grade 1, with PT 4C. Provide with brackets, arms, mounting devices, fasteners, covers, and other features necessary for the particular application. Size closers in accordance with manufacturer's printed recommendations, or provide multi-size closers, Sizes 1 through 6, and list sizes in the Hardware Schedule. Provide manufacturer's 10 year warranty.

Use stainless steel inside bracketed or door mounted closers on exterior doors. On interior doors use closers of 302 or 304 stainless steel or non-ferrous materials. On surface-mounted closers use or apply rust inhibiting finish on all ferrous parts. Also apply this finish on concealed closers.

2.3.11.1 Identification Marking

Engrave each closer with manufacturer's name or trademark, date of manufacture, and manufacturer's size designation in locations that will be visible after installation.

2.3.12 Overhead Holders

Provide in accordance with ANSI/BHMA A156.8.

2.3.13 Door Protection Plates

Provide in accordance with ANSI/BHMA A156.6.

2.3.13.1 Sizes of Kick Plates

2 inch less than door width for single doors; 1 inch less than door width for pairs of doors. Provide 10 inch kick plates for flush doors.

2.3.14 Door Stops and Silencers

Provide in accordance with ANSI/BHMA A156.16. Silencers Type L03011. Provide three silencers for each single door, two for each pair.

2.3.15 Thresholds

Provide in accordance with ANSI/BHMA A156.21. Use J35100, with vinyl or silicone rubber insert in face of stop, for exterior doors opening out, unless specified otherwise. Align bottom with door frame rabbet.

2.3.20 Auxiliary Hardware (Other than locks)

Provide in accordance with ANSI/BHMA A156.16, Grade 1.

2.3.22 Special Tools

Provide special tools, such as spanner and socket wrenches and dogging keys, as required to service and adjust hardware items.

2.4 FASTENERS

Provide fasteners of type, quality, size, and quantity appropriate to the specific application. Fastener finish to match hardware. Provide stainless steel or nonferrous metal fasteners in

locations exposed to weather. Verify metals in contact with one another are compatible and will avoid galvanic corrosion when exposed to weather.

2.5 FINISHES

Provide in accordance with ANSI/BHMA A156.18. Provide hardware in BHMA 630 finish (satin stainless steel), unless specified otherwise. Provide items not manufactured in stainless steel in BHMA 626 finish (satin chromium plated) over brass or bronze, except finish for surface door closers, and except BHMA 652 finish (satin chromium plated) for steel hinges. Provide hinges for exterior doors in stainless steel with BHMA 630 finish Furnish exit devices in BHMA 626 finish in lieu of BHMA 630 finish . Match exposed parts of concealed closers to lock and door trim.

Match hardware finish for aluminum doors to the doors.

2.6 KEY CABINET AND CONTROL SYSTEM

Provide in accordance with ANSI/BHMA A156.5, Type required to yield a capacity 50 percent greater than the number of key changes used for door locks.

PART 3 EXECUTION

3.1 INSTALLATION

Provide hardware in accordance with manufacturers' printed installation instructions. Fasten hardware to wood surfaces with full-threaded wood screws or sheet metal screws. Provide machine screws set in expansion shields for fastening hardware to solid concrete and masonry surfaces. Provide toggle bolts where required for fastening to hollow core construction. Provide through bolts where necessary for satisfactory installation.

3.1.2 Threshold Installation

Extend thresholds the full width of the opening and notch end for jamb stops. Set thresholds in a full bed of sealant and anchor to floor with cadmium-plated, countersunk, steel screws in expansion sleeves if reqd. For aluminum thresholds placed on top of concrete surfaces, coat the underside surfaces that are in contact with the concrete with fluid applied waterproofing as a separation measure prior to placement.

3.3 FIRE DOORS AND EXIT DOORS

Provide hardware in accordance with NFPA 72 for door alarms, NFPA 80 for fire doors, NFPA 101 for exit doors, and NFPA 252 for fire tests of door assemblies.

3.3 HARDWARE LOCATIONS

Provide in accordance with SDI/DOOR A250.8, unless indicated or specified otherwise.

3.4 KEY CABINET AND CONTROL SYSTEM

Locate where directed. Tag one set of file keys and one set of duplicate keys.Place other keys in appropriately marked envelopes, or tag each key. Provide complete instructions for setup and use of key control system. On tags and envelopes, indicate door and room numbers or master or grand master key.

3.5 FIELD QUALITY CONTROL

After installation, protect hardware from paint, stains, blemishes, and other damage until acceptance of work. Submit notice of testing 15 days before scheduled, so that testing can be witnessed by the Contracting Officer. Adjust hinges, locks, latches, bolts, holders, closers, and other items to operate properly. Demonstrate that permanent keys operate respective locks, and give keys to the Contracting Officer. Correct, repair, and finish, errors in cutting and fitting and damage to adjoining work.

-- End of Section --

SECTION 08 81 00

GLAZING

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

AAMA 800	(2016) Voluntary Specifications and Test Methods for Sealants
AAMA GDSG-1	(1987) Glass Design for Sloped Glazing
AAMA TIR A7	(2011) Sloped Glazing Guidelines

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z97.1	(2015) Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test

ASTM INTERNATIONAL (ASTM)

ASTM C509	(2006; R 2015) Elastomeric Cellular Preformed Gasket and Sealing Material
ASTM C864	(2005; R 2015) Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers
ASTM C920	(2018) Standard Specification for Elastomeric Joint Sealants
ASTM C1021	(2008; R 2014) Standard Practice for Laboratories Engaged in Testing of Building Sealants
ASTM C1036	(2016) Standard Specification for Flat Glass
ASTM C1048	(2018) Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass
ASTM C1087	(2016) Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems

ASTM C1172	(2019) Standard Specification for Laminated Architectural Flat Glass
ASTM C1184	(2014) Standard Specification for Structural Silicone Sealants
ASTM C1281	(2016) Standard Specification for Preformed Tape Sealants for Glazing Applications
ASTM C1376	(2015) Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass
ASTM D395	(2016; E 2017) Standard Test Methods for Rubber Property - Compression Set
ASTM D2287	(2012) Nonrigid Vinyl Chloride Polymer and Copolymer Molding and Extrusion Compounds
ASTM D4802	(2016) Standard Specification for Poly(Methyl Methacrylate) Acrylic Plastic Sheet
ASTM E90	(2009; R2016) Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
ASTM E119	(2018c; E 2018) Standard Test Methods for Fire Tests of Building Construction and Materials
ASTM E413	(2016) Classification for Rating Sound Insulation
ASTM E1300	(2016) Standard Practice for Determining Load Resistance of Glass in Buildings
ASTM E2190	(2010) Standard Specification for Insulating Glass Unit Performance and Evaluation
ASTM E2226	(2015a2015; R 2019b) Standard Practice for Application of Hose Stream
ASTM F1642/F1642M	(2017) Standard Test Method for Glazing and Glazing Systems Subject to Airblast Loadings
ASTM F2912	(2017) Standard Specification for Glazing and Glazing Systems Subject to Airblast Loadings

GLASS ASSOCIATION OF NORTH AMERICA (GANA)

GANA Glazing Manual	(2008) Glazing Manual
GANA Sealant Manual	(2008) Sealant Manual
GANA Standards Manual	(2008) Engineering Standards Manual

INSULATING GLASS MANUFACTURERS ALLIANCE (IGMA)

IGMA TB-1200	(1983; R 2016) Guidelines for Insulating Glass Dimensional Tolerances
IGMA TB-3001	(2001) Guidelines for Sloped Glazing
IGMA TM-3000	(1990; R 2016) North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use

NATIONAL FENESTRATION RATING COUNCIL (NFRC)

NFRC 100	(2014) Procedure for Determining Fenestration Product U-Factors
NFRC 200	(2014) Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 80	(2016; TIA 16-1) Standard for Fire Doors and Other Opening Protectives
NFPA 251	(2006) Standard Methods of Tests of Fire Resistance of Building Construction and Materials
NFPA 252	(2017) Standard Methods of Fire Tests of Door Assemblies
NFPA 257	(2012; ERTA 2017) Standard on Fire Test for Window and Glass Block Assemblies

U.S. DEPARTMENT OF ENERGY (DOE)

Energy Star	(1992; R 2006) Energy Star Energy Efficiency Labeling System (FEMP)

UNDERWRITERS LABORATORIES (UL)

UL 752	(2005; Reprint Dec 2015) Standard for Bullet-Resisting Equipment
UL MEAPD	(2011) Mechanical Equipment and Associated Products Directory (online version is listed under Certifications at www.ul.com)

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:
Product Data
Insulating Glazing
Accessories
Sealants

Samples
Insulating Glass
Glazing
Compound
Glazing Tape
Sealing Tapes
Certificates
Insulating Glass
Plastic Glazing
Manufacturer's Instructions
Setting and Sealing Materials
Glass Setting

1.3 SYSTEM DESCRIPTION

Fabricate and install watertight and airtight glazing systems to withstand thermal movement and wind loading without glass breakage, gasket failure, deterioration of glazing accessories, or defects in the work. Glazed panels must comply with the safety standards, in accordance with ANSI Z97.1.

[1.4 QUALITY CONTROL

Submit two 8 by 10 inch samples of each glazing type.

1.5 DELIVERY, STORAGE, AND HANDLING

Deliver products to the site in unopened containers, labeled plainly with manufacturers' names and brands. Store glass and setting materials in safe, enclosed dry locations and do not unpack until needed for installation. Handle and install materials in a manner that will protect them from damage.

1.6 ENVIRONMENTAL REQUIREMENTS

Do not start glazing work until the outdoor temperature is above 40 degrees F and rising, unless procedures recommended by the glass manufacturer are made to warm the glass and rabbet surfaces. Provide ventilation to prevent condensation of moisture on glazing work during installation. Do not perform glazing work during damp or rainy weather.

1.7 WARRANTY

1.7.1 Warranty for Insulated Glass Units

Warranty insulating glass units against development of material obstruction to vision (such as dust, fogging, or film formation on the inner glass surfaces) caused by failure of the hermetic seal, other than through glass breakage, for a 10-year period following acceptance of the work. Provide new units for any units failing to comply with terms of this warranty within 45 working days after receipt of notice.

PART 2 PRODUCTS

2.1 GLASS

ASTM C1036, unless specified otherwise. In doors and sidelights, provide safety glazing material conforming to 16 CFR 1201.

2.1.1 Clear Glass

For interior glazing (i.e., pass and observation windows), 1/4 inch thick glass should be used.

2.1.2 Patterned Glass

Type II, Class 1 (translucent), Form 3 (patterned), Quality q5 or q6 (decorative), Pattern P1 (linear), 1/2" reeeded

2.1.3 Mirrors

2.1.3.1 Glass Mirrors

Glass for mirrors must be Type I transparent flat type, Class 1-clear, Glazing Quality q1 1/4 inch thick conforming to ASTM C1036. Glass must be coated on one surface with silver coating, copper protective coating, and mirror backing paint. Silver coating must be highly adhesive pure silver coating of a thickness which must provide reflectivity of 83 percent or more of incident light when viewed through 1/4 inch thick glass, and must be free of pinholes or other defects. Copper protective coating must be pure bright reflective copper, homogeneous without sludge, pinholes or other defects, and must be of proper thickness to prevent "adhesion pull" by mirror backing paint. Mirror backing paint must consist of two coats of special scratch and abrasion-resistant paint, and must be baked in uniform thickness to provide a protection for silver and copper coatings which will permit normal cutting and edge fabrication.

2.1.4 Tempered Glass

ASTM C1048, Kind FT (fully tempered), Provide wherever safety glazing material is indicated or specified, or required by code.

2.2 INSULATING GLASS UNITS

Two panes of glass separated by a dehydrated airspace filled with inert gas and hermetically sealed, conforming to ASTM E2190. Submit performance and compliance documentation for each type of insulating glass.

Per NFRC 200 and NFRC 100 Insulated glass units must have a maximum Solar Heat Gain Coefficient (SHGC) and a maximum U-factor within the limits of local Building Codes. See Oregon Specialty Energy Code for energy performance requirements for glazed systems.

Aluminum frames shall be manufacturer’s standard thermally broken frame.

Dimensional tolerances must be as specified in IGMA TB-1200. Spacer must be black, roll-formed, thermally broken aluminum with bent or tightly welded or keyed and sealed joints to completely seal the spacer periphery and eliminate moisture and hydrocarbon vapor transmission into airspace through the corners. Primary seal must be compressed polyisobutylene and the secondary seal must be a specially formulated silicone.

2.2.1 Low Emissivity Coatings

Interior and exterior glass panes for Low-E insulating units must be Type I annealed flat glass, with anti-reflective low-emissivity coating or heat-strengthened or fully tempered glass complying with ASTM C1048.

2.3 SETTING AND SEALING MATERIALS

Provide as specified in the GANA Glazing Manual, IGMA TM-3000, IGMA TB-3001, and manufacturer's recommendations, unless specified otherwise herein. Do not use metal sash putty, nonskinning compounds, nonresilient preformed sealers, or impregnated preformed gaskets. Materials exposed to view and unpainted must be gray or neutral color. Sealant testing must be performed by a testing agency qualified according to ASTM C1021. Submit glass manufacturer's recommendations for setting and sealing materials and for installation of each type of glazing material specified.

2.3.1 Sealants

Provide elastomeric sealants.

2.3.1.1 Elastomeric Sealant

ASTM C920, Type S, Grade NS, Class 12.5, Use G. Use for channel or stop glazing sash. Sealants must be chemically compatible with setting blocks, edge blocks, and sealing tapes, with sealants used in manufacture of insulating glass units

2.3.2 Glazing Tapes

2.3.2.1 Back-Bedding Mastic Glazing Tapes

Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C1281 and AAMA 800.

2.3.2.2 Expanded Cellular Glazing Tapes

Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800.

2.3.3 Sealing Tapes

Preformed, semisolid, PVC-based material of proper size and compressibility for the particular condition, complying with ASTM D2287. Use only where glazing rabbet is designed for tape and tape is recommended by the glass or sealant manufacturer. Provide spacer shims for use with compressible tapes. Tapes must be chemically compatible with the product being set.

2.3.4 Setting Blocks and Edge Blocks

Closed-cell neoprene setting blocks must be dense extruded type conforming to ASTM C509 and ASTM D395, Method B, Shore A durometer between 70 and 90. Edge blocking must be Shore A durometer of 50 (plus or minus 5). Provide silicone setting blocks when blocks are in contact with silicone sealant. Profiles, lengths and locations must be as required and recommended in writing by glass manufacturer.

2.3.5 Glazing Gaskets

Glazing gaskets must be extruded with continuous integral locking projection designed to engage into metal glass holding members to provide a watertight seal during dynamic loading, building movements and thermal movements. Glazing gaskets for a single glazed opening must be

continuous one-piece units with factory-fabricated injection-molded corners free of flashing and burrs. Glazing gaskets must be in lengths or units recommended by manufacturer to ensure against pull-back at corners. Provide glazing gasket profiles as recommended by the manufacturer for the intended application.

2.3.5.1 Fixed Glazing Gaskets

Fixed glazing gaskets must be closed-cell (sponge) smooth extruded compression gaskets of cured elastomeric virgin neoprene compounds conforming to ASTM C509, Type 2, Option 1.

2.3.5.2 Wedge Glazing Gaskets

Wedge glazing gaskets must be high-quality extrusions of cured elastomeric virgin neoprene compounds, ozone resistant, conforming to ASTM C864, Option 1, Shore A durometer between 65 and 75.

2.3.5.3 Aluminum Framing Glazing Gaskets

Glazing gaskets for aluminum framing must be permanent, elastic, non-shrinking, non-migrating, watertight and weathertight.

2.3.6 Accessories

Provide as required for a complete installation, including glazing points, clips, shims, angles, beads, and spacer strips. Provide noncorroding metal accessories. Provide primer-sealers and cleaners as recommended by the glass and sealant manufacturers. Use ASTM C1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to surface.

2.4 MIRROR ACCESSORIES

2.4.1 Mastic

Mastic for setting mirrors must be a polymer type mirror mastic resistant to water, shock, cracking, vibration and thermal expansion. Provide mastic compatible with mirror backing paint, and as approved by mirror manufacturer.

2.4.2 Mirror Frames

Provide mirrors with mirror frames (J-mold channels) fabricated of one-piece roll-formed Type 304 stainless steel with No. 4 brushed satin finish and concealed fasteners which will keep mirrors snug to wall. Frames must be continuous around all sides (unless wall to wall mirrors are indicated then shall be continuous at top and bottom. Concealed fasteners of type to suit wall construction material must be provided with mirror frames.

2.4.3 Mirror Clips

Provide clips with concealed fasteners of type to suit wall construction material.

PART 3 EXECUTION

Any materials that show visual evidence of biological growth due to the presence of moisture must not be installed on the building project.

3.1 PREPARATION

Preparation, unless otherwise specified or approved, must conform to applicable recommendations in the GANA Glazing Manual, GANA Sealant Manual, IGMA TB-3001, IGMA TM-3000, and manufacturer's recommendations. Determine the sizes to provide the required edge clearances by measuring the actual opening to receive the glass. Grind smooth in the shop glass edges that will be exposed in finish work. Leave labels in place until the installation is approved, except remove applied labels on heat-absorbing glass and on insulating glass units as soon as glass is installed. Securely fix movable items or keep in a closed and locked position until glazing compound has thoroughly set.

3.2 GLASS SETTING

Shop glaze or field glaze items to be glazed using glass of the quality and thickness specified or indicated. Glazing, unless otherwise specified or approved, must conform to applicable recommendations in the GANA Glazing Manual, GANA Sealant Manual, IGMA TB-3001, IGMA TM-3000, and manufacturer's recommendations. Aluminum windows, wood doors, and wood windows may be glazed in conformance with one of the glazing methods described in the standards under which they are produced, except that face puttying with no bedding will not be permitted. Handle and install glazing materials in accordance with manufacturer's instructions. Use beads or stops which are furnished with items to be glazed to secure the glass in place. Verify products are properly installed, connected, and adjusted.

3.2.1 Patterned Glass

Set glass with one patterned surface with smooth surface on the weather side. When used for interior partitions, place the patterned surface in same direction in all openings.

3.2.2 Insulating Glass Units

Do not grind, nip, or cut edges or corners of units after the units have left the factory. Springing, forcing, or twisting of units during setting will not be permitted. Handle units so as not to strike frames or other objects. Installation must conform to applicable recommendations of IGMA TB-3001 and IGMA TM-3000.

3.3 CLEANING

Clean glass surfaces and remove labels, paint spots, putty, and other defacement as required to prevent staining. Glass must be clean at the time the work is accepted.

3.4 PROTECTION

Protect glass work immediately after installation. Identify glazed openings with suitable warning tapes, cloth or paper flags, attached with non-staining adhesives. Protect reflective glass with a protective material to eliminate any contamination of the reflective coating. Place protective material far enough away from the coated glass to allow air to circulate to reduce heat buildup and moisture accumulation on the glass. Upon removal, separate protective materials for reuse or recycling. Remove and replace glass units which are broken, chipped, cracked, abraded, or otherwise damaged during construction activities with new units.

-- End of Section --

SECTION 09 29 00

GYPSUM BOARD

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A108.11	(1992; Reaffirmed 2005) Specifications for Interior Installation of Cementitious Backer Units

ASTM INTERNATIONAL (ASTM)

ASTM C475/C475M	(2017) Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board
ASTM C514	(2004; R 2014) Standard Specification for Nails for the Application of Gypsum Board
ASTM C557	(2003; R 2017) Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing
ASTM C840	(2018b) Standard Specification for Application and Finishing of Gypsum Board
ASTM C954	(2018) Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness
ASTM C1002	(2018) Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs
ASTM C1047	(2014a) Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base
ASTM C1177/C1177M	(2017) Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing
ASTM C1178/C1178M	(2013) Standard Specification for Glass Mat Water-Resistant Gypsum Backing Panel
ASTM C1396/C1396M	(2017) Standard Specification for Gypsum Board
ASTM C1629/C1629M	(2018a) Standard Classification for Abuse-Resistant

	Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels
ASTM D226/D226M	(2017) Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing
ASTM D412	(2016) Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension
ASTM D624	(2000; R 2012) Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers
ASTM D1037	(2012) Evaluating Properties of Wood-Base Fiber and Particle Panel Materials
ASTM D1149	(2007; R 2012) Standard Test Method for Rubber Deterioration - Surface Ozone Cracking in a Chamber
ASTM D2394	(2017) Standard Test Methods for Simulated Service Testing of Wood and Wood-Base Finish Flooring
ASTM D3273	(2016) Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber
ASTM D5420	(2016) Standard Test Method for Impact Resistance of Flat, Rigid Plastic Specimen by Means of a Strike Impacted by a Falling Weight (Gardner Impact)
ASTM E84	(2018a) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM E695	(2003; R 2015; E 2015) Measuring Relative Resistance of Wall, Floor, and Roof Construction to Impact Loading

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

CDPH SECTION 01350	(2010; Version 1.1) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers

FM GLOBAL (FM)

FM APP GUIDE	(updated on-line) Approval Guide http://www.approvalguide.com/

GREEN SEAL (GS)

GS-36	(2013) Adhesives for Commercial Use

GYPSUM ASSOCIATION (GA)

GA 214	(2010) Recommended Levels of Gypsum Board Finish

GA 216	(2010) Application and Finishing of Gypsum Panel Products
GA 224	(2008) Installation of Predecorated Gypsum Board
GA 253	(2012) Application of Gypsum Sheathing
GA 600	(2009) Fire Resistance Design Manual

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS	SCS Global Services (SCS) Indoor Advantage

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1168	(2017) Adhesive and Sealant Applications

UNDERWRITERS LABORATORIES (UL)

UL 2818	(2013) GREENGUARD Certification Program For Chemical Emissions For Building Materials, Finishes And Furnishings
UL Fire Resistance	(2014) Fire Resistance Directory

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

Product Data

Gypsum Board
Glass Mat Covered or Reinforced Gypsum Sheathing
Glass Mat Covered or Reinforced Gypsum Sheathing Sealant

Accessories
Submit for each type of gypsum board.

1.3 DELIVERY, STORAGE, AND HANDLING

1.3.1 Delivery

Deliver materials in the original packages, containers, or bundles with each bearing the brand name, applicable standard designation, and name of manufacturer, or supplier.

1.3.2 Storage

Keep materials dry by storing inside a sheltered building. Where necessary to store gypsum board and cementitious backer units outside, store off the ground, properly supported on a level platform, and protected from direct exposure to rain, snow, sunlight, and other extreme weather conditions. Provide adequate ventilation to prevent condensation. Store per manufacturer's recommendations for allowable temperature and humidity range. Do not store panels near materials that may offgas or emit harmful fumes, such as kerosene heaters, fresh paint, or adhesives. Do not use materials that have

visible moisture or biological growth.

1.3.3 Handling

Neatly stack gypsum board and cementitious backer units flat to prevent sagging or damage to the edges, ends, and surfaces.

1.4 QUALIFICATIONS

Furnish type of gypsum board work specialized by the installer with a minimum of 3years of documented successful experience.

1.5 ENVIRONMENTAL REQUIREMENTS

Do not expose the gypsum board to excessive sunlight prior to gypsum board application. Maintain a continuous uniform temperature of not less than 50 degrees F and not more than 80 degrees F for at least one week prior to the application of gypsum board work, while the gypsum board application is being done, and for at least one week after the gypsum board is set. Shield air supply and distribution devices to prevent any uneven flow of air across the plastered surfaces. Provide ventilation to exhaust moist air to the outside during gypsum board application, set, and until gypsum board jointing is dry. In glazed areas, keep windows open top and bottom or side to side 3 to 4 inches. Reduce openings in cold weather to prevent freezing of joint compound when applied. For enclosed areas lacking natural ventilation, provide temporary mechanical means for ventilation. In unglazed areas subjected to hot, dry winds or temperature differentials from day to night of 20 degrees F or more, screen openings with cheesecloth or similar materials. Avoid rapid drying. During periods of low indoor humidity, provide minimum air circulation following gypsum boarding and until gypsum board jointing complete and is dry.

1.6 FIRE RESISTIVE CONSTRUCTION

Comply with specified fire-rated assemblies for design numbers indicated per UL Fire Resistance or FM APP GUIDE.

]PART 2 PRODUCTS

2.1 MATERIALS

Conform to specifications, standards and requirements specified. Provide gypsum board types, gypsum backing board types, cementitious backing units, and joint treating materials manufactured from asbestos free materials only.

2.1.1 Gypsum Board

ASTM C1396/C1396M.

2.1.1.1 Regular

48 inch wide, 5/8 inch thick, .

2.1.1.2 Type X (Special Fire-Resistant)

48 inch wide, 5/8 inch thick, edges.

2.1.1.3 Mold Resistant / Anti-Microbial Gypsum

ASTM D3273. 48 inch wide, 5/8 inch thick, tapered edges.

2.1.2 Regular Water-Resistant Gypsum Backing Board

ASTM C1396/C1396M

2.1.2.1 Regular

48 inch wide, 5/8 inch thick, tapered edges.

2.1.2.2 Type X (Special Fire-Resistant)

48 inch wide, 5/8 inch thick, tapered edges.

2.1.3 Glass Mat Covered or Reinforced Gypsum Sheathing

Exceeds physical properties of ASTM C1396/C1396M and ASTM C1177/C1177M. Provide 5/8 inch, gypsum sheathing. Provide gypsum board of with a noncombustible water-resistant core, with glass mat surfaces embedded to the gypsum core or reinforcing embedded throughout the gypsum core. Warrant gypsum sheathing board for at least twelve months against delamination due to direct weather exposure. Provide continuous, asphalt impregnated, building felt to cover exterior face of sheathing. Seal all joints, seams, and penetrations with compatible sealant.

2.1.3.1 Glass Mat Covered or Reinforced Gypsum Sheathing Sealant

Provide sealant compatible with glass mat covered or reinforced gypsum sheathing, rubber washers for masonry veneer anchors, and other associated cavity wall components such as anchors and through wall flashing. Provide sealants for glass mat covered or reinforced gypsum sheathing board edge seams and veneer anchor penetrations recommended by the glass mat covered or reinforced gypsum sheathing manufacturer and have the following performance requirements:

a. ASTM D412: Tensile Strength, 80 psi
b. ASTM D412: Ultimate Tensile Strength (maximum elongation), 170 psi
c. ASTM D624: Tear Strength, dieB, 27 ppi
d. ASTM D1149: Joint Movement Capability after 14 Days cure, plus or minus 50 percent.

2.1.4 Joint Treatment Materials

ASTM C475/C475M. Product must be low emitting VOC types with VOC limits not exceeding 50 g/L. Provide data identifying VOC content of joint compound. Use all-purpose joint and texturing compound containing inert fillers and natural binders, including lime compound. Pre-mixed compounds must be free of antifreeze, vinyl adhesives, preservatives, biocides and other slow releasing compounds.

2.1.4.1 Embedding Compound

Specifically formulated and manufactured for use in embedding tape at gypsum board joints and compatible with tape, substrate and fasteners.

2.1.4.2 Finishing or Topping Compound

Specifically formulated and manufactured for use as a finishing compound.

2.1.4.3 All-Purpose Compound

Specifically formulated and manufactured to serve as both a taping and a finishing compound and compatible with tape, substrate and fasteners.

2.1.4.4 Setting or Hardening Type Compound

Specifically formulated and manufactured for use with fiber glass mesh tape.

2.1.4.5 Joint Tape

Use cross-laminated, tapered edge, reinforced paper, or fiber glass mesh tape recommended by the manufacturer.

2.1.5 Fasteners

2.1.5.1 Nails

ASTM C514.

2.1.5.2 Screws

ASTM C1002, Type "G", Type "S" or Type "W" steel drill screws for fastening gypsum board to gypsum board, wood framing members and steel framing members less than 0.033 inch thick. ASTM C954 steel drill screws for fastening gypsum board to steel framing members 0.033 to 0.112 inch thick. Provide cementitious backer unit screws with a polymer coating.

2.1.6 Adhesives

Provide non-aerosol adhesive products used on the interior of the building (defined as inside of the weatherproofing system) meeting either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of SCAQMD Rule 1168. Provide aerosol adhesive products used on the interior of the building (defined as inside of the weatherproofing system) meeting either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of GS-36. Provide certification or validation of indoor air quality for non-aerosol adhesives applied on the interior of the building (inside of the weatherproofing system). Provide certification or validation of indoor air quality for aerosol adhesives used on the interior of the building (inside of the weatherproofing system).

2.1.6.1 Adhesive for Fastening Gypsum Board to Metal Framing

Type recommended by gypsum board manufacturer.

2.1.6.2 Adhesive for Fastening Gypsum Board to Wood Framing

ASTM C557.

2.1.6.3 Adhesive for Laminating

Adhesive attachment is not permitted for multi-layer gypsum boards. For laminating gypsum studs to face panels, provide adhesive recommended by gypsum board manufacturer.

2.1.7 Accessories

ASTM C1047. Fabricate from [corrosion protected steel or plastic designed for intended use. Accessories manufactured with paper flanges are not acceptable. Flanges must be free of dirt, grease, and other materials that may adversely affect bond of joint treatment. Provide prefinished or job decorated materials.

2.1.8 Asphalt Impregnated Building Felt

Provide a 15 lb asphalt moisture barrier over glass mat covered or reinforced gypsum sheathing. Conforming to ASTM D226/D226M Type 1 (No. 15) for asphalt impregnated building felt.

2.1.9 Water

Provide clean, fresh, and potable water. PART 3

EXECUTION

3.1 EXAMINATION

3.1.1 Framing and Furring

Verify that framing and furring are securely attached and of sizes and spacing to provide a suitable substrate to receive gypsum board and cementitious backer units. Verify that all blocking, headers and supports are in place to support plumbing fixtures and to receive soap dishes, grab bars, towel racks, and similar items. Do not proceed with work until framing and furring are acceptable for application of gypsum board and cementitious backer units.

Do not install materials that show visual evidence of biological growth.

3.2 APPLICATION OF GYPSUM BOARD

Apply gypsum board to framing and furring members in accordance with ASTM C840 or GA 216 and the requirements specified. Apply gypsum board with separate panels in moderate contact; do not force in place. Stagger end joints of adjoining panels. Neatly fit abutting end and edge joints. Use gypsum board of maximum practical length; select panel sizes to minimize waste. Cut out gypsum board to make neat, close, and tight joints around openings. In vertical application of gypsum board, provide panels in lengths required to reach full height of vertical surfaces in one continuous piece. Lay out panels to minimize waste; reuse cutoffs whenever feasible. Surfaces of gypsum board and substrate members may be bonded together with an adhesive, except where prohibited by fire rating(s). Treat edges of cutouts for plumbing pipes, screwheads, and joints with water-resistant compound as recommended by the gypsum board manufacturer. Provide type of gypsum board for use in each system specified herein as indicated.

3.2.1 Application of Single-Ply Gypsum Board to Wood Framing

Apply in accordance with ASTM C840, System I or GA 216.

3.2.2 Application of Two-Ply Gypsum Board to Wood Framing

Apply in accordance with ASTM C840, System II or GA 216.

3.2.3 Adhesive Nail-On Application to Wood Framing

Apply in accordance with ASTM C840, System III or GA 216. This method may be used in lieu of ASTM C840, System I at the option of the Contractor.

3.2.4 Semi-Solid Gypsum Board Partitions

Provide in accordance with ASTM C840, System IV or GA 216 .

3.2.5 Solid Gypsum Board Partitions

Provide in accordance with ASTM C840, System V or GA 216.

3.2.6 Adhesive Application to Interior Masonry or Concrete Walls

Apply in accordance with ASTM C840, System VI or GA 216.

3.2.7 Application of Gypsum Board to Steel Framing and Furring

Apply in accordance with ASTM C840, System VIII or GA 216.

3.2.8 Arches and Bending Radii

Apply gypsum board in accordance with ASTM C840, System IX or GA 216.

3.2.9 Gypsum Board for Wall Tile or Tile Base Applied with Adhesive

In dry areas (areas other than tubs, shower enclosures, saunas, steam rooms, gang shower rooms), apply glass mat water-resistant gypsum tile backing board or water-resistant gypsum backing board in accordance with ASTM C840, System X or GA 216.

3.2.10 Exterior Application

Apply exterior gypsum board (such as at soffits) in accordance with ASTM C840, System XI or GA 216.

3.2.11 Glass Mat Covered or Fiber Reinforced Gypsum Sheathing

Apply glass mat covered or fiber reinforced gypsum sheathing in accordance to gypsum association publications GA 253. Follow gypsum sheathing manufacturer's requirements of design details for joints and fasteners and be properly installed to protect the substrate from moisture intrusion. Do not leave exposed surfaces of the glass mat covered or fiber reinforced gypsum sheathing beyond the manufacturer's recommendation without a weather barrier cladding. Provide continuous asphalt impregnated building felt over sheathing surface in shingle fashion with edges and ends lapped a minimum of 6 inch. Properly flash the openings. Seal all joints, seams, and penetrations with a compatible silicone sealant.

3.2.12 Floating Interior Angles

Minimize framing by floating corners with single studs and drywall clips. Locate the attachment fasteners adjacent to ceiling and wall intersections in accordance with ASTM C840, System XII or GA 216.

3.2.13 Control Joints

Install expansion and contraction joints in ceilings and walls in accordance with ASTM C840, System XIII or GA 216. Fill control joints between studs in fire-rated construction with firesafing insulation to match the fire-rating of construction.

3.2.14 Application of Foil-Backed Gypsum Board

Apply foil-backed gypsum board in accordance with ASTM C840, System XIV orGA 216.

3.2.15 Application of Predecorated Gypsum Board

Apply predecorated gypsum board in accordance with GA 224. Attach predecorated gypsum board with adhesive and fasteners as recommended by the manufacturer. Conceal fasteners in the finished work.

3.2.16 Application of Abuse Resistant Gypsum Board

Apply in accordance with applicable system of ASTM C840 as specified or GA 216. Follow manufacturers written instructions on how to cut, drill and attach board.

3.3 FINISHING OF GYPSUM BOARD

Tape and finish gypsum board in accordance with ASTM C840, GA 214 and GA 216.

Unless otherwise specified, finish all gypsum board walls, partitions and ceilings to Level 5 in accordance with GA 214.

Finish walls and ceilings without critical lighting to receive flat paints, light textures, or wall coverings to Level 4 in accordance with GA 214.

Finish walls and ceilings to receive a heavy-grade wall covering to Level 3 in accordance with GA 214.

Finish walls and ceilings to receive textured finish before painting to Level 3 in accordance with GA 214.

Finish water resistant gypsum backing board, ASTM C1396/C1396M, to receive ceramic tile to Level 2 in accordance with GA 214.

Finish plenum areas above ceilings to Level 1 in accordance with GA 214.

Provide joint, fastener depression, and corner treatment. Tool joints as smoothly as possible to minimize sanding and dust. Do not use self-adhering fiber glass mesh tape with conventional drying type joint compounds; use setting or hardening type compounds only. Provide treatment for water-resistant gypsum board as recommended by the gypsum board manufacturer. Protect workers, building occupants, and HVAC systems from gypsum dust.

3.3.1 Uniform Surface

Wherever gypsum board is to receive eggshell, semigloss or gloss paint finish, or where severe, up or down lighting conditions occur, finish gypsum wall surface in accordance to GA 214 Level 5. In accordance with GA 214 Level 5, apply a thin skim coat of joint compound to the entire gypsum board surface, after the two-coat joint and fastener treatment is complete and dry.

3.4 SEALING

Seal openings around pipes, fixtures, and other items projecting through gypsum board and cementitious backer units as specified in Section 07 92 00 JOINT SEALANTS. Apply material with exposed surface flush with gypsum board or cementitious backer units.

3.4.1 Sealing for Glass Mat or Reinforced Gypsum Board Sheathing

Apply silicone sealant in a 3/8 inch bead to all joints and trowel flat. Apply enough of the same sealant to all fasteners penetrating through the glass mat gypsum board surface to completely cover the penetration when troweled flat.

3.5 FIRE-RESISTANT ASSEMBLIES

Wherever fire-rated construction is indicated, provide materials and application methods, including types and spacing of fasteners and framing in accordance with the specifications contained in UL Fire Resistance for the Design Number(s) indicated, or GA 600 for the File Number(s) indicated. Joints of fire-rated gypsum board enclosures must be closed and sealed in accordance with UL test requirements or GA requirements. Seal penetrations through rated partitions and ceilings tight in accordance with tested systems.

3.6 PATCHING

Patch surface defects in gypsum board to a smooth, uniform appearance, ready to receive finishes.

-- End of Section --

SECTION 09 65 00

RESILIENT FLOORING

PART 1 GENERAL

1.1 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM D4078	(2002; R 2015) Water Emulsion Floor Polish
ASTM D5603	(2001; R 2008) Rubber Compounding Materials - Recycled Vulcanizate Particulate Rubber
ASTM E648	(2017a) Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source
ASTM F710	(20172019) Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring
ASTM F1303	(2004; R 2014) Sheet Vinyl Floor Covering with Backing
ASTM F1344	(2015) Rubber Floor Tile
ASTM F1482	(2015) Installation and Preparation of Panel Type Underlayments to Receive Resilient Flooring
ASTM F1700	(2018a) Standard Specification for Solid Vinyl Floor Tile
ASTM F1859	(2014; E 2016) Standard Specification for Rubber Sheet Floor Covering Without Backing
ASTM F1860	(2014; E 2016) Standard Specification for Rubber Sheet Floor Covering With Backing
ASTM F1861	(2016) Standard Specification for Resilient Wall Base
ASTM F1869	(2016) Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride

ASTM F2034	(2008; R 2013) Sheet Linoleum Floor Covering
ASTM F2169	(2015; E 2016) Standard Specification for Resilient Stair Treads
ASTM F2170	(20182019) Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes
ASTM F2195	(2013) Linoleum Floor Tile

GREEN SEAL (GS)

GS-36	(2013) Adhesives for Commercial Use

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS	SCS Global Services (SCS) Indoor Advantage

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1168	(2017) Adhesive and Sealant Applications

UNDERWRITERS LABORATORIES (UL)

UL 2818	(2013) GREENGUARD Certification Program For Chemical Emissions For Building Materials, Finishes And Furnishings

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

Shop Drawings
Resilient Flooring and Accessories;
Product Data
Resilient Flooring and Accessories;
Adhesives
Samples
Resilient Flooring and Accessories
Test Reports
Moisture, Alkalinity and Bond Tests;
Manufacturer's Instructions
Surface Preparation;
Installation;
Operation and Maintenance Data
Resilient Flooring and Accessories;

1.3 CERTIFICATES

1.3.1 Indoor Air Quality

Submit required indoor air quality certifications and validations in one submittal package.

1.3.1.1 Floor Covering Materials

Provide Rubber Tile & Rubber Stair Treads, Rubber Sheet Flooring, Luxury Vinyl Tile], Sheet Linoleum, Linoleum Tile, and wall base products certified to meet indoor air quality requirements by FLOORSCORE, UL 2818 (Greenguard) Gold, SCS Global Services Indoor Advantage Gold or provide certification by other third-party programs. Provide current product certification documentation from certification body.

1.3.1.2 Adhesives, Caulking and Sealants

Provide products certified to meet indoor air quality requirements by UL 2818 (Greenguard) Gold, SCS Global Services Indoor Advantage Gold or provide certification or validation by other third-party programs that products meet the requirements of this Section. Provide current product certification documentation from certification body. When product does not have certification, provide validation that product meets the indoor air quality product requirements cited herein.

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver materials to the building site in original unopened containers bearing the manufacturer's name, style name, pattern color name and number, production run, project identification, and handling instructions. Store materials in a clean, dry, secure, and well-ventilated area with ambient air temperature maintained above 68 degrees F and below 85 degrees F, stacked according to manufacturer's recommendations. Protect materials from the direct flow of heat from hot-air registers, radiators and other heating fixtures and appliances. Observe ventilation and safety procedures specified in the MSDS.

1.5 ENVIRONMENTAL REQUIREMENTS

Maintain areas to receive resilient flooring at a temperature above 68 degrees F and below 85 degrees F for 3 days before application, during application and 2 days after application, unless otherwise directed by the flooring manufacturer for the flooring being installed. Maintain a minimum temperature of 55 degrees F thereafter. Provide adequate ventilation to remove moisture from area and to comply with regulations limiting concentrations of hazardous vapors.

1.6 SCHEDULING

Schedule resilient flooring application after the completion of other work which would damage the finished surface of the flooring.

1.7 WARRANTY

Provide manufacturer's standard performance guarantees or warranties that extend beyond a one year period.

1.8 EXTRA MATERIALS

Provide one box of extra flooring material of each color and pattern of flooring installed. Provide

extra wall base material composed of 20 linear feet of each type, color and pattern. Package all extra materials in original properly marked containers bearing the manufacturer's name, brand name, pattern color name and number, production run, and handling instructions. Provide extra materials from the same lot as those installed. Leave extra stock at the site in location assigned by Owner's representative.

PART 2 PRODUCTS

2.1 RUBBER TILE FLOORING

A. Basis of Design Product: Johnsonite / Tarkett Solid Rubber Tile and Stair Treads and Risers.

Tarkett Inc. 2728 Summer Street P.O. Box 3145 Houston, TX 77253 or
Johnsonite 16910 Munn Road Chagrin Falls, Ohio 44023
Phone: 888-639-8275

B. Color and Texture as selected from manufacture's full range of colors and textures.

2.2 LINOLEUM

A. Basis of Design Product: Farbo – "Marmolium Decibel" Forbo Flooring Systems North America, Humboldt Industrial Park, 8 Maplewood Drive, P.O. Box 667, US-Hazleton, PA 18201 Phone: +1 570 459 07 71 Fax: +1 570 450 02 58 info.na@forbo.com, http://www.forboflooringna.com

B. Color and Texture as selected from manufacture's full range of colors and textures.

2.3. LUXURY VINYL TILES AND PLANKS

A. Basis of Design Product: Johnsonite / Tarkett Luxury Vinyl Tiles and Planks

Tarkett Inc. 2728 Summer Street P.O. Box 3145 Houston, TX 77253 or
Johnsonite 16910 Munn Road Chagrin Falls, Ohio 44023
Phone: 888-639-8275

B. Color and Texture as selected from manufacture's full range of colors and textures.

2.6 WALL BASE

A. Basis of Design Product: Johnsonite / Tarkett "MILLWORK"

Tarkett Inc. 2728 Summer Street P.O. Box 3145 Houston, TX 77253 or
Johnsonite 16910 Munn Road Chagrin Falls, Ohio 44023
Phone: 888-639-8275

B. Color as selected from manufacture's full range of colors.

2.7 MOULDING

Provide tapered mouldings of vinyl or rubber as recommended by flooring manufacturer for both

edges and transitions of flooring materials specified. Provide vertical lip on moulding of maximum 1/4 inch. Provide bevel change in level between 1/4 and 1/2 inch with a slope no greater than 1:2.

2.8 ADHESIVES

Provide adhesives for flooring, base and accessories as recommended by the manufacturer and comply with local indoor air quality standards. Submit manufacturer's descriptive data, documentation stating physical characteristics, and mildew and germicidal characteristics.

Provide non-aerosol adhesive products used on the interior of the building (defined as inside of the weatherproofing system) that meet either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of SCAQMD Rule 1168. Provide aerosol adhesives used on the interior of the building that meet either emissions requirements of CDPH SECTION 01350 (use the office or classroom requirements, regardless of space type) or VOC content requirements of GS-36. Provide certification or validation of indoor air quality for adhesives.

2.9 SURFACE PREPARATION MATERIALS

Provide surface preparation materials, such as panel type underlayment, lining felt, and floor crack fillers as recommended by the flooring manufacturer for the subfloor conditions. Comply with ASTM F1482 for panel type underlayment products.

2.10 POLISH/FINISH

Provide polish finish as recommended by the manufacturer and conform to ASTM D4078 for polish.

2.11 CAULKING AND SEALANTS

Provide caulking and sealants as recommended by the manufacturer.

2.12 MANUFACTURER'S COLOR, PATTERN AND TEXTURE

Provide color, pattern and texture for resilient flooring and accessories selected from manufacturer's standard colors. Color, if indicated, is not intended to limit the selection of equal colors from other manufacturers.

Provide flooring in any one continuous area or replacement of damaged flooring in continuous area from same production run with same shade and pattern. Submit scaled drawings indicating patterns (including location of patterns and colors) and dimensions. Submit manufacturer's descriptive data and three samples of each color and type of flooring, base, mouldings, and accessories sized a minimum 2-1/2 by 4 inch.

2.13 FIRE RESISTANCE TESTING REQUIREMENTS

Provide a minimum average critical radiant flux of 0.45 watts per square centimeter for flooring in corridors and exits when tested in accordance with ASTM E648.

PART 3 EXECUTION

3.1 EXAMINATION

Examine and verify that site conditions are in agreement with the design package. Report all conditions that will prevent a proper installation. Do not take any corrective action without written permission from the Government. Work will proceed only when conditions have been corrected and accepted by the installer. Submit manufacturer's printed installation instructions for all flooring materials and accessories, including preparation of substrate, seaming techniques, and recommended adhesives.

3.2 SURFACE PREPARATION

Provide a smooth, true, level plane for surface preparation of the flooring, except where indicated as sloped. Floor to be flat to within 3/16 inch in 10 feet. Prepare subfloor in accordance with flooring manufacturer's recommended instructions. Prepare the surfaces of lightweight concrete slabs (as defined by the flooring manufacturer) as recommended by the flooring manufacturer. Comply with ASTM F710 for concrete subfloor preparation. Floor fills or toppings may be required as recommended by the flooring manufacturer. Install underlayments, when required by the flooring manufacturer, in accordance with manufacturer's recommended printed installation instructions. Comply with ASTM F1482 for panel type underlayments. Before any work under this section is begun, correct all defects such as rough or scaling concrete, chalk and dust, cracks, low spots, high spots, and uneven surfaces. Repair all damaged portions of concrete slabs as recommended by the flooring manufacturer. Remove concrete curing and sealer compounds from the slabs, other than the type that does not adversely affect adhesion. Remove paint, varnish, oils, release agents, sealers, waxes, and adhesives, as required by the flooring product in accordance with manufacturer's printed installation instructions.

3.3 MOISTURE, ALKALINITY AND BOND TESTS

Determine the suitability of the concrete subfloor for receiving the resilient flooring with regard to moisture content and pH level by moisture and alkalinity tests. Conduct moisture testing in accordance with ASTM F1869 or ASTM F2170, unless otherwise recommended by the flooring manufacturer. Conduct alkalinity testing as recommended by the flooring manufacturer. Determine the compatibility of the resilient flooring adhesives to the concrete floors by a bond test in accordance with the flooring manufacturer's recommendations. Submit copy of test reports for moisture and alkalinity content of concrete slab, and bond test stating date of test, person conducting the test, and the area tested.

3.4 GENERAL INSTALLATION

Do not install building construction materials that show visual evidence of biological growth.

3.5 PLACING LUXURY VINYL TILES

Install luxury vinyl tile flooring using glue-down installation. Install flooring and accessories in accordance with manufacturer's printed installation instructions. Prepare and apply adhesives in accordance with manufacturer's directions for installation method specified. Keep tile lines and joints square, symmetrical, tight, and even. Keep each floor in true, level plane, except where slope is indicated. Vary edge width as necessary to maintain full-size tiles in the field, no edge tile to be less than one-half the field tile size, except where irregular shaped rooms make it impossible. Cut flooring to fit around all permanent fixtures, built-in furniture and cabinets, pipes, and outlets. Cut, fit, and scribe edge tile to walls and partitions after field flooring has been applied.

3.6 PLACING SHEET LINOLEUM FLOORING

Install sheet linoleum flooring and accessories in accordance with manufacturer's printed installation instructions. Prepare and apply adhesives in accordance with manufacturer's printed directions. Provide square, symmetrical, tight, and even flooring lines and joints. Keep each floor in true, level plane, except where slope is indicated. Cut flooring to fit around all permanent fixtures, built-in furniture and cabinets, pipes, and outlets. Lay out sheets to minimize waste. Cut, fit, and scribe flooring to walls and partitions after field flooring has been applied. Cut seams by overlapping or underscribing as recommended by the manufacturer. Finish joints flush, free from voids, recesses, and raised areas.

3.8 PLACING RUBBER SHEET FLOORING

Install rubber sheet flooring and accessories in accordance with manufacturer's printed installation instructions. Prepare and apply adhesives in accordance with manufacturer's printed directions. Provide square, symmetrical, tight, and even flooring lines and joints. Keep each floor in true, level plane, except where slope is indicated. Cut seams by overlapping or underscribing as recommended by the manufacturer. Lay out sheets to minimize waste. Cut flooring to fit around all permanent fixtures, built-in furniture and cabinets, pipes, and outlets. Cut, fit, and scribe flooring to walls and partitions after field flooring has been applied.

3.9 PLACING MOULDING

Provide moulding where flooring termination is higher than the adjacent finished flooring and at transitions between different flooring materials. When required, locate moulding under door centerline. Moulding is not required at doorways where thresholds are provided. Secure moulding with adhesive as recommended by the manufacturer. Prepare and apply adhesives in accordance with manufacturer's printed directions.

3.10 PLACING WALL BASE

Install wall base in accordance with manufacturer's printed installation instructions. Prepare and apply adhesives in accordance with manufacturer's printed directions.Tighten base joints and make even with adjacent resilient flooring. Fill voids along the top edge of base at masonry walls with caulk. Roll entire vertical surface of base with hand roller, and press toe of base with a straight piece of wood to ensure proper alignment. Avoid excess adhesive in corners.

3.11 PLACING STAIR TREADS, RISERS, AND STRINGERS

Secure and install stair treads, risers, and stringers in accordance with manufacturer's printed installation instructions. Cover the surface of treads and risers the full width of the stairs. Provide equal length pieces butted together to cover the treads and risers for stairs wider than manufacturer's standard lengths. Provide stringer angles on both the wall and banister sides of the stairs, and landing trim.

3.12 CLEANING

Immediately upon completion of installation of flooring in a room or an area, dry and clean the flooring and adjacent surfaces to remove all surplus adhesive. Clean flooring as recommended in accordance with manufacturer's printed maintenance instructions and within the recommended time frame. As required by the manufacturer, apply the recommended number of coats and type

of polish and finish in accordance with manufacturer's written instructions.

3.13 PROTECTION

From the time of installation until acceptance, protect flooring from damage as recommended by the flooring manufacturer. Remove and replace flooring which becomes damaged, loose, broken, or curled and wall base which is not tight to wall or securely adhered.

-- End of Section --

SECTION 09 68 00

CARPETING

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS (AATCC)

AATCC 16	(2004; E 2008; E 2010) Colorfastness to Light
AATCC 107	(2013) Colorfastness to Water
AATCC 134	(2016) Electrostatic Propensity of Carpets
AATCC 165	(2013) Colorfastness to Crocking: Textile Floor Coverings - Crockmeter Method
AATCC 174	(2016) Antimicrobial Activity Assessment of New Carpets

ASTM INTERNATIONAL (ASTM)

ASTM D297	(2015) Rubber Products - Chemical Analysis
ASTM D1335	(2017; E 2018) Standard Test Method for Tuft Bind of Pile Yarn Floor Coverings
ASTM D1667	(2017) Standard Specification for Flexible Cellular Materials - Poly (Vinyl Chloride) Foam (Closed-Cell)
ASTM D2859	(2016) Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials
ASTM D3278	(1996; R 2011) Flash Point of Liquids by Small Scale Closed-Cup Apparatus
ASTM D3574	(2017) Standard Test Methods for Flexible Cellular Materials—Slab, Bonded, and Molded Urethane Foams
ASTM D3676	(2013) Rubber Cellular Cushion Used for Carpet or Rug Underlay
ASTM D5793	(2018) Standard Test Method for Binding Sites Per Unit Length or Width of Pile Yarn Floor Coverings

ASTM D5848	(2010; E 2010) Mass Per Unit Area of Pile Yarn Floor Coverings
ASTM D6859	(2011) Standard Test Method for Pile Thickness of Finished Level Pile Yarn Floor Coverings
ASTM D7330	(2015) Standard Test Method for Assessment of Surface Appearance Change in Pile Floor Coverings Using Standard Reference Scales
ASTM E648	(2017a) Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source

CARPET AND RUG INSTITUTE (CRI)

CRI 104	(2015) Carpet Installation Standard for Comnmercial Carpet
CRI 105	(2015) Carpet Installation Standard for Residential Carpet
CRI GLP QM	(2017) Green Label Plus Quality Manual
CRI Test Method 103	(2015) Standard Test Method for the Evaluation of Texture Appearance Retention of Carpet Standards Program

GREEN SEAL (GS)

GS-36	(2013) Adhesives for Commercial Use

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

ISO 2551	(1981) Machine-made Textile Floor Coverings - Determination of Dimensional Changes Due to the Effects of Varied Water and Heat Conditions

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS	SCS Global Services (SCS) Indoor Advantage

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1113	(2016) Architectural Coatings
SCAQMD Rule 1168	(2017) Adhesive and Sealant Applications

UNDERWRITERS LABORATORIES (UL)

UL 2818	(2013) GREENGUARD Certification Program For Chemical Emissions For Building Materials, Finishes And Furnishings

WOOLMARK COMPANY (WBI)

Woolmark	(1964) Certification for 100 Percent Pure New Woo

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

Shop Drawings
Installation Drawings;
Product Data
Carpet;
Recycled Content for Carpeting;
Samples
Carpet;
Moldings;
Test Reports
Moisture and Alkalinity Tests;
Certificates
Indoor Air Quality for Carpet;
Manufacturer's Instructions
Surface Preparation
Operation and Maintenance Data Cleaning and Maintenance Service
Closeout Submittals
Warranty

1.3 CERTIFICATIONS

1.3.1 Indoor Air Quality Certifications

1.3.1.1 Floor Covering Materials

Provide carpet and cushion products certified to meet indoor air quality requirements by UL 2818 (GreenGuard) Gold, SCS Global Services Indoor Advantage Gold, CRI GLP QM or provide certification or validation by other third-party program that products meet the requirements of this Section. Provide current product certification documentation from certification body. When product does not have certification, provide validation that product meets the indoor air quality product requirements cited herein.

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver materials to the site in the manufacturer's original wrappings and packages clearly labeled with the manufacturer's name, brand name, size, dye lot number, and related information. Remove materials from packaging and store them in a clean, dry, well ventilated area protected from damage, soiling, and moisture, and maintain at a temperature above 60 degrees F for 2 days prior to installation.Do not store carpet near materials that may off gas or emit harmful fumes..

1.5 AMBIENT CONDITIONS

Maintain areas in which carpeting is to be installed at a temperature above 60 degrees F and below 90 degrees F for 2 days before installation, during installation, and for 2 days after installation. Provide temporary ventilation during work of this section. Maintain a minimum temperature of 55 degrees F thereafter for the duration of the contract.

1.6 WARRANTY

Provide manufacturer's standard performance guarantees or warranties including minimum ten year wear warranty, two year material and workmanship and ten year tuft bind and delamination.

PART 2 PRODUCTS

2.1 CARPET

Furnish first quality carpet that is free of visual blemishes, streaks, poorly dyed areas, fuzzing of pile yarn, spots or stains, and other physical and manufacturing defects. Provide carpet materials and treatments as reasonably nonallergenic and free of other recognized health hazards. Provide a static control construction on all grade carpets which gives adequate durability and performance. Submit manufacturer's catalog data and printed documentation stating physical characteristics, durability, resistance to fading, and flame resistance characteristics for each type of carpet material and installation accessory. Submit manufacturer's Product Data for 1) Carpet, and 2) Moldings.

Submit Samples of the following:

a. Carpet: Two "Production Quality" samples 18 by 18 inches minimum of each carpet proposed for use, showing quality, pattern, and color specified

b. Moldings: Two samples of each type minimum 12 inches long

2.1.1 Recycled Content

Carpeting must contain a minimum of 20 percent recycled content. Provide data identifying percentage of recycled content for carpeting.

Provide certification of indoor air quality for carpet.

2.1.2 Indoor Air Quality Requirements

Products must meet emissions requirements of CDPH SECTION 01350. Provide certification or validation of indoor air quality for carpet.

2.1.3 Basis of Design Products:

Modular Carpet Tile: Pre-approved carpet tile products available through Interface’s GSA contract Color, Pattern & Texture as selected by Architect.
Interface, 1280 West Peachtree St NW, Atlanta, GA 30309

Entrance Carpet (Walk off Matt): “Ultra Entry” 3/8” PVC grid and beveled, heavy-duty attached nosing. Color as selected by Architect.
Mats Inc., 179 Campanelli Parkway Stoughton MA 02072; Telephone 800-MATS-INC (800-628-7462); Fax 781-344-1537; www.matsinc.com.

2.1.3.11 Backing Materials

Provide primary backing materials like those customarily used and accepted by the trade for each type of carpet. Provide secondary backing to suit project requirements of those customarily used and accepted by the trade for each type of carpet.

2.1.3.12 Attached Cushion

Provide manufacturer's standard attached cushion of chemically frothed or mechanically frothed polyurethane with minimum weight of 22 oz/sq. yard, minimum density of 14 lb/cubic foot, minimum thickness of 0.100 inch, and maximum compression resistance of 5 psi, and compression set of 15 percent in accordance with ASTM D3676. Do not exceed the maximum ash content of 50 percent when tested in accordance with ASTM D297. Pass the accelerated aging test in accordance with ASTM D3676 or ASTM D1667 for the cushion.

2.2 PERFORMANCE REQUIREMENTS

2.2.1 Texture Appearance Retention Rating (TARR)

Provide carpet with a greater than or equal to 3.0 (Heavy) TARR traffic level classification in accordance with ASTM D7330 or CRI Test Method 103.

2.2.2 Static Control

Provide static control to permanently regulate static buildup to less than 3.5 kV when tested at 20 percent relative humidity and 70 degrees F in accordance with AATCC 134.

2.2.3 Flammability and Critical Radiant Flux Requirements

Comply with 16 CFR 1630 or ASTM D2859. Provide carpet in corridors and exits with a minimum average critical radiant flux of 0.22 watts per square centimeter when tested in accordance with ASTM E648.

2.2.4 Tuft Bind

Comply with ASTM D1335 for tuft bind force required to pull a tuft or loop free from carpet backing with a minimum 10 pound average force for loop pile broadloom, 3 pound average force for cut pile broadloom, or 8 pound average force for modular carpet tile.

2.2.5 Colorfastness to Crocking

Comply dry and wet crocking with AATCC 165 and with a Class 4 minimum rating on the AATCC Color Transference Chart for all colors.

2.2.6 Colorfastness to Light

Comply colorfastness to light with AATCC 16, Test Option E "Water-Cooled Xenon-Arc Lamp, Continuous Light" and with a minimum 4 grey scale rating after 40 hours.

2.2.7 Colorfastness to Water

Comply colorfastness to water with AATCC 107 and with a minimum 4.0 gray scale rating and a

minimum 4.0 transfer scale rating.

2.2.8 Delamination Strength

Provide delamination strength for tufted carpet with a secondary back of minimum 2.5 lbs/inch.

2.2.9 Antimicrobial

Nontoxic antimicrobial treatment in accordance with AATCC 174 Part I (qualitative), guaranteed by the carpet manufacturer to last the life of the carpet.

2.3 ADHESIVES AND CONCRETE PRIMER

Comply with applicable regulations regarding toxic and hazardous materials. Provide water resistant, mildew resistant, nonflammable, and nonstaining adhesives and concrete primers for carpet installation as required by the carpet manufacturer. Provide release adhesive for modular tile carpet as recommended by the carpet manufacturer. Provide adhesives flashpoint of minimum 140 degrees F in accordance with ASTM D3278. Non-aerosol adhesive products used on the interior of the building (defined as inside of the weatherproofing system) must meet either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of SCAQMD Rule 1168. Aerosol adhesive products used on the interior of the building (defined as inside of the weatherproofing system) must meet either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of GS-36. Provide validation of indoor air quality for aerosol adhesives. Provide validation of indoor air quality for non-aerosol adhesives. Concrete primer products used on the interior of the building (defined as inside of the weatherproofing system) must meet either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of SCAQMD Rule 1113. Provide validation of indoor air quality for concrete primer.

2.4 MOLDINGS

Provide carpet moldings where floor covering material changes or carpet edge does not abut a vertical surface. Provide molding designed for the type of carpet being installed. Provide floor flange of a minimum 1 1/2 inches wide. Provide color to match resilient base.

2.5 TAPE

Provide tape for seams as recommended by the carpet manufacturer for the type of seam used in broadloom installation.

PART 3 EXECUTION

3.1 SURFACE PREPARATION

Do not install carpet on surfaces that are unsuitable and will prevent a proper installation. Prepare subfloor in accordance with flooring manufacturer's recommended instructions. Repair holes, cracks, depressions, or rough areas using material recommended by the carpet or adhesive manufacturer. Free floor of any foreign materials and sweep clean. Before beginning work, test subfloor with glue and carpet to determine "open time" and bond. Submit three copies of the manufacturer's printed Installation instructions for the carpet, including Surface Preparation, seaming techniques, and recommended adhesives and tapes.

3.2 MOISTURE AND ALKALINITY TESTS

Test concrete slab for moisture content and excessive alkalinity in accordance with CRI 104/CRI 105. Submit three copies of reports of Moisture and Alkalinity Tests including content of concrete slab stating date of test, person conducting the test, and the area tested.

3.3 PREPARATION OF CONCRETE SUBFLOOR

Do not commence installation of the carpeting until concrete substrate is at least 90 days old. Prepare the concrete surfaces in accordance with the carpet manufacturer's instructions. Match carpet, when required, and adhesives to prevent off-gassing to a type of curing compounds, leveling agents, and concrete sealer.

3.4 INSTALLATION

Perform all work by manufacturer's approved installers. Conduct installation in accordance with the manufacturer's printed instructions and CRI 104/CRI 105. Protect edges of carpet meeting hard surface flooring with molding and install in accordance with the molding manufacturer's printed instructions. Follow ventilation, personal protection, and other safety precautions recommended by the adhesive manufacturer. Continue ventilation during installation and for at least 72 hours following installation. Do not permit traffic or movement of furniture or equipment in carpeted area for 24 hours after installation. Complete other work which would damage the carpet prior to installation of carpet.

Do not install building construction materials that show visual evidence of biological growth.

3.4.1 Modular Tile Installation

Install in pattern approved by Architect.

Install modular tiles with manufacturer approved adhesive system with snug joints. Comply with manufacturer installation instructions for required drying time of releasable adhesive so it sets up properly. Provide accessibility to the subfloor where required. Carpet tile on stairs and sloped surfaces must be installed with a more permanent installation method in accordance with the manufacturer's instructions and with manufacturer recommended adhesives for this application.

3.4.3 Entrance Carpet Installation

Install in pattern approved by Architect.

Cut mats to specified size and finish them with a tapered vinyl edge that is glued and sewn on. Install tiles with snug joints, smooth, uniform, and secure, with a minimum of seams. Prepare regular, unnoticeable, and treated seams with a seam adhesive. Neatly cut and fit, securely, cutouts at door jambs, columns, and ducts. Locate seams at doorways parallel to and centered with doors. Do not make seams perpendicular to doors or at pivot points.

3.5 CLEANING AND PROTECTION

Submit three copies of carpet manufacturer's maintenance instructions describing recommended type of cleaning equipment and material, spotting and cleaning methods, and cleaning cycles.

3.5.1 Cleaning

After installation of the carpet, remove debris, scraps, and other foreign matter. Remove soiled spots and adhesive from the face of the carpet with appropriate spot remover. Cut off and remove protruding face yarn. Vacuum carpet clean.

3.5.2 Protection

Protect the installed carpet from soiling and damage with heavy, reinforced, nonstaining kraft paper, plywood, or hardboard sheets. Lap and secure edges of kraft paper protection to provide a continuous cover. Restrict traffic for at least 48 hours.

3.6 REMNANTS

Provide remnants remaining from the installation, consisting of scrap pieces more than 6 feet in dimension with more than 50 square feet total to local non-profit such as Habitat for Humanity as directed by the Owner. Remove non-retained scraps from site and recycle appropriately.

3.7 MAINTENANCE

3.7.1 Extra Materials

Provide extra material from same dye lot. Provide a minimum of three percent of total square yards of each carpet type, pattern, and color.

-- End of Section --

SECTION 09 72 00

WALL COVERINGS

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. Vinyl wall covering.

B. Related Sections include the following:
1. Division 9 Section for paint, primers, coatings, and paint.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include data on physical characteristics, durability, fade resistance, and flame-resistance characteristics.

B. Shop Drawings: Show location and extent of each wall-covering type. Indicate pattern placement**,** seams and termination points.

C. Schedule: For wall coverings. Use same designations indicated on Drawings.

D. Samples for Initial Selection: For each type of wall covering indicated.

E. Samples for Verification: Full width by 36-inch- (1000-mm-) long section of wall covering from lot to be used for each type of wall covering indicated for each color, texture, and pattern required.
1. Show complete pattern repeat.
2. Mark top and face of material.

F. Maintenance Data: For wall coverings to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: Provide wall coverings and adhesives with the following fire-test-response characteristics as determined by testing identical products applied with identical adhesives to substrates per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

1. Surface-Burning Characteristics: As follows, per ASTM E 84:

    a. Flame-Spread Index: 25 or less.
    b. Smoke-Developed Index: 450 or less.

B. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate appearance and aesthetic effects and set quality standards for installation.

1. Provide a mockup for each type of wall covering on each substrate required. Comply with requirements in ASTM F 1141.
2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not install wall coverings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Lighting: Do not install wall covering until a permanent level of lighting is provided on the surfaces to receive wall covering.

C. Ventilation: Provide continuous ventilation during installation and for not less than the time recommended by wall-covering manufacturer for full drying or curing.

1.6 EXTRA MATERIALS

A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Wall-Covering Material: Full-size units equal to **5** percent of amount of each type installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in Part 2.2 "Wall-Covering Products" Article.

2.2 WALL-COVERING PRODUCTS

A. General: Provide rolls of each type of wall covering from the same run number or dye lot.

B. Vinyl Wall Covering, KOROSEAL INTERIOR PRODUCTS 3875 Embassy Parkway, Suite 110 Fairlawn, Ohio 44333

1. As Selected by architect from manufacturer's "designer series" full range of colors, textures, weights, and finishes.

2.3 ACCESSORIES

A. Adhesive: Mildew-resistant, nonstaining adhesive, for use with specific wall covering and substrate application, as recommended in writing by wall-covering manufacturer**,** and with a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Primer/Sealer: Mildew-resistant primer/sealer complying as recommended in writing by wall-covering manufacturer for intended substrate.

C. Wall Liner: Nonwoven, synthetic underlayment and adhesive as recommended by wall-covering manufacturer.

D. Seam Tape: As recommended in writing by wall-covering manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for levelness, wall plumbness, maximum moisture content, and other conditions affecting performance of work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Comply with manufacturer's written instructions for surface preparation.

B. Clean substrates of substances that could impair wall covering's bond, including mold, mildew, oil, grease, incompatible primers, dirt, and dust.

C. Prepare substrates to achieve a smooth, dry, clean, structurally sound surface free of flaking, unsound coatings, cracks, and defects.

1. Moisture Content: Maximum of 5 percent on new plaster, concrete, and concrete masonry units when tested with an electronic moisture meter.
2. Plaster: Allow new plaster to cure. Neutralize areas of high alkalinity.
3. Metals: If not factory primed, clean and apply metal primer.
4. Gypsum Board: Prime with primer recommended by wall-covering manufacturer.
5. Painted Surfaces: Treat areas susceptible to pigment bleeding.

D. Check painted surfaces for pigment bleeding. Sand gloss, semi-gloss, and eggshell finishes with fine sandpaper.

E. Remove hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.

F. Acclimatize wall-covering materials by removing them from packaging in the installation areas not less than 24 hours before installation.

G. Install wall liner, with no gaps or overlaps, where required by wall-covering manufacturer. Form smooth wrinkle-free surface for finished installation. Do not begin wall-covering installation until wall liner has dried.

3.3 INSTALLATION

A. General: Comply with wall-covering manufacturers' written installation instructions applicable to products and applications indicated, except where more stringent requirements apply.

B. Cut wall-covering strips in roll number sequence. Change roll numbers at partition breaks and corners.

C. Install strips in same order as cut from roll.

D. Install reversing every other strip.

E. Install wall covering with no gaps or overlaps, no lifted or curling edges, and no visible shrinkage.

F. Match pattern 72 inches (1830 mm) above the finish floor.

G. Install seams vertical and plumb at least 6 inches (150 mm) from outside corners and **6 inches (150 mm)** from inside corners unless a change of pattern or color exists at corner. No horizontal seams are permitted.

H. Fully bond wall covering to substrate. Remove air bubbles, wrinkles, blisters, and other defects.

I. Trim edges and seams for color uniformity, pattern match, and tight closure. Butt seams without any overlay or spacing between strips.

3.4 CLEANING

A. Remove excess adhesive at finished seams, perimeter edges, and adjacent surfaces.

B. Use cleaning methods recommended in writing by wall-covering manufacturer.

C. Replace strips that cannot be cleaned.

D. Reinstall hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.

END OF SECTION

SECTION 09 91 10 - EXTERIOR PAINTING

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 surface preparation and the application of paint systems on the following exterior substrates:
   1. Steel.
   2. Pre-Finished Sheet Metal Fabricated from Coil Stock Substrates.
   3. Wood.
   4. Plastic trim fabrications.

B. Related Sections include the following:
   1. Division 9 Section "Interior Painting" for surface preparation and the application of paint systems on interior substrates.

1.3 SUBMITTALS

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

B. Samples for Initial Selection: For each type of topcoat product indicated.

C. Samples for Verification: For each type of paint system and each color and gloss of topcoat indicated.

   1. Submit Samples on rigid backing, 8 inches (200 mm) square.
   2. Step coats on Samples to show each coat required for system.
   3. Label each coat of each Sample.
   4. Label each Sample for location and application area.

D. Product List: For each product indicated, include the following:

   1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
   2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.
   3. Volatile Organic Compound Content level contained in product.

1.4 QUALITY ASSURANCE

A. MPI Standards:

1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.

B. Mockups: Apply benchmark samples of each paint system indicated and each color and finish selected to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.

a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
b. Other Items: Architect will designate items or areas required.

2. Final approval of color selections will be based on benchmark samples.

a. If preliminary color selections are not approved, apply additional benchmark samples of additional colors selected by Architect at no added cost to Owner.

C. Volatile Organic Compounds (V.O.C.) Content
1. All paint products shall be compliant with Oregon D.E.Q. and U.S. Environmental Protection Agency standards for maximum levels of Volatile Organic Compounds for the type of product and application.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.6 PROJECT CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).

B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.

1. Quantity: Furnish an additional [**5**] percent, but not less than **1 gal. (3.8 L)** of each material and color applied.

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. Benjamin Moore & Co.
2. California Paints.
3. Cloverdale Paint.
4. Columbia Paint & Coatings.
5. Coronado Paint.
6. Davis Paint Company.
7. Del Technical Coatings.
8. Diamond Vogel Paints.
9. Dunn-Edwards Corporation.
10. Durant Paints Inc.
11. Duron, Inc.
12. Hirshfield's, Inc.
13. ICI Paints.
14. Insl-x.
15. Kelly-Moore Paints.
16. Kwal-Howells Paint.
17. M.A.B. Paints.
18. McCormick Paints.
19. Miller Paint.
20. PPG Architectural Finishes, Inc.
21. Rodda Paint Co.
22. Sherwin-Williams
23. Sigma Coatings.
24. Smiland Paint Company.
25. Spectra-Tone.
26. Vista Paint.

2.2 PAINT, GENERAL

A. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

B. Colors: **As selected by Architect from manufacturer's full range of colors and sheens**.

2.3 PRIMERS/SEALERS

A. Alkali-Resistant Primer: MPI #3.

B. Bonding Primer (Water Based): MPI #17.

C. Bonding Primer (Solvent Based): MPI #69.

D. Primer for Pre-Finished Sheet Metal Fabricated from Coil Stock Substrates: Sherwin Williams DTM Bonding Primer, or approved equal.

2.4 METAL PRIMERS

A. Alkyd Anticorrosive Metal Primer: MPI #79.

B. Quick-Drying Alkyd Metal Primer: MPI #76.

C. Waterborne Galvanized-Metal Primer: MPI #134.

2.5 EXTERIOR LATEX PAINTS

A. Exterior Latex (Flat): MPI #10 (Gloss Level 1).

B. Exterior Latex (Semigloss): MPI #11 (Gloss Level 5).

C. Exterior Latex (Gloss): MPI #119 (Gloss Level 6, except minimum gloss of 65 units at 60 deg).

D. Exterior Latex for Pre-Finished Sheet Metal Fabricated from Coil Stock Substrates: Sherwin Williams Pro Industrial Acrylic, or approved equal.

2.6 EXTERIOR ALKYD PAINTS

A. Exterior Alkyd Enamel (Flat): MPI #8 (Gloss Level 1).

B. Exterior Alkyd Enamel (Semigloss): MPI #94 (Gloss Level 5).

C. Exterior Alkyd Enamel (Gloss): MPI #9 (Gloss Level 6).

2.7 QUICK-DRYING ENAMELS

A. Quick-Drying Enamel (Semigloss): MPI #81 (Gloss Level 5).

B. Quick-Drying Enamel (High Gloss): MPI #96 (Gloss Level 7).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.
2. Masonry (Clay and CMU): 12 percent.
3. Wood: 15 percent.
4. Plaster: 12 percent.
5. Gypsum Board: 12 percent.

C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.

1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

C. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

E. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.

F. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

G. Pre-Finished Sheet Metal Fabricated from Coil Stock Substrates:
1. Power-wash the surface to be painted with a 5% solution in water of commercial (non-industrial, non-bleach) detergents to remove protective wax as well as dust, dirt and

grease. Pressure should not exceed 2,000 PSI. Rinse thoroughly after cleaning and allow to dry.
2. Lightly scuff sand the finish with Scotch-Brite pads.
3. If the original finish is compromised and the metallic substrate is exposed, clean surface per the above and a apply primer to compromised area.

H. Plastic Trim Fabrication Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions.

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 FIELD QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when paints are being applied:

1. Owner will engage the services of a qualified testing agency to sample paint materials being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
2. Testing agency will perform tests for compliance of paint materials with product requirements.
3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying-paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 EXTERIOR PAINTING SCHEDULE

A. Steel Substrates:

1. Quick-Drying Enamel System: MPI EXT 5.1A.

a. Prime Coat: Quick-drying alkyd metal primer.
b. Intermediate Coat: Quick-drying enamel matching topcoat.
c. Topcoat: Quick-drying enamel

2. Alkyd System: MPI EXT 5.1D.

a. Prime Coat: Alkyd anticorrosive metal primer.
b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
c. Topcoat: Exterior alkyd enamel.

B. Galvanized-Metal Substrates:

1. Latex System: MPI EXT 5.3A.

a. Prime Coat: Cementitious galvanized-metal primer.
b. Intermediate Coat: Exterior latex matching topcoat.
c. Topcoat: Exterior latex [**(flat)**] [**(semigloss)**] [**(gloss)**].

2. Latex Over Water-Based Primer System: MPI EXT 5.3H.

a. Prime Coat: Waterborne galvanized-metal primer.
b. Intermediate Coat: Exterior latex matching topcoat.
c. Topcoat: Exterior latex [**(flat)**] [**(semigloss)**] [**(gloss)**].

3. Alkyd System: MPI EXT 5.3B.

a. Prime Coat: Cementitious galvanized-metal primer.
b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
c. Topcoat: Exterior alkyd enamel [**(flat)**] [**(semigloss)**] [**(gloss)**].

C. Pre-Finished Sheet Metal Fabricated from Coil Stock Substrates:

a. Prime Coat: Sherwin Williams DTM Bonding Primer, or approved equal
b. Intermediate Coat: Sherwin Williams Pro Industrial Acrylic, or approved equal.
c. Topcoat: Sherwin Williams Pro Industrial Acrylic, or approved equal.

D. Plastic Trim Fabrication Substrates:

1. Latex System: MPI EXT 6.8A.

a. Prime Coat: Bonding primer [**(water based)**] [**(solvent based)**].
b. Intermediate Coat: Exterior latex matching topcoat.
c. Topcoat: Exterior latex [**(flat)**] [**(semigloss)**] [**(gloss)**].

2. Alkyd System: MPI EXT 6.8B.

a. Prime Coat: Bonding primer [**(water based)**] [**(solvent based)**].
b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
c. Topcoat: Exterior alkyd enamel [**(flat)**] [**(semigloss)**] [**(gloss)**].

E. Exterior Gypsum Board Substrates:

1. Latex System: MPI EXT 9.2A.

a. Prime Coat: Exterior latex matching topcoat.
b. Intermediate Coat: Exterior latex matching topcoat.
c. Topcoat: Exterior latex [**(flat)**] [**(semigloss)**] [**(gloss)**].

END OF SECTION 09911

SECTION 09912 - INTERIOR PAINTING

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 surface preparation and the application of paint systems on the following interior substrates:

1. Concrete.
2. Steel.
3. Wood.
4. Gypsum board.
5. Spray-textured ceilings.

B. Related Sections include the following:
1. Division 9 Section "Exterior Painting" for surface preparation and the application of paint systems on exterior substrates.

1.3 SUBMITTALS

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

B. Samples for Initial Selection: For each type of topcoat product indicated.

C. Samples for Verification: For each type of paint system and in each color and gloss of topcoat indicated.

1. Submit Samples on rigid backing, 8 inches (200 mm) square.
2. Step coats on Samples to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

D. Product List: For each product indicated, include the following:

1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.

1.4 QUALITY ASSURANCE

A. MPI Standards:

1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.

B. Mockups: Apply benchmark samples of each paint system indicated and each color and finish selected to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.

   a. Wall and Ceiling Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
   b. Other Items: Architect will designate items or areas required.

2. Apply benchmark samples after permanent lighting and other environmental services have been activated.
3. Final approval of color selections will be based on benchmark samples.

   a. If preliminary color selections are not approved, apply additional benchmark samples of additional colors selected by Architect at no added cost to Owner.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.6 PROJECT CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.

1. Quantity: Furnish an additional [**5**] percent, but not less than [**1 gal. (3.8 L)**] of each material and color applied.

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. Benjamin Moore & Co.
2. Benjamin Moore & Co., Limited (Canada).
3. Bennette Paint Mfg. Co., Inc.
4. BLP Mobile Paint Manufacturing.
5. California Paints.
6. Cloverdale Paint.
7. Color Wheel Paints & Coatings.
8. Columbia Paint & Coatings.
9. Coronado Paint.
10. Davis Paint Company.
11. Diamond Vogel Paints.
12. Dunn-Edwards Corporation.
13. Durant Paints Inc.
14. Duron, Inc.
15. Envirocoat Technologies Inc.
16. Farrell-Calhoun.
17. Flex Bon Paints.
18. Frazee Paint.
19. General Paint.
20. Griggs Paint.
21. Hallman Lindsay Quality Paints.
22. Hirshfield's, Inc.
23. ICI Devoe (Canada).
24. ICI Paints.
25. ICI Paints (Canada).
26. Insl-x.
27. Iowa Paint Manufacturing Company, Inc.
28. Kelly-Moore Paints.
29. Kwal-Howells Paint.
30. M.A.B. Paints.
31. McCormick Paints.
32. Miller Paint.
33. Mills Paint.
34. Northern Paint.
35. PARA Paints.
36. Parker Paint Mfg. Co. Inc.
37. Porter Paints.
38. PPG Architectural Finishes, Inc.
39. Rodda Paint Co.
40. Sherwin-Williams Company (The).
41. Sico, Inc.
42. Sigma Coatings.
43. Smiland Paint Company.
44. Spectra-Tone.
45. Sterling Paint.

46. Tamms Industries, Inc.
47. Tower Paint.
48. Vista Paint.

2.2 PAINT, GENERAL

A. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

B. Chemical Components of Field-Applied Interior Paints and Coatings: Provide products that comply with the following limits for VOC content, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and the following chemical restrictions; these requirements do not apply to primers or finishes that are applied in a fabrication or finishing shop:

1. Flat Paints and Coatings: VOC content of not more than 50 g/L.
2. Nonflat Paints and Coatings: VOC content of not more than 150 g/L.
3. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
4. Restricted Components: Paints and coatings shall not contain any of the following:

a. Acrolein.
b. Acrylonitrile.
c. Antimony.
d. Benzene.
e. Butyl benzyl phthalate.
f. Cadmium.
g. Di (2-ethylhexyl) phthalate.
h. Di-n-butyl phthalate.
i. Di-n-octyl phthalate.
j. 1,2-dichlorobenzene.
k. Diethyl phthalate.
l. Dimethyl phthalate.
m. Ethylbenzene.
n. Formaldehyde.
o. Hexavalent chromium.
p. Isophorone.
q. Lead.
r. Mercury.
s. Methyl ethyl ketone.
t. Methyl isobutyl ketone.
u. Methylene chloride.
v. Naphthalene.
w. Toluene (methylbenzene).
x. 1,1,1-trichloroethane.
y. Vinyl chloride.

C. **Colors and Sheen: As selected by Architect from manufacturer's full range**.

2.3 PRIMERS/SEALERS

A. Interior Latex Primer/Sealer: MPI #50.

B. Interior Alkyd Primer/Sealer: MPI #45.

C. Wood-Knot Sealer: Sealer recommended in writing by topcoat manufacturer for use in paint systems indicated.

2.4 METAL PRIMERS

A. Alkyd Anticorrosive Metal Primer: MPI #79.

B. Quick-Drying Alkyd Metal Primer: MPI #76.

C. Rust-Inhibitive Primer (Water Based): MPI #107.

D. Cementitious Galvanized-Metal Primer: MPI #26.

2.5 WOOD PRIMERS

A. Interior Latex-Based Wood Primer: MPI #39.

2.6 LATEX PAINTS

A. Interior Latex (Flat): MPI #53 (Gloss Level 1).

B. Interior Latex (Low Sheen): MPI #44 (Gloss Level 2).

C. Interior Latex (Eggshell): MPI #52 (Gloss Level 3).

D. Interior Latex (Satin): MPI #43 (Gloss Level 4).

E. Interior Latex (Semigloss): MPI #54 (Gloss Level 5).

F. Interior Latex (Gloss): MPI #114 (Gloss Level 6, except minimum gloss of 65 units at 60 deg).

G. Institutional Low-Odor/VOC Latex (Flat): MPI #143 (Gloss Level 1).

H. Institutional Low-Odor/VOC Latex (Low Sheen): MPI #144 (Gloss Level 2).

I. Institutional Low-Odor/VOC Latex (Eggshell): MPI #145 (Gloss Level 3).

J. Institutional Low-Odor/VOC Latex (Semigloss): MPI #147 (Gloss Level 5).

2.7 ALKYD PAINTS

A. Interior Alkyd (Flat): MPI #49 (Gloss Level 1).

B. Interior Alkyd (Eggshell): MPI #51 (Gloss Level 3).

C. Interior Alkyd (Semigloss): MPI #47 (Gloss Level 5).

D. Interior Alkyd (Gloss): MPI #48 (Gloss Level 6).

2.8 QUICK-DRYING ENAMELS

A. Quick-Drying Enamel (Semigloss): MPI #81 (Gloss Level 5).

B. Quick-Drying Enamel (High Gloss): MPI #96 (Gloss Level 7).

2.9 DRY FOG/FALL COATINGS

A. Latex Dry Fog/Fall: MPI #118.

B. Waterborne Dry Fall: MPI #133.

C. Interior Alkyd Dry Fog/Fall: MPI #55.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.
2. Masonry (Clay and CMU): 12 percent.
3. Wood: 15 percent.
4. Gypsum Board: 12 percent.
5. Plaster: 12 percent.

C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.

1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" and/or “MPI maintenance Repainting Manual” applicable to substrates indicated.

B. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

C. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

E. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.

F. Wood Substrates:

1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
2. Sand surfaces that will be exposed to view, and dust off.
3. Prime edges, ends, faces, undersides, and backsides of wood.
4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

G. Gypsum Board Substrates: Do not begin paint application until finishing compound is dry and sanded smooth.

H. Spray-Textured Ceiling Substrates: Do not begin paint application until surfaces are dry.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions.

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.

B. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

C. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

D. Painting Mechanical and Electrical Work: Paint items exposed in equipment rooms and occupied spaces including, but not limited to, the following:

1. Mechanical Work:

a. Uninsulated metal piping.
b. Uninsulated plastic piping.
c. Pipe hangers and supports.
d. Tanks that do not have factory-applied final finishes.
e. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
f. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
g. Mechanical equipment that is indicated to have a factory-primed finish for field painting.

3.4 FIELD QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when paints are being applied:

1. Owner will engage the services of a qualified testing agency to sample paint materials being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
2. Testing agency will perform tests for compliance with product requirements.
3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying-paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 INTERIOR PAINTING SCHEDULE

A. Concrete Substrates, Nontraffic Surfaces:

1. Latex System: MPI INT 3.1E.

a. Prime Coat: Interior latex matching topcoat.
b. Intermediate Coat: Interior latex matching topcoat.
c. Topcoat: Interior latex .

2. Alkyd System: MPI INT 3.1D.

a. Prime Coat: Interior latex primer/sealer.
b. Intermediate Coat: Interior alkyd matching topcoat.
c. Topcoat: Interior alkyd .

3. Institutional Low-Odor/VOC Latex System: MPI INT 3.1M.

a. Prime Coat: Institutional low-odor/VOC interior latex matching topcoat.
b. Intermediate Coat: Institutional low-odor/VOC interior latex matching topcoat.
c. Topcoat: Institutional low-odor/VOC interior latex .

4. High-Performance Architectural Latex System: MPI INT 3.1C.

a. Prime Coat: Interior latex primer/sealer.
b. Intermediate Coat: High-performance architectural latex matching topcoat.
c. Topcoat: High-performance architectural latex.

B. Steel Substrates:

1. Quick-Drying Enamel System: MPI INT 5.1A.

a. Prime Coat: Quick-drying alkyd metal primer.
b. Intermediate Coat: Quick-drying enamel matching topcoat.
c. Topcoat: Quick-drying enamel.

2. Water-Based Dry-Fall System: MPI INT 5.1C.

a. Prime Coat: Quick-drying alkyd metal primer.
b. Topcoat: Waterborne dry fall.

3. Alkyd Dry-Fall System: MPI INT 5.1D.

a. Prime Coat: Quick-drying alkyd metal primer.
b. Topcoat: Interior alkyd dry fog/fall.

4. Latex Over Alkyd Primer System: MPI INT 5.1Q.

a. Prime Coat: Quick-drying alkyd metal primer.

b. Intermediate Coat: Interior latex matching topcoat.
c. Topcoat: Interior latex.

5. Alkyd System: MPI INT 5.1E.

a. Prime Coat: Quick-drying alkyd metal primer.
b. Intermediate Coat: Interior alkyd matching topcoat.
c. Topcoat: Interior alkyd.

6. Institutional Low-Odor/VOC Latex System: MPI INT 5.1S.

a. Prime Coat: Rust-inhibitive primer (water based).
b. Intermediate Coat: Institutional low-odor/VOC interior latex matching topcoat.
c. Topcoat: Institutional low-odor/VOC interior.

7. High-Performance Architectural Latex System: MPI INT 5.1R.

a. Prime Coat: Quick-drying alkyd metal primer.
b. Intermediate Coat: High-performance architectural latex matching topcoat.
c. Topcoat: High-performance architectural.

C. Gypsum Board Substrates:

1. Latex System: MPI INT 9.2A.

a. Prime Coat: Interior latex primer/sealer matching topcoat.
b. Intermediate Coat: Interior latex matching topcoat.
c. Topcoat: Interior latex.

2. Institutional Low-Odor/VOC Latex System: MPI INT 9.2M.

a. Prime Coat: Interior latex primer/sealer.
b. Intermediate Coat: Institutional low-odor/VOC interior latex matching topcoat.
c. Topcoat: Institutional low-odor/VOC interior.

D. Spray-Textured Ceiling Substrates:

1. Latex System: MPI INT 9.1A, spray applied.

a. Prime Coat: Interior latex primer.
b. Topcoat: Interior latex.

END OF SECTION 09912

SECTION 10 14 36
SIGNAGE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Plastic interior panel signs.
   1. Room Identification.
   2. Stairs.
   3. Restroom.
   4. Elevator Lobby.
   5. Informational Signage.
   6. Directory Signage.

1.2 REFERENCES

A. ANSI 117.1 - For Buildings and Facilities.

B. ASTM International (ASTM):
   1. ASTM D 635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.
   2. ASTM D 1929 - Standard Test Method for Determining Ignition Temperature of Plastics.
   3. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

C. Underwriters Laboratories (UL):
   1. UL 94 - Tests for Flammability of Plastic Materials for Parts in Devices and Appliances.
   2. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials.

1.3 PERFORMANCE REQUIREMENTS

A. Provide photopolymer signage that conforms to the requirements of all regulatory agencies holding jurisdiction.

B. Requirements:
   1. Comply with all applicable provisions of the 2010 ADA Standard for Accessible Design.
   2. Character Proportion: Letters and numbers on signs must have a width-to-height ratio between 3:5 and 1:1 and a stroke width-to-height ratio between 1:5 and 1:10.
   3. Color Contrast: Characters and symbols must contrast with their background - either light characters on a dark background or dark characters on a light background.
   4. Raised Characters or Symbols: Letters and numbers on signs must be raised 1/32 in (0.8 mm) minimum and be sans serif characters. Raised characters or symbols must be at least 5/8 in (16 mm) high but no higher than 2 in (50 mm). Symbols or pictograms on signs must be raised 1/32 in (0.8 mm) minimum.
   5. Symbols of Accessibility: Accessible facilities required to be identified must use the international symbol of accessibility.
   6. Braille: Grade II with accompanying text.

C. Fire Performance Characteristics:
   1. Provide photopolymer signage with surface burning characteristics that consist of a

flame spread of 75 and a smoke development of 120 when tested in accordance to UL 723 (ASTM E 84).

1.4 SUBMITTALS

A. Submit under provisions of Section 01 30 00 - Administrative Requirements.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.
4. Cleaning and maintenance data.

C. Shop Drawings: Detail drawings showing sizes, lettering and graphics, construction details of each type of sign and mounting details with appropriate fasteners for specific project substrates.

D. Manufacturer's Installation Instructions: Printed installation instructions for each signage system.

E. Message List: Signage report indicating signage location, text and sign type.

F. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and available pictograms, characters, and Braille indications.

G. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and typical pictograms, characters, and Braille indications.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum two years documented experience in work of this Section.

B. Installer Qualifications: Minimum two years documented experience in work of this Section.

C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
1. Furnish signs designated by Architect.
2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
3. Refinish mock-up area as required to produce acceptable work.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in unopened factory packaging.

B. Inspect materials at delivery to verify there are no defects or damage.

C. Store products in manufacturer's original packaging until ready for installation in climate controlled location away from direct sunlight.

D. Store and dispose of solvent-based materials, and materials used with solvent-based materials in accordance with requirements of local authorities having jurisdiction.

1.7 PROJECT CONDITIONS

A. Install products in an interior climate controlled environment.

B. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 BASIS OF DESIGN PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Nova Polymers, Inc., which is located at: 8 Evans St. Suite 201; Fairfield, NJ 07004; Toll Free Tel: 888-484-NOVA (6682); Email:request info (info@novapolymers.com); Web:https://www.novapolymers.com

1. Acceptable Fabricator: Western Sign Services P.O. Box 332 – Boring, OR 97009 (503) 313-8863

B. Other manufacturers and fabricators will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

2.2 SIGNAGE - GENERAL

A. Design:
1. Text/Graphics Placement: As indicated on contract drawings.
2. Font: As selected from manufacturer’s standard ADA compliant fonts.

B. Braille:
1. Grade 2 Braille.

C. It is the intent of these specifications to establish a sign standard for the Owner including but not limited to, wall-mounted directional signs, primary room identification, restrooms, conference rooms and all code compliant Braille signage.

D. Comply with all applicable provisions of the 2010 ADA Standard for Accessible Design codes that apply to the State and Local jurisdiction of the project.

E. If required text and graphics are not indicated in specification or on drawings, obtain Architect's instructions as to text and graphics prior to preparation of shop drawings.

F. Arrows, symbols and pictograms will be provided in style, sizes, colors and spacing as indicated in drawings for each sign system.

G. Typography: See Drawings. Copy shall be a clean and accurate reproduction of typeface(s) specified. Upper and lower case and all caps as indicated in Sign Type drawings and Signage Schedule. Letter spacing to be set by manufacturer.

2.3 INTERIOR SIGNAGE

A. Panel Material: Novacryl PT Series Photopolymer or equal.
1. Composition: minimum 0.032 inch (0.8 mm) thick moisture resistant, non-glare interior nylon photopolymer on ultraviolet resistant clear PETG sign base, single piece construction. Laminated photopolymers, added-on characters, and engraved characters are not acceptable.

2. Type and Color: To be selected from manufacturer's full color range by Architect.
3. Surface burning characteristics: Flame spread/smoke developed rating less than 75/120, tested to ASTM E 84 and UL 723.
4. Rate of burning: Tested to ASTM D 635 at nominal 0.060 inch (1.5 mm) thickness with resulting Classification CC1.
5. Vertical burning: Tested to UL 94, classified as 94V-2 in thickness of 0.118 inch (3.0 mm) or greater and 94HB in thicknesses less than 0.118 inch (3.0 mm).
6. Self-ignition temperature: 800 degrees F (427 degrees C), tested to ASTM D 1929.

B. Frames aluminum flat 1/4 inch thick with square corners.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

3.4 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 10 28 13

TOILET ACCESSORIES

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z535.4	(2011) Product Safety Signs and Labels

ASTM INTERNATIONAL (ASTM)

ASTM C1036	(2016) Standard Specification for Flat Glass
ASTM F2285	(2004; R 2016; E 2016) Standard Consumer Safety Performance Specification for Diaper Changing Tables for Commercial Use
ASTM G21	(2015) Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:
Product Data Finishes;
Accessory Items;
Samples Finishes;
Accessory
Items
Certificates
Accessory Items
Operation and Maintenance Data

1.3 DELIVERY, STORAGE, AND HANDLING

Wrap toilet accessories for shipment and storage, then deliver to the jobsite in manufacturer's original packaging, and store in a clean, dry area protected from construction damage and vandalism.

1.4 WARRANTY

Provide manufacturer's standard performance guarantees or warranties that extend beyond a 1 year period.

PART 2 PRODUCTS

2.1 MANUFACTURED UNITS

Provide toilet accessories where indicated in accordance with paragraph SCHEDULE. Provide each accessory item complete with the necessary mounting plates of sturdy construction with corrosion resistant surface.

Provide stainless steel products listed herein manufactured from materials containing a minimum of 50 percent recycled content. Provide data identifying percentage of recycled content for stainless steel toilet accessories.

2.1.1 Anchors and Fasteners

Provide anchors and fasteners capable of developing a restraining force commensurate with the strength of the accessory to be mounted and suited for use with the supporting construction. Provide exposed fasteners with finish to match the accessory.

2.1.2 Finishes

Except where noted otherwise, provide the following finishes on metal:

Metal	Finish
Stainless steel	No. 4 satin finish
Carbon steel, copper alloy, and brass	Nickel Satin finish

2.2 ACCESSORY ITEMS

Conform to the requirements for accessory items specified below. Submit fasteners proposed for use for each type of wall construction, mounting, operation, and cleaning instructions and one sample of each other accessory proposed for use. Incorporate approved samples into the finished work, provided they are identified and their locations noted. Submit certificate for each type of accessory specified, attesting that the items meet the specified requirements.

2.2.1 Grab Bars (GB)

Provide an 18 gauge, 1-1/4 inch grab bar OD Type 304 stainless steel. Provide form and length for grab bar as indicated. Provide concealed mounting flange. Provide grab with peened non-slip surface. Furnish installed bars capable of withstanding a 500 pound vertical load without coming loose from the fastenings and without obvious permanent deformation. Allow 1-1/2 inch space between wall and grab bar.

Provide form and length for grab bar as indicated on drawings.

2.2.2 Mirrors, Glass (MG)

Provide Type I transparent flat type, Class 1-clear glass for mirrors. Glazing Quality q1 1/4 inch thick conforming to ASTM C1036. Coat glass on one surface with silver coating, copper

protective coating, and mirror backing paint. Provide highly adhesive pure silver coating of a thickness which provides reflectivity of 83 percent or more of incident light when viewed through 1/4 inch thick glass, free of pinholes or other defects. Provide copper protective coating with pure bright reflective copper, homogeneous without sludge, pinholes or other defects, of proper thickness to prevent "adhesion pull" by mirror backing paint. Provide mirror backing paint with two coats of special scratch and abrasion-resistant paint and baked in uniform thickness to provide a protection for silver and copper coatings which will permit normal cutting and edge fabrication.

2.2.3 Mirror, Tilt (MT)

Provide surface mounted tilt mirror with full visibility for persons in a wheelchair. Furnish adjustable tilt mirror, extending at least 4 inch from the wall at the top and tapering to 1 inch at the bottom. Provide size in accordance with the drawings Conform to ASTM C1036 and paragraph Glass Mirrors.

2.2.4 Paper Towel Dispenser (PTD)

Provide paper towel dispenser constructed of a minimum 0.03 inch Type 304 stainless steel, surface mounted.

2.2.5 Combination Paper Towel Dispenser/Waste Receptacle (PTDWR)

Provide semi-recessed dispenser/receptacle. Design waste receptacle to be locked in unit and removable for service. Provide tumbler key locking mechanism. Provide waste receptacle with a minimum capacity of 12 gallons. Fabricate a minimum 0.03 inch stainless steel welded construction unit with all exposed surfaces having a satin finish. Provide waste receptacle that accepts reusable liner standard for unit manufacturer. Provide Paper Towel Dispenser that uses manufacturer’s standard roll type paper towels and is furnished with ADA accessible hardware for operation.

2.2.6 Soap Dispenser (SD)

Provide soap dispenser surface mounted, liquid type consisting of a vertical Type 304 stainless steel tank with holding capacity of 40 fluid ounces with a corrosion-resistant all-purpose valve that dispenses liquid soaps, lotions, detergents and antiseptic soaps.

2.2.7 Toilet Tissue Dispenser (TTD)

Furnish Type II - surface mounted toilet tissue holder with two rolls of standard tissue mounted horizontally. Provide stainless steel, satin finish cabinet.

PART 3 EXECUTION

3.1 INSTALLATION

Do not install items that show visual evidence of biological growth. Provide the same finish for the surfaces of fastening devices exposed after installation as the attached accessory. Install accessories at the location and height indicated. Protect exposed surfaces of accessories with strippable plastic or by other means until the installation is accepted. After acceptance of accessories, remove and dispose of strippable plastic protection. Coordinate accessory manufacturer's mounting details with other trades as their work progresses. After installation, thoroughly clean exposed surfaces and restore damaged work to its original condition or

replace with new work.

3.1.1 Recessed Accessories

Fasten accessories with wood screws to studs, blocking or rough frame in wood construction. Set anchors in mortar in masonry construction. Fasten to metal studs or framing with sheet metal screws in metal construction.

3.1.2 Surface Mounted Accessories

Mount on concealed backplates, unless specified otherwise. Install accessories with sheet metal screws or wood screws or toggle bolts or other approved fasteners as required by the construction. Install backplates in the same manner, or provide with lugs or anchors set in mortar, as required by the construction. Fasten accessories mounted on gypsum board and plaster walls without solid backing into the metal or wood studs or to solid wood blocking secured between wood studs, or to metal backplates secured to metal studs.

3.2 CLEANING

Clean material in accordance with manufacturer's recommendations. Do not use alkaline or abrasive agents. Take precautions to avoid scratching or marring exposed surfaces.

3.3 SCHEDULE

Room or Space	Accessories Required					
Restroom 213	GB	MT	PTDWR	TTD	SD	

-- End of Section –

SECTION 12 36 00

COUNTERTOPS

PART 1 GENERAL

1.1 REFERENCES

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

ASME INTERNATIONAL (ASME)

ASME B18.6.1	(2016) Wood Screws (Inch Series) ASTM

INTERNATIONAL (ASTM)

ASTM A167	(2011) Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
ASTM A325	(2014) Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
ASTM A325M	(2014) Standard Specification for Structural Bolts, Steel, Heat Treated, 830 MPa Minimum Tensile Strength (Metric)
ASTM D570	(1998; E 2010; R 2010) Standard Test Method for Water Absorption of Plastics
ASTM D638	(2014) Standard Test Method for Tensile Properties of Plastics
ASTM D2583	(2013a) Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor
ASTM D4689	(2012) Standard Specification for Adhesive, Casein-Type
ASTM D4690	(2012) Standard Specification for Urea Formaldehyde Resin Adhesives
ASTM E84	(2018a) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM F594	(2009; E 2015) Standard Specification for Stainless Steel Nuts

INTERNATIONAL ASSOCIATION OF PLUMBING AND MECHANICAL OFFICIALS (IAPMO)

IAPMO Z124.3	(2005) Plastic Lavatories

INTERNATIONAL CODE COUNCIL (ICC)

ICC IPC	(2018) International Plumbing Code

KITCHEN CABINET MANUFACTURERS ASSOCIATION (KCMA)

KCMA A161.1	(2017) Performance & Construction Standards for Kitchen and Vanity Cabinets

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

Shop Drawings
- Fabrication;
- Installation Drawings;

Product Data
- Synthetic Resin;
- Tile;
- FRP;
- Adhesives;
- Fasteners;
- Joint Sealants;

Samples
- Countertop;
- Backsplash;
- FRP;
- Manufacturer's Standard Color Charts;

1.3 DELIVERY, STORAGE, AND HANDLING

Deliver, store, and handle countertops [and backsplash] in a manner that will prevent damage and disfigurement.

Provide temporary skids under units weighing more than 400 pounds.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

Provide the manufacturer's standard type countertops or as indicated on the drawings. Accomplish fastenings to permit removal and replacement of individual countertops without affecting the remainder of the installation.

Submit manufacturer's instructions for countertops including special provisions required to install equipment components and system packages. Include all special notices detailing impedances, hazards and safety precautions.

Submit manufacturer's standard color charts for countertops showing the manufacturer's

recommended color and finish selections.

Provide certification or validation of indoor air quality for countertop products.

2.1.1 Design

Provide factory fabricated, prefinished solid surface countertops in the manufacturer's standard finishes of the type, design, and configuration indicated. Provide countertops as specified and meet the requirements of KCMA A161.1. Accomplish fastenings to permit removal and replacement of individual units without affecting the remainder of the installation. Provide counters with watertight sink rim when indicated. Include removable drawers equipped with position stops to avoid accidental complete withdrawals.

2.2 FABRICATION

2.2.1 Countertop And Backsplash

2.2.1.1 Solid Polymer Countertops

Provide countertop and backsplash as shown, with 3/4 -inch material thickness, cast, and filled nonporous solid surfacing composed of acrylic polymer, mineral fillers, and pigments. Repair superficial damage, a depth of no more than 0.010-inch, by sanding or polishing. Use material conforming to the following performance requirements:

a. Tensile Strength; 4100 psi, when tested in accordance with ASTM D638.

b. Hardness; Barcol Impressor 50 when tested in accordance with ASTM D2583. c.

Flammability; rated Class I with a flame spread of 25 maximum and a smoke developed of 100 maximum when tested in accordance with ASTM E84.

c. Boiling water resistance; no effect when tested in accordance with ANSI/NEMA LD 3.

d. High temperature; no effect when tested in accordance with ANSI/NEMA LD 3.

e. Liquid absorption; 0.06 percent maximum (24 hours) when tested in accordance with ASTM D570.

f. Sanitation; National Sanitation Foundation approval for food contact in accordance with Standard 51 and approval for food area applications.

f. Impact resistance; no failure for ball drop when tested in accordance with ANSI/NEMA LD 3.

2.2.2 Color, Texture, and Pattern

Color to be selected from manufacturer’s standard colors textures and patterns.

2.3 MATERIALS

Provide fasteners conforming to the following:

a. Stainless Steel Screws: Group, Type and Class as applicable
b. Anchoring Devices: FS FF-S-325, Group, Type, and Class as applicable
c. Nuts: ASTM F594, stainless steel
d. Bolts: ASTM A325, heavy, hexagon head bolts stainless steel
e. Nuts: ASTM F836M, stainless steel
f. Bolts: ASTM A325M, heavy, hexagon head bolts stainless steel
g. Steel supports: if required, provide steel support brackets and anchors and fasteners capable of developing a restraining force commensurate with the suited for use with the supporting construction.

2.4 MIXES

2.4.1 Adhesives

Provide mounting adhesives meeting either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of SCAQMD Rule 1168.

2.4.1.1 Mounting Adhesives

Provide structural-grade silicone or epoxy adhesives of type recommended by manufacturer for application and conditions of use.

Provide spacers, if required, of type recommended by adhesive manufacturer.

2.4.2 Joint Sealants

Use clear silicone sealant of type recommended by manufacturer for application and conditions of use. Provide joint sealant products meeting either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of SCAQMD Rule 1168.

PART 3 EXECUTION

3.1 INSTALLATION

Inspect material for defects prior to installation. Ensure materials throughout bear labels with the same batch number. Visually inspect materials used for adjacent pieces to assure acceptable color match. Inspect in lighting conditions similar to those on the project. Repair or replace damaged materials.

Install countertops plumb with cabinetry level to within 1/16-inch in 10-feet. Level base cabinets by adjusting leveling screws. Scribe and fit scribe strips to irregularities of adjacent surfaces. Gap openings exceeding 0.025-inch are not acceptable.

Secure countertops to cabinetry and wall construction at 24" maximum on center.

Submit installation drawings for countertops. Ensure drawings include location of cabinets, details of cabinets related and dimensional positions, and locations for roughing in plumbing, including sinks, faucets, strainers and cocks.

3.1.1 Preliminary Installation and Adjustment

Install materials in accordance to manufacturer's recommendations. Lift and place to avoid breakage. Position materials to verify that materials are correctly sized and prepared. Make necessary adjustments. If jobsite cutting, grinding, or polishing is required, use water-cooled tools. Protect jobsite and surfaces against dust and water. Perform work away from installation site if possible. Shim countertop adjacent to sinks and where drainage is required, slightly to insure positive drainage.

3.1.2 Permanent Installation

After verifying fit, clean substrates of dust and contamination, and clean back side and joints with solvent.

Apply sufficient quantity of mounting adhesive in accordance with adhesive manufacturer's recommendations to provide permanent, secure installation.

Install surfacing plumb, level, and square and flat to within 1/6-inch in 10-feet.

3.1.3 Joints

Ensure joints between adjacent pieces of surfacing are:

a. Flush, tight fitting, level, and neat.

b. Securely joined with adhesive. Fill joints level with quartz surfacing. Clamp or brace surfacing in position until adhesive sets. Seal joints with silicone sealer.

3.2 FIELD QUALITY CONTROL

Examine casework grounds and supports for adequate anchorage, foreign material, moisture, and unevenness that could prevent quality casework installation.

Ensure that electrical and plumbing rough-ins for casework are complete. Do not proceed with installation until defects are corrected.

3.3 ADJUSTING AND CLEANING

3.3.1 Solvent

Use a product recommended by adhesive manufacturer to clean surface to assure adhesion of adhesives and sealants.

3.3.2 Cleaning Agents

Use non-abrasive, soft-scrub type kitchen cleaners.

3.3.3 Cleaning

On completion touch up marred or abraded finished surfaces. Remove crating and packing materials from premises. Wipe down surfaces to remove fingerprints and markings and leave in clean condition.

-- End of Section --

SECTION 14 24 23
HYDRAULIC PASSENGER ELEVATORS

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M	(2015; Errata 1 2015; Errata 2 2016) Structural Welding Code - Steel

ASME INTERNATIONAL (ASME)

ASME A17.1/CSA B44	(2016) Safety Code for Elevators and Escalators
ASME A17.2	(2017) Guide for Inspection of Elevators, Escalators, and Moving Walks Includes Inspection Procedures for Electric Traction and Winding Drum Elevators, Hydraulic Elevators, and Escalators and Moving Walks
ASME B16.9	(2018) Factory-Made Wrought Buttwelding Fittings
ASME B16.11	(2016) Forged Fittings, Socket-Welding and Threaded

ASTM INTERNATIONAL (ASTM)

ASTM A53/A53M	(2018) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A106/A106M	(2018) Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C62.41	(1991; R 1995) Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits

INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC	(2018) International Building Code

NATIONAL ELEVATOR INDUSTRY, INC. (NEII)

NEII-1	(2000; R thru 2017) Building Transportation Standards

and Guidelines, including the Performance Standards Matrix for New Elevator Installation

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2017; ERTA 1-2 2017; TIA 17-1; TIA 17-2; TIA 17-3; TIA 17-4; TIA 17-5; TIA 17-6; TIA 17-7; TIA 17-8; TIA 17-9; TIA 17-10; TIA 17-11; TIA 17-12; TIA 17-13; TIA 17-14; TIA 17-15; TIA 17-16; TIA 17-17) National Electrical Code
NFPA 70E	(2018; TIA 18-1; TIA 81-2) Standard for Electrical Safety in the Workplace
NFPA 72	(2019; TIA 19-1; ERTA 2019) National Fire Alarm and Signaling Code
NFPA 101	(2018; TIA 18-1; TIA 18-2; TIA 18-3) Life Safety Code

OREGON STRUCTURAL SPECIALITY CODE (OSSC)

OSSC	(2019) Oregon Structural Specially Code

1.2 SUBMITTALS

Shop Drawings
- Elevator Components;
- Elevator Machine;
- Elevator Controller;
- Wiring Diagrams;

Product Data
- Elevator and Accessories
- Elevator Components
- Data Sheets
- Elevator Microprocessor Controller;

Design Data
- Emergency Power Systems
- Heat Loads
- Reaction Loads

Certificates
- Elevator Parts and Components
- Warranty Endorsement
- Letter Welders' Qualifications
- Elevator Controller Certification;

Operation and Maintenance Data
- Elevator Maintence
- Software and Documentation;

1.2.1 Shop Drawing Requirements

Provide assembly and arrangement of elevators, accessories, and elevator components. Show location of elevator machine and elevator controller. Provide details for materials and equipment, including but not limited to operating and signal fixtures, doors, door and car frames, car enclosure, controllers, motors, guide rails and brackets, layout of hoistway in plan and elevation, and other layout information and clearance dimensions.

1.2.2 Product Data Requirements

Provide manufacturers' product data for all elevator components, including but not limited to the following: elevator controller, hydraulic pump unit, hydraulic pump and motor, hydraulic cylinder, hydraulic piping and fittings, car and hall fixture buttons and switches, cab and machine room or control room communication devices, door operator, door protection system, car roller guides, and buffers. For data sheets, provide document identification number or bulletin number, published or copyrighted prior to the date of contract bid opening. Provide controller manufacturer's published procedures for performance of each and all testing required by ASME A17.1/CSA B44.

1.2.3 Design Data

1.2.3.1 Reaction Loads

Provide calculations by registered professional engineer for reaction loads imposed on building by elevator system. Demonstrate calculations complying with ASME A17.1/CSA B44, and OSSC 2019. Provide calculations from elevator manufacturer, or by registered professional engineer, for total anticipated heat loads generated by all of the elevator equipment.

1.2.3.3 Emergency Power Systems

Where the facility does have an emergency power system, confirm the elevators that will be connected to the emergency power system. Confirm the complete emergency power system and sequence of operation for all elevators, including operation of the elevator lobby manual selection switch. Provide wiring diagrams for building emergency power interface with elevator controls. For elevators not supplied by an emergency power system, provide manufacturers' product data for auxiliary power systems.

1.2.4 Welders' Requirements

Comply with AWS D1.1/D1.1M, Section 5. Include certified copies of field welders' qualifications. List welders' names with corresponding code marks to identify each welder's welding work.

1.2.5 Maintenance Control Program (MCP)

For each elevator, prepare and provide a written Maintenance Control Program (MCP) that complies with ASME A17.1/CSA B44 Section 8.6, including written documentation that details the test procedures for each and every test that is required to be performed by ASME A17.1/CSA B44. Assemble all MCP documentation, and supporting technical attachments, in a single MCP package and provide in both electronic and hard copy. Assemble entire hard copy MCP in 3-ring binders. For each elevator provided, the MCP must include only documentation and instruction that apply to the elevator specified.

For each elevator, provide an additional, separate binder that includes all maintenance, repair, replacement, call back, and other records required by ASME A17.1/CSA B44. The records binder must be kept in the elevator mechanical room, maintained by elevator maintenance and service personnel, and be available at all times to authorized personnel.

Provide detailed information regarding emergency service procedures and elevator installation company personnel contact information. Provide a listing of all tools to be provided to the Contracting Officer as components of the elevator system.

1.3 QUALITY ASSURANCE

1.3.1 Qualification

Provide a designed and engineered elevator system by an elevator contractor regularly engaged in the installation of elevator systems. Provide elevator components manufactured by companies regularly engaged in the manufacture of elevator components. Utilize only licensed and certified elevator personnel for the installation, adjusting, testing, and servicing of the elevators.

1.3.1.1 Elevator Contractor's Elevator Technicians

Perform all elevator related work under the direct guidance of a state certified elevator technician with a minimum of three years of experience in the installation of elevator systems of the type and complexity specified in the contract documents. Provide an endorsement letter from the elevator manufacturer, certifying that the elevator specialist is qualified. All elevator technicians must carry a current certification issued by one of the following organizations:

a. National Association of Elevator Contractors (NAEC)

b. National Elevator Industry Education Program (NEIEP)

1.3.2 Manufacturers' Technical Support

Provide elevator components from manufacturers that provide factory training and online and live telephone elevator technical support to any elevator installation, service, and maintenance contractor. Provide elevator components from manufacturers that guarantee accessibility to all replacement and repair parts and components to any elevator installation, service, and maintenance contractor.

1.3.3 Operation and Maintenance Data

Assemble all shop drawing and product data material into O&M Data Packages in accordance with Article SUBMITTALS. Provide two complete O&M Data Packages in hard copy and two complete electronic O&M data packages on separate CDs, in PDF format. Provide all O&M Data Packages to Contracting Officer. Include controller diagnostic documentation and software as required under Article CONTROL EQUIPMENT.

1.3.4 Wiring Diagrams

Provide complete wiring diagrams and sequence of operations, which show electrical connections and functions of elevator systems. Provide one set (11 inch by 17 inch minimum size) of wiring diagrams, with individual sheets laminated in plastic and assembled in binder, to be stored in the machine room or control room cabinet. Provide one additional hard copy set and two complete electronic sets on separate CDs, in PDF format. Coded diagrams are not acceptable unless fully identified.

1.3.5 Machine Room/Control Room Cabinet

For storage of O&M Data Packages and Wiring Diagrams, provide locking metal cabinet with a

minimum size of 20 inch W by 12 inch D by 30 inch H. Cabinet must be sized large enough to accommodate all O&M Data and hardware required in paragraphs OPERATION AND MAINTENANCE DATA and WIRING DIAGRAMS. Secure cabinet to machine room or control room wall.

1.4 NEW INSTALLATION SERVICE

Provide elevator warranty service in accordance with the manufacturer's maintenance plan, warranty requirements and applicable safety codes, for a period of 12 months after the date of acceptance. Perform this work during regular working hours. Provide supplies and parts to keep elevator system in operation. Perform service only by factory trained personnel. Provide Monthly services to include repairs, adjustments, greasing, oiling, and cleaning. Provide service log in elevator machine room or control room and update Monthly, throughout the one-year warranty period.

Provide 24-hour emergency service, with two hour on-site response time, during this period without additional cost.

1.4.1 Periodic Elevator Certification Inspection and Testing

Provide elevator mechanic to support Certified Elevator Inspector in the periodic six-month and the annual Category 1 elevator certification inspection and testing. Perform Category 1 inspection and testing no greater than 30 days prior to the end of the warranty period. Perform all elevator certification testing in the presence of QEI Certified Elevator Inspector.

In conjunction with the testing noted above, test systems for Emergency Power Operation, Earthquake Emergency Operation, and Hospital Emergency Commandeering Service Operation, as applicable. Schedule so that testing does not interfere with building operations.

1.5 FIRE PROTECTION SYSTEM

Coordinate interface between building fire protection system and elevator controls.

1.5.1 Fire Sprinklers

Provide fire sprinklers in accordance with all applicable safety codes. Provide shutoff valve, check valve, and non-adjustable, zero time-delay flow switch, in each sprinkler line immediately outside of each machine room, control room, and hoistway, as applicable. Provide inspectors' test valve for periodic testing of flow switch and shunt trip disconnect.

Pipe sprinkler piping serving these spaces in a series manner with no laterals. Locate inspectors' test connection at the end of pipe runs such that operation of the test connection will purge air from system piping.

1.5.2 Shunt Trip Disconnect

Provide flow switches specified in paragraph FIRE SPRINKLERS to comply with ASME A17.1/CSA B44 and NFPA 72 for shunt trip of the main line power supply. For each elevator, provide control wiring connecting the flow switch to a shunt trip equipped circuit breaker located in the elevator machine room or control room. Upon flow of water, flow switch will instantaneously cause opening of the shunt-trip circuit breaker and remove power from the elevator. Flow switch must also send a signal to fire alarm control panel to indicate water flow condition.

PART 2 PRODUCTS

2.1 ELEVATOR DESCRIPTION

Provide elevator system that complies with ASME A17.1/CSA B44 in its entirety, ASME A17.2 in its entirety, and additional requirements specified herein. Provide elevator system that meets or exceeds the NEII-1 Ride Quality Performance Standards Matrix (RQPSM). Comply with the RQPSM
"Intermediate Performance" criteria. Provide and install elevators in accordance with 36 CFR 1191 - ABAAS, ICC IBC, IEEE 62.41, NFPA 70 and NFPA 101 requirements.

2.1.1 Elevator Design Parameters

2.1.1.1 Elevator No.1 - Non-EMSA Elevator

Basis of Design Product: Canton Elevator Inc. Machine-room-less, Hole-less, Single Stage, Dual Jack, Front Opening, -"2500# HYDRO MLR"

a. Type: Holeless
b. Rated load: 2500 lb.
c. Rated Speed: 125fpm
d. Car Door Type: Single speed side slide.
e. Car Door Opening Width: 3 ft.-6 in. minimum.

2.1.2 Cab Enclosure and Hoistway Entrance Assemblies

Provide finishes as selected from manufacturer's full range of colors and finishes:

a. Floor; Luxury vinyl Tile.

b. Walls; laminated plastic on plywood . Provide each cab wall with equally spaced and equally sized wall panels. All wall panel fasteners must be concealed.

Wall trim; stainless steel.

Accessories; Provide hand rails on full length of back wall and side walls of elevator cab.

c. Car doors, car door returns, and wall reveals; stainless steel.

d. Ceilings; anodized aluminum. Ceiling frame; stainless steel.

e. Hoistway Entrance Assembly Material and Finishes; stainless steel.

2.2 ELEVATOR OPERATION

ASME A17.1/CSA B44, Introduction, Section 3, Definitions.

2.2.1 Selective Collective Automatic Operation

2.3 SPECIAL OPERATION AND CONTROL

Provide the following special operations and control systems.

2.3.1 Keys for Elevator Key Switches

Provide a minimum of twelve keys per unique cylinder used on all key switches for a single elevator. If there is more than one elevator, additional keys will not be required unless there are additional unique lock cylinders. Provide keys with brass or fiberglass tags marked "PROPERTY OF THE U.S. GOVERNMENT" on one side with function of key or approved code number on the other side.

2.3.2 Firefighters' Emergency Operation (FEO)

Provide FEO equipment and signaling devices. The designated level for the FEO Phase I key operated switch is the groundfloor. In the FEO Phase I fixture, provide FEO Operating Instructions.

2.3.2.1 Firefighters' Emergency Operation (FEO) Key Box

Provide flush mounted, locking, FEO Key Box of a minimum size of 5 inch W by 9 inch H by 1.5 inch Install at a height of 6 feet above floor level and directly above the FEO Phase I key switch. Provide box equipped with lock that uses the FEO K1 key.

2.3.3 Hoistway Access Operation

Provide hoistway access operation with switches at top and bottom terminal landings. Locate switch 6 feet above floor level, within 12 inches of elevator hoistway entrance frame or with the ferrule exposed when located in the elevator entrance frame.

2.3.4 In-Car Inspection Operation

Provide In-Car Inspection Operation.

2.3.5 Independent Service

Provide exposed key-operated switch in car operating panel to enable independent service and simultaneously disable in-car signals and landing-call responses. Provide indicator lights that automatically illuminate during independent service. For duplex or group operation, if one car is removed from group another car will respond to its hall calls.

2.3.6 Selective Door Operation

For elevator with one or more rear openings at same level as front opening, provide full-selective operation with car and door operating buttons clearly marked for front and rear openings, front and rear car button for each such floor, and front and rear "DOOR OPEN" and "DOOR CLOSE" buttons. Only door for which the button was operated opens or closes.

2.4 ELEVATOR DRIVE SYSTEM

Provide hydraulic elevator drive system, including pump unit, piping, cylinder/plunger assembly, and associated equipment, which will operate at a maximum working pressure of 500 psi or less.

Provide complete elevator system that meets or exceeds the NEII-1 Ride Quality Standard, including elevator ride quality and noise levels in car and in elevator machine room and machinery space.

2.4.1 Hydraulic Pump Unit

Provide self-contained pump unit, including oil-hydraulic elevator pump, electric motor, suction-line oil strainer, and structural steel outer base with tank supports and isolation pads. Provide oil tank capacity for full plunger displacement plus at least 10 gallons. Provide means to maintain oil temperature between 100 and 130 degrees F regardless of ambient temperature. Limit acoustic output in elevator machine room and machinery space to 80 dbA.

2.4.1.1 Pump Motor

Provide intermittent-duty pump motor rated at 120 starts/hour. Provide motor that is sized so that the motor amperage does not exceed the motor data tag amperage in any operating condition, exclusive of acceleration and deceleration. Provide minimum of one mega ohm insulation resistance between conductors and motor frame. Provide motor and pump nameplate and data tags permanently mounted on the outside of the pump unit frame, with all data viewable without the use of mirrors or other tools.

2.4.2 Hydraulic Controls and Equipment

Provide control valve, overspeed safety valve, blowout-proof muffler, and hydraulic pump discharge strainer in the hydraulic oil supply line. Provide two 1/4 turn, ball valve type manual shutoff valves. Provide one in the elevator hoistway pit and one in the elevator machine room or machinery space.

2.4.2.1 Hydraulic Control Valve

Provide constant-velocity, down-speed regulated, control valve. Down-speed regulated control valve allows the car to travel at the same speed in the down direction, regardless of the load on the elevator. In addition, the hydraulic control valve must have built-in adjustment capability to operate the elevator at 140 percent of rated speed to facilitate periodic testing of the overspeed safety valve.

2.4.2.2 Hydraulic Overspeed Safety Valve

Provide overspeed safety valve in hydraulic oil supply line, directly adjacent to the hydraulic cylinder. Provide threaded pipe connections between the hydraulic cylinder and the overspeed valve. Provide valve equipped with manufacturer's manual shutoff feature. Overspeed valve must not be equipped with a manual or automatic lowering feature. Provide adjustable valve with means to seal adjustment after inspection and testing by certified elevator inspector.

2.4.3 Hydraulic Piping and Accessories

Provide ASTM A53/A53M or ASTM A106/A106M, Schedule 80, black steel piping with ASME B16.9 or ASME B16.11 fittings for supply piping. Extend schedule 80 piping from the pump control valve body, inside the pump unit, to the hydraulic cylinder in the hoistway. Provide welded or threaded forged pipe fittings for all fittings and components of the hydraulic oil supply line. Provide hangers or supports for all piping and components.

2.4.3.1 Containment of Hydraulic Oil Supply Line

Protect all portions of hydraulic oil supply line that are installed below ground, including portions encapsulated in concrete or covered by construction, with continuous, Schedule 80, PVC. Inside diameter of PVC must be 3 inches larger than the outside diameter of the hydraulic oil supply line pipe and couplings.

2.4.4 Hydraulic Elevator Type

Provide a holeless direct plunger type hydraulic elevator. Elevators with telescopic or inverted cylinder-plungers are not acceptable and may not be used. Rope hydraulic elevator design is not acceptable and may not be used.

2.4.4.1 Cylinder-Plunger (Jack) Unit

Provide a single-stage plunger of seamless steel construction. Provide cylinder with self-stabilizing mount that will support and hold cylinder plumb without the need for stabilization means at the bottom of the cylinder. Provide a threaded, 1/4 inch bleeder valve at the top of the cylinder, just below packing gland.

2.5 CONTROL EQUIPMENT

Enclose all elevator control equipment in factory-primed and baked-enamel coated sheet-metal cabinets with ventilation louvers and removable or hinged doors. Mount cabinets at a height of 10 inches above machine room or control room finish floor.

2.5.1 Motor Control Equipment

Provide elevator motor control with electronic, soft-start motor starter.

2.5.2 Elevator Microprocessor Controller

For each individual elevator controller, and for each group controller, provide a microprocessor controller that complies with the following paragraphs. Provide controller(s) package that includes all hardware and software required for the installation, maintenance, and service of the elevator, in its' entirety. Provide verification of technical support service that the controller manufacturer provides to any licensed elevator installation, service, and maintenance company.

Provide an elevator controller from a manufacturer that provides comprehensive factory training to include controller installation, adjustment, service, and maintenance. The training must be identified as available to any licensed elevator contractor. Provide verification of an established and documented training schedule, with pricing, for factory training classes that manufacturer has provided for a minimum period of one year prior to contract award date.

The elevator controller must be nonproprietary equipment accompanied by a user's manual with controller connections, landing system, position indicators, buttons, diagnostic tools, and full access to and explanation of fault codes. The elevator controller shall not require the use of proprietary diagnostic equipment for service and maintenance.

Controller shall be available for purchase and installation by any licensed elevator contractor. All components, parts, diagnostic tools, and software must be available for use by any licensed elevator contractor; "exchange-only" provisions for the purchase of spare parts are not acceptable. The elevator controller manufacturer must publish an industry competitive price listing for all controller parts, diagnostic tools, and software.

Provide verification of telephone and internet based technical support service that the elevator controller manufacturer provides to any licensed elevator installation, service, and maintenance company at an industry competitive price. The service must include live telephone based technical support for installation, adjustment, maintenance, and troubleshooting of the elevator controller and related elevator components. The service must be available during standard

working hours.

Provide an elevator controller that is designed to automatically reestablish normal elevator operation following any temporary loss of power, regardless of duration.

2.5.2.1 Elevator Controller Interface Cabinet

For each individual elevator microprocessor controller, provide a separate elevator control cabinet with an integrated human interface system. For group elevator installations, a single cabinet and interface system with full access to each elevator controller may be utilized. The separate controller interface cabinet must be supplied by the elevator controller manufacturer and include a minimum 12 inch wide keyboard and a minimum 10 inch monitor. The elevator controller interface cabinet must comply with arc-flash protection requirements of NFPA 70E and UFC 3-560-01.

2.5.2.1.1 Elevator Microprocessor Human Interface

The interface system must provide complete elevator controller interface capability and must include the elevator controller manufacturer's comprehensive package of installation and diagnostic software. The microprocessor interface system must provide unrestricted access to all parameters, all levels of adjustment, and all flags necessary for installation, adjustment, maintenance, and troubleshooting of each elevator and for the elevator group. All software programming must be stored in non-volatile memory. The elevator controller fault log must provide non-volatile memory fault log storage of all faults, trouble calls, and fault history for a minimum of one year and the ability to download or print the fault log. The controller interface must also provide the capability to display and diagnose trouble calls, faults, and shutdowns. Expiring software, degrading operation, and "key" access controls are not acceptable.

2.5.2.2 Software and Documentation

Provide three copies of the manufacturer's maintenance and service diagnostic software, with complete software documentation, that will enable the same level of unrestricted access to all controllers of the same make and model, regardless of the installation date or location. Provide signed certification, from the manufacturer's corporate headquarters, that guarantees that the microprocessor software and access system will not terminate the unlimited and unrestricted access at any future date.

2.5.2.3 Elevator Controller Certification

For elevator installations in the United States, including United States territories, provide an elevator microprocessor controller that has a current certificate of safety code compliance issued by the Technical Standards and Safety Authority (TSSA), Toronto, Canada.

2.6 OPERATING PANELS, SIGNAL FIXTURES, AND COMMUNICATIONS CABINETS

For all panels and fixtures, provide identical and uniform panel and fixture design, material, finish, and components for all elevators. For all panels and fixtures, legibly and indelibly identify all buttons, devices, and all operating positions for each device. Use engraving and backfilling, or photo etching, for button and device designations. Do not use attached signs. Provide elevator manufacturers' standard grade for all key switches unless otherwise specified. All illuminating panels and
fixture components must utilize LED lighting for energy efficiency.

2.6.1 Car and Hall Buttons

For all cab and landing fixture buttons, provide industry-standard, vandal resistant push buttons with positive-stop assembly design. Buttons must be minimum 3/4 inch diameter, satin-finish stainless steel, with illuminating LED halo.

2.6.2 Passenger Car-Operating Panel

Provide each car with one car operating pane that contains operation controls and communication devices. Provide exposed, flush mounted buttons for the controls identified in subparagraph PASSENGER CONTROLS. Provide a lockable service cabinet for the controls listed in subparagraph SERVICE CONTROLS. Use engraving and backfilling or photo etching for button and switch designations. Do not use attached signs.

2.6.2.1 Passenger Controls

In addition to ASME A17.1/CSA B44 requirements, provide the following operating controls, identified as indicated:

a. Illuminating car-call buttons identified to correspond to landings served by the elevator.

b. "DOOR OPEN" and "DOOR CLOSE" buttons. For front and rear openings at the same floor, include the identification "F" and "R" for each opening.

c. Red, illuminating "ALARM" button.

d. Key-operated "Independent Service" switch.

e. "Help" communication device to include communication between elevator cab and elevator machine room or control room.

2.6.2.2 Service Controls

In addition to ASME A17.1/CSA B44 requirements, provide the following operating controls, identified as indicated:

a. Provide a key-operated, three-position switch for "In car Inspection Operation" and "Hoistway Access". The center switch position will provide normal, automatic operation.

b. "Car Light" switch.

c. "Car Fan" switch with two speed settings identified.

d. 120-volt ac 60 Hz single-phase duplex electrical outlet of ground-fault-circuit-interrupt (GFCI) design.

2.6.2.3 Certificate Window

Provide a minimum 4 inch wide by 6 inch high certificate window for elevator inspection certificate. Locate window in the Service Controls door of the Car Operating Panel.

2.6.2.4 Emergency Signaling Devices

Provide an audible signaling device, operable from the Car Operating Panel button marked "ALARM". The audible signaling device must have a sound pressure rating between 80 and 90 dBA at 10 ft. Provide battery backup power capable of operating the audible signaling device for at

least one hour.

2.6.3 Elevator In-Car Position Indicators

For all elevators, provide illuminating position indicator in the Car Operating Panel.

2.6.4 Elevator In-Car Direction Indicators

For 2-stop elevator installations, provide visual direction indicators and audible car arrival signal in the elevator car door jamb, in accordance with ABA Standards. Visual indicators must be visible from the hall call fixture.

2.6.5 Hall Call Landing Fixtures

Provide a hall call fixture adjacent to each elevator. Provide a single push-button for terminal landings and dual push-buttons, up and down, at intermediate landings.

2.6.5.1 Designated Landing Hall Call Fixture

2.6.5.1.1 Location of COMMUNICATION MEANS FAILURE (CMF) Visual Signal

When required by ASME A17.1/CSA B44, provide an elevator CMF audible and illuminating signal, and reset switch, in the FEO Designated Landing hall call fixture. Mount the signal and reset switch at a minimum of 7 inches above the "UP" hall call button.

2.6.5.1.2 COMMUNICATION MEANS FAILURE (CMF) Visual and Audible Signal Operation

Provide a CMF visual and audible signal system that conforms to ASME A17.1/CSA B44. Provide continuous verification of operability of the telephone line and immediate activation of audible and visual signals when verification means determines that the telephone line is not functioning. Provide illumination of visual signal at one second intervals. Provide a minimum of 65 dBA audible signal at 30 second intervals.

2.6.5.1.3 Firefighters' Emergency Operation Phase I Switch and Visual Signal

When required by ASME A17.1/CSA B44, provide an elevator Firefighters' Emergency Operation Phase I switch and illuminating visual signal in the FEO Designated Landing hall call fixture. Provide FEO Phase I visual signal that is designed with intermittent, flashing, illumination when actuated by the machine room, control room, or hoistway fire alarm initiating device. Locate FEO Phase I key switch above the CMF visual signal with a minimum of 6 inches vertical between the centerlines of the CMF signal and the FEO Phase I key switch. Locate FEO Phase I visual signal directly above the Phase I switch. In addition, locate Elevator Corridor Call Station Pictograph at top of hall call fixture.

2.6.6 Elevator Car Position and Direction Indicators and Car Arrival Signal

For elevator installations with three or more stops, provide a separate hall landing fixture that includes the visual elevator position indicator, visual direction indicators, and audible car arrival signal, in accordance with ABA Standards.

2.6.7 Designated Landing Elevator Identification Fixture

For duplex and group elevator installations, provide a separate elevator identification fixture for

each elevator, with identification engraved and backfilled with a contrasting color. Number elevators from left to right, as seen during primary approach from building main entrance to elevator lobby. For multiple elevator groups, begin numbering with group that is closest to the building main entrance.

2.6.8 Emergency or Standby Power

When emergency or standby power is provided for elevator operation, provide an elevator emergency power visual indicator that conforms to ASME A17.1/CSA B44. Locate the visual signal in the Firefighters Emergency Operation fixture for each simplex elevator and for each elevator group. When an emergency power selector switch is required, provide switch in a separate, flush mounted fixture located at the designated level, in view of all elevator entrances.

2.7 CAR DOOR EQUIPMENT

2.7.1 Car Door Operator

Provide elevator door operator equipment and circuitry that is designed and installed as discreet communication. Serial communication must not be used for this system.

2.7.2 Infra-red Curtain Unit

Provide Infra-red Curtain Unit (ICU) with multiple infra-red beams that protect to the full height and width of the door opening. Provide door nudging operation.

2.8 PASSENGER ELEVATOR GUIDES, PLATFORM, AND ENCLOSURE

2.8.1 Roller Guides

Provide coil-spring loaded roller guide assemblies in adjustable mountings on each side of car and counterweight frames in accurate alignment at top and bottom of frames.

2.8.2 Car Enclosure Wall Panels, Return Panels, Doors, Entrance Columns, and Transom

Provide 14 Gauge minimum stainless steel cab wall panels and entrance components. Use same material and finish for all hoistway and car entrance assemblies. Apply sound-deadening material on exterior of all cab wall panels.

2.8.3 Car Enclosure Top

Provide reinforced, 12 gauge minimum steel car enclosure top. Provide hinged emergency exit with lock that complies with the seismic risk zone 2 or greater design requirements of ASME A17.1/CSA B44. Locate emergency exit hinge towards the rear of the elevator cab. Design and configure the elevator cab interior ceiling to provide convenient and unobstructed access to, and use of, emergency exit from inside the elevator cab.

2.8.4 Car Door

Provide 16 gauge minimum stainless steel car doors of sandwich construction with flush surfaces on car and landing sides. Provide a minimum of 2 door guide assemblies per door panel, one guide at leading and one at trailing door edge with guides in the sill groove their entire length of travel.

2.8.5 Car Entrance Sill

Provide one piece cast nickel silver, stainless steel, or white bronze entrance sill(s). Set sills level and flush with floor finish. Use same material for hoistway and car entrance sills.

Coordinate attachment to floor with other trades, provide hardware required.

2.8.6 Cab Finish Floor

Provide cab finish floor with top of finish floor flush with the cab sill.

2.8.7 Car Fan

Provide 2-speed fan for car enclosure forced ventilation. Fan must be mounted in the car enclosure top.

2.8.8 Car Lighting

Utilize LED lighting for elevator car interior illumination. Provide a minimum of 10 foot-candles, measured at all areas of the car enclosure floor. Provide automatic car lighting operation that will turn off car lights after 3 minutes of inactivity. Car lights must automatically turn on upon actuation of an elevator car or hall call.

2.8.9 Car Protection Pads and Hooks

Provide fire retardant, hanging car protection pads that provide protection for all car interior wall panels. Provide permanently installed studs in car that are designed for hanging the car protection pads in the car.

2.9 PASSENGER ELEVATOR HOISTWAY DOORS AND ENTRANCES

Provide hoistway entrance assemblies with a minimum 1-1/2 hour fire rating. Use same material and finish for all hoistway and car entrance assemblies.

2.9.1 Hoistway Entrance Frames

Provide 14 gage minimum stainless steel hoistway entrance frames. Solidly grout uprights of entrance ways to height of 5 feet.

2.9.2 Hoistway Entrance Sills

Provide one-piece cast nickel silver, stainless steel, or white bronze entrance sills. Set top of landing sill flush with top of finish floor. Solidly grout under full length of sill. Use same material for all hoistway and car entrance sills.

2.9.3 Hoistway Entrance Doors

Provide [hollow metal][stainless steel] non-vision construction hoistway entrance doors with flush surfaces on car and landing sides. Provide a minimum of 2 door guide assemblies per door panel, one guide at leading edge and one at trailing edge with guides in the sill groove the entire length of door travel. Use same material and finish for all hoistway and car entrance assemblies.

2.9.4 Hoistway Entrance Door Track Dust Covers

Provide sheet metal hoistway door track dust covers at each landing. Dust covers must cover top and hoistway side of door locks and door roller tracks, and extend the full width of the door track and associated hardware. Dust cover sections will not exceed 3 feet in length.

2.10 HOISTWAY EQUIPMENT

2.10.1 Car Guide Rails and Fastenings

Provide T-section type guide rails for car. Paint rail shanks with one coat of black enamel.

2.10.2 Pit Equipment and Support Channels

Provide rail-to-rail pit channels to serve as mounting surface for main guide rails. Hydraulic cylinders and car buffers. Method of installation of channels, brackets and buffer mounts must be such that pit waterproofing is not punctured.

2.10.3 Pit "STOP" Switch

Provide push-to-stop/pull-to-run type pit "STOP" switch.

2.10.4 Traveling Cables

Suspend traveling cables by means of self-tightening webbed devices or internal suspension members.

2.10.5 Hoistway Pit Ladder

Provide continuous horizontal rungs for the full height of the pit ladder.

PART 3 EXECUTION

3.1 INSTALLATION

Install in accordance with contract specifications, manufacturer's instructions, NEII-1 Building Transportation Standards and Guidelines, and all applicable building and safety code requirements.

3.1.1 Structural Members and Finish Materials

Do not cut or alter structural members. Do not alter finish materials from manufacturer's original design. Restore any damaged or defaced work to original condition.

3.1.2 Miscellaneous Requirements

Provide recesses, cutouts, slots, holes, patching, grouting, and refinishing to accommodate elevator installation. Use core drilling to drill all new holes in concrete. Finish work to be straight, level, and plumb. During installation, protect machinery and equipment from dirt, water, or mechanical damage. At completion, clean all work and spot paint.

3.2 FIELD QUALITY CONTROL

The Contractor will provide and utilize a third-party licensed and certified Qualified Elevator Inspector (QEI) to conduct elevator pre-acceptance inspection and testing. The QEI must perform inspections and witness tests to ensure that the installation conforms to all applicable safety codes and contract requirements. The QEI will be directly employed by the Contractor and independent of the elevator contractor.

Upon completion, the QEI must provide written test data for all ASME A17.1/CSA B44 Acceptance Tests and written certification that the elevator is complete and ready for final Acceptance Inspection, Testing, and Commissioning.

3.3 ACCEPTANCE INSPECTION, TESTING AND COMMISSIONING

When elevator system installation is complete and ready for final inspection, notify Architect that elevator system is ready for Acceptance Inspection, Testing, and Commissioning. Provide QEI certification specified in Article FIELD QUALITY CONTROL.

3.3.1 Acceptance Inspection Support

Prime and Elevator Contractors must provide inspection support and perform all required tests, in order to demonstrate proper operation of each elevator system and to prove that each system complies with contract requirements and all applicable building and safety codes. Inspection procedures in ASME A17.2 form a part of this inspection and acceptance testing. All inspection and testing must be conducted in the presence of the Qualified Elevator Inspector (QEI).

If the elevator does not comply with all contract and safety code requirements on the initial Acceptance Inspection and Test, the Contractor is responsible for all costs involved with re-inspection and re-testing required as a result of contractor delays and discrepancies discovered during inspection and testing.

3.3.2 Testing Materials and Instruments

Furnish all testing materials and instruments necessary for Acceptance Inspection, Testing and Commissioning. At a minimum, include calibrated test weights, tachometer, accelerometer, hydraulic pressure gauge, 600-volt mega ohm meter, volt meter and ammeter, infrared temperature gauge, door pressure gage, dynamometer, and 20 foot tape measure.

3.3.3 Field Tests

3.3.3.1 Endurance Tests

Test each elevator for a period of one hour continuous, automatic operation, with specified rated load in the elevator cab. During the one hour test, stop car at each floor, in both directions of travel, and allow automatic door open and close operation. The requirements for Automatic Operation, Rated Speed, Leveling, Temperature Rise and Motor Amperes must be met throughout the duration of the Endurance Test. Restart the one hour test period from the beginning, following any shutdown or failure.

3.3.3.2 Speed Tests

Determine actual speed of each elevator, in both directions of travel, with rated load and with no load in elevator car. Make Speed tests at the beginning and at the end of the Endurance test.

Determine speed by tachometer reading or accelerometer, excluding accelerating and slow-down zones. Under all conditions, minimum acceptable elevator speed is the Rated speed specified. Maximum acceptable elevator speed is 110 percent of Rated speed.

3.3.3.3 Leveling Tests

Test elevator car leveling operation and provide a leveling accuracy equal to or less than 1/8 inch at each floor with no load in car, and with rated load in car, in both directions of travel. Determine leveling accuracy at the beginning and at the end of the endurance tests.

3.3.3.4 Temperature Rise Tests

Determine temperature rise of elevator pump motor and hydraulic fluid during one-hour full-load test run. Under these conditions, maximum temperature rise must not exceed acceptable temperature rise indicated on manufacturer's data plate. Start test only when equipment is within 5 degrees C of ambient temperature.

3.3.3.5 Motor Ampere Tests

At beginning and end of Endurance test, measure and record motor amperage in both directions of travel and in both no-load and rated load conditions.

3.3.3.6 Elevator Performance and Ride Quality Testing

Evaluate elevator performance to ensure compliance with specification requirements related to the NEII-1 Performance Standards Matrix for New Elevator Installations.

3.3.3.7 Hydraulic Safety Valve (Automatic Shutoff Valve) Tests

In order to ensure consistent performance, regardless of hydraulic oil temperature, test the Hydraulic Safety Valve twice. Test once before the one-hour endurance test and once immediately after the one-hour test. For elevator certification, safety valve must perform to code in both tests.

3.3.3.8 Hydraulic Pressure Tests

Check the hydraulic static pressure and rated-speed operating pressure at the hydraulic control valve, under both no load and rated load conditions.

3.3.3.9 Pressure Test of Liner/Cylinder Assembly

Perform 20 psig pressure test of the completed and installed liner/cylinder assembly. Test liner/cylinder assembly as a sealed unit. Provide safety relief valve set to relieve at 20 psig; 4.5 inch diameter dial pressure gage scaled for 0 to 50 psig and calibrated to 0.5 percent accuracy; and an air pressure admission throttle and shutoff valve. For safety, pressure test must only be performed when liner and cylinder are fully inserted and assembled in the well casing. Perform the test from remote location outside of the elevator pit. Perform test in the presence of, and witnessed by, a Certified Elevator Inspector.

-- End of Section --

SECTION 14 42 16
VERTICAL WHEELCHAIR LIFTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Shaftway Vertical Wheelchair Lift.

1.2 RELATED SECTIONS

A. Division 16 - Electrical: Dedicated telephone service and wiring connections.

B. Division 16 - Electrical: Lighting and wiring connections at top of shaft.

C. Division 16 - Electrical: Electrical power service and wiring connections.

1.3 REFERENCES

A. ASME A17.1 - Safety Code for Elevators and Escalators.

B. ASME A17.5 - Elevator and Escalator Electrical Equipment.

C. ASME A18.1 - Safety Standard for Platform Lifts and Stairway Chairlifts.

D. ICC/ANSI A117.1 - Accessible and Usable Buildings and Facilities.

E. NFPA 70 - National Electric Code.

F. OSSC (latest edition) Oregon Structural Specialty Code.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 00

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Submit manufacturer's installation instructions, including preparation, storage and handling requirements.
   2. Include complete description of performance and operating characteristics.
   3. Show maximum and average power demands.

C. Shop Drawings:
   1. Show details of assembly, erection and anchorage.
   2. Include wiring diagrams for power, control, and signal systems.
   3. Show complete layout and location of equipment, including required clearances and coordination with shaftway.

D. Reaction Loads
   1. Provide calculations by registered professional engineer for reaction loads imposed on building by elevator system. Demonstrate calculations complying with ASME A118.1 and OSSC 2019.

E. Selection Samples: For each finished product specified, provide two complete sets of color chips representing manufacturer's full range of available colors and patterns.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Firm with minimum 10 years experience in manufacturing of vertical platform lifts, with evidence of experience with similar installations of type specified.

B. Installer Qualifications: Licensed to install equipment of this scope, with evidence of experience with specified equipment. Installer shall maintain an adequate stock of replacement parts, have qualified people available to ensure fulfillment of maintenance and callback service without unreasonable loss of time in reaching project site.

1.6 REGULATORY REQUIREMENTS

A. Provide platform lifts in compliance with:
1. ASME A18.1 - Safety Standard for Platform Lifts and Stairway Chairlifts.
2. ASME A17.1 - Safety Code for Elevators and Escalators.
3. ASME A17.5 - Elevator and Escalator Electrical Equipment.
4. NFPA 70 - National Electric Code.
5. OSSC – Oregon Structural Specialty Code (latest edition)

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store components off the ground in a dry covered area, protected from adverse weather conditions.

1.8 PROJECT CONDITIONS

A. Do not use wheelchair lift for hoisting materials or personnel during construction period.

1.9 WARRANTY

A. Warranty: Provide a two-year limited warranty for wheelchair lift materials and workmanship.

B. Extended Warranty: Provide an extended manufacturer's warranty covering the wheelchair lift materials and workmanship for the following additional extended period beyond the initial two-year warranty. Preventive Maintenance Agreement required.
1. Five Years (7 years total).

PART 2 PRODUCTS

2.1 BASIS OF DESIGN PRODUCT:

A. Garaventa Lift; Mid-Size Shaftway Vertical Wheelhcair Lift – hydraulic model.

B. Model GVL-EN-144;

2.2 MANUFACTURER

A. Acceptable Manufacturer: Garaventa Lift; United States - P.O. Box 1769, Blaine, WA 98231-1769. Toll Free: 800-663-6556. Tel: (604) 594-0422. Fax: (604) 594-9915. Email:productinfo@garaventalift.com. Web:www.garaventalift.com.

B. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

2.3 SHAFTWAY VERTICAL WHEELCHAIR LIFT

A. Capacity: 750 lbs (340 kg) rated capacity.

B. Mast Height:
   1. Sufficient for existing floor to floor dimension.
   2. Basis of Design Product Model GVL SW -144; 147 inches (3734 mm) maximum lifting height.

C. Nominal Clear Platform Dimensions:
   1. Mid-Size: 39 inches (992 mm) by 60 inches (1522 mm).

D. Platform Configuration:
   1. 90 Degree Entry/Exit: Front and side openings.

E. Landing Openings:
   1. Lower Landing: Door.
   2. Upper Landing: Door.

F. Door Construction:
   1. Wood doors as specified in section 08-14-00. Lift Manf. to supply frame, with a door closer, pull handle, integrated interlock and 16 gauge (1.5 mm) galvanized steel kick plates for doors.

   2. Door Width:
      a. Lower Landing:
         1) 36” (nominal)
      b. Upper landing:
         1) 36” (nominal)

G. Power Door Operators: Automatically opens the doors when platform arrives at a landing. Will also open at landing by pressing call button or by gently pulling door.
   1. ADA Compliant and obstruction sensitive.
   2. Low voltage, 24 VDC with all wiring concealed.
   3. Provide power operators at the following locations:
      a. Lower Landing: Door.
      b. Upper landing: Door.

H. Lift Components:
   1. Machine Tower: Manufacturer’s standard.
   2. Base Frame: Structural steel.
   3. Platform Side Wall Panels: Manufacturer’s standard

I. Base Mounting and Access to Lift at Lower Landing:
   1. Floor Mount:/ Pit Mount: Lift to be mounted on existing floor, shaftway and area in front of lower landing shall be constructed to provide access to meet manufacturers requirements for the platform size specified.

J. Drive Mast Side Wall Panels: manufacturer’s standard panels and mounting hardware to cover the void between both sides of the mast and the side of the shaftway. Panels to cover the front and top of the void area to the height of the top surface of the drive mast.

K. Hydraulic Drive:
   1. Drive Type: Chain hydraulic.
   2. Emergency Operation: Manual device to lower platform and auxiliary battery power to raise or lower platform.
   3. Safety Devices:
      a. Slack chain safety device.

b. Shoring device.
4. Travel Speed: Manufacturer's standard.
5. Motor: Manufacturer's standard for lifting height.
6. Power Supply:
   a. 120 VAC single phase; 60 Hz on a dedicated 15 amp circuit.
   b. Powered by continuous building mains converted to 24 VDC equipped with auxiliary battery power system capable of running lift up and down for a minimum of 5 trips with rated load. Required for high usage lifts.

L. Platform Controls: 24 VDC control circuit with the following features.
1. Direction Control: Illuminated tactile and constant pressure buttons with dual platform courtesy lights and safety light.
2. Illuminated and audible emergency stop switch shuts off power to lift and activates audio alarm equipped with battery backup.
3. Keyless operation.
4. Emergency Telephone: Platform shall be equipped with ADA compliant autodialer telephone with a stainless steel faceplate. Telephone shall operate in the event of power failure. A telephone line shall be supplied to the lift site as specified under Division 16.
5. Arrival Gong and Digital Floor Display.

M. Call Station Controls: 24 VDC control circuit with the following features.
1. Direction Control: Illuminated and tactile constant pressure buttons with illuminated "in-use" indicator.
2. Safety indicator lamp.
3. Keyless operation.
4. Call Station Mounting:
   a. Lower:
      1) Wall mounted surface.
   b. Upper:
      1) Wall mounted surface.

N. Safety Devices and Features:
1. Grounded electrical system with upper, lower, and final limit switches.
2. At all landings a solenoid activated interlock shall electrically monitor that the door is in the closed position and the lock is engaged before lift can move from landing.
3. Electrical disconnect shall shut off power to the lift.

O. Finishes
1. Aluminum Extrusions: Champagne anodized finish.
2. Ferrous Components: Electrostatically applied baked powder finish, fine textured.
   a. Color: Satin Grey, RAL 7030.
3. Lift Finish: Baked powder coat finish as selected by the Architect from manufacturer's optional RAL color chart.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. Verify shaft and machine space are of correct size and within tolerances.

C. Verify required landings and openings are of correct size and within tolerances.

D. Verify electrical rough-in is at correct location.

E. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install lifts in accordance with applicable regulatory requirements including ASME A 17.1, ASME A 18.1 and the manufacturer's instructions.

B. Install system components and connect to building utilities.

C. Accommodate equipment in space indicated.

D. Startup equipment in accordance with manufacturer's instructions.

E. Adjust for smooth operation.

3.4 FIELD QUALITY CONTROL

A. Perform tests in compliance with ASME A 17.1 or A18.1 and as required by authorities having jurisdiction.

B. Schedule tests with agencies and Architect, Owner, and Contractor present.

3.5 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 21 13 13 WET-PIPE SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 CONTRACT CONDITIONS

A. Work of this Section is bound by the Contract Conditions and Division 1, bound herewith, in addition to this Specification and accompanying Drawings.

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 REFERENCE STANDARDS

A. NFPA 13

B. ASEE 1015

C. UL

D. ASTM

E. ASME

1.4 SUMMARY

A. Section Includes:

1. Pipes, fittings, and specialties.
2. Specialty valves.
3. Sprinklers.
4. Alarm devices.
5. Pressure gages.

1.5 DEFINITIONS

A. Standard-Pressure Sprinkler Piping: Wet-pipe sprinkler system piping designed to operate at working pressure of 175-psig maximum.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For wet-pipe sprinkler systems.

1. Include plans, elevations, sections, and attachment details for area of change.
2. Include diagrams for power, signal, and control wiring.

C. Delegated-Design Submittal: For wet-pipe sprinkler systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified individual (licensed professional engineer or NICET certified designer) responsible for their preparation.

D. As required by Authority Having Jurisdiction

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer and designer.

B. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13 that have been approved by authorities having jurisdiction, including hydraulic calculations if required.

C. Welding certificates.

D. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13. Include "Contractor's Material and Test Certificate for Aboveground Piping."

E. Field quality-control reports.

1.8 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For wet-pipe sprinkler systems and specialties to include in emergency, operation, and maintenance manuals.

1.9 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1.10 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer's responsibilities include designing, fabricating, and installing sprinkler systems and providing design services needed to assume responsibility. Base calculations on results of fire-hydrant flow test.
   a) Design Responsibility: Preparation of working plans, calculations, and field test reports by a qualified designer.

B. Welding Qualifications: Qualify procedures and operators according to 2010 ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with the following:

1. NFPA 13.

B. Standard-Pressure Piping System Component: Listed for 175-psig minimum working pressure.

C. Delegated Design: Engage a qualified designer, as defined in Section 014000 "Quality Requirements," to design wet-pipe sprinkler systems.

1. Sprinkler system design shall be approved by authorities having jurisdiction.
   a) Margin of Safety for Available Water Flow and Pressure: 10 percent, including losses through water-service piping, valves, and backflow preventers.
2. Maximum Protection Area per Sprinkler: According to UL listing and NFPA 13.

D. Seismic Performance: Sprinkler piping shall withstand the effects of earthquake motions determined according to NFPA 13 and ASCE/SEI 7.

2.3 STEEL PIPE AND FITTINGS

A. Standard-Weight, Black-Steel Pipe: ASTM A 53/A 53M, Type E, Grade B. Pipe ends may be factory or field formed to match joining method.

B. Schedule 30, Black-Steel Pipe: ASTM A 135/A 135M; ASTM A 795/A 795M, Type E; or ASME B36.10M wrought steel, with wall thickness not less than Schedule 30 and not more than Schedule 40. Pipe ends may be factory or field formed to match joining method.

C. Thinwall Black-Steel Pipe: ASTM A 135/A 135M or ASTM A 795/A 795M, threadable, with wall thickness less than Schedule 30 and equal to or greater than Schedule 10. Pipe ends may be factory or field formed to match joining method.

D. Schedule 10, Black-Steel Pipe: ASTM A 135/A 135M or ASTM A 795/A 795M, Schedule 10 in NPS 5 and smaller; and NFPA 13 -specified wall thickness in NPS 6 to NPS 10, plain end.

E. Nonstandard OD, Thinwall Black-Steel Pipe: ASTM A 135/A 135M or ASTM A 795/A 795M thinwall with plain ends and wall thickness less than Schedule 10.

F. Hybrid Black-Steel Pipe: ASTM A 135/A 135M or ASTM A 795/A 795M lightwall, with wall thickness less than Schedule 10 and greater than Schedule 5.

G. Schedule 5 Steel Pipe: ASTM A 135/A 135M or ASTM A 795/A 795M lightwall with plain ends.

H. Black-Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M, standard-weight, seamless steel pipe with threaded ends.

I. Uncoated-Steel Couplings: ASTM A 865/A 865M, threaded.

J. Uncoated, Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.

K. Malleable- or Ductile-Iron Unions: UL 860.

L. Cast-Iron Flanges: ASME 16.1, Class 125.

M. Steel Flanges and Flanged Fittings: ASME B16.5, Class 150.

1. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch thick ASME B16.21, nonmetallic and asbestos free or EPDM rubber gasket.
   a) Class 125 and Class 250, Cast-Iron, Flat-Face Flanges: Full-face gaskets.
   b) Class 150 and Class 300, Ductile-Iron or -Steel, Raised-Face Flanges: Ring-type gaskets.
2. Metal, Pipe-Flange Bolts and Nuts: Carbon steel unless otherwise indicated.

N. Steel Welding Fittings: ASTM A 234/A 234M and ASME B16.9.

1. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

O. Grooved-Joint, Steel-Pipe Appurtenances:

1. Pressure Rating: 250-psig minimum.
2. Painted Grooved-End Fittings for Steel Piping: ASTM A 47/A 47M, malleable-iron casting or ASTM A 536, ductile-iron casting, with dimensions matching steel pipe.
3. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213 rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.

P. Steel Pressure-Seal Fittings: UL 213, FM Global-approved, 175-psig pressure rating with steel housing, rubber O-rings, and pipe stop; for use with fitting manufacturers' pressure-seal tools.

2.4 SPECIALTY VALVES

A. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."

B. Pressure Rating:
1. Standard-Pressure Piping Specialty Valves: 175-psig minimum.

C. Body Material: Cast or ductile iron

D. Size: As required.

E. End Connections: Flanged or grooved.

F. Alarm Valves:

1. Standard: UL 193.
2. Design: For horizontal or vertical installation.
3. Include trim sets for bypass, drain, electrical sprinkler alarm switch, pressure gages, and fill-line attachment with strainer.
4. Drip Cup Assembly: Pipe drain without valves and separate from main drain piping.

5. Drip Cup Assembly: Pipe drain with check valve to main drain piping.
6. Include provision for chain locking.
7. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application

G. Automatic (Ball Drip) Drain Valves:

1. Standard: UL 1726.
2. Pressure Rating: 175-psig minimum.
3. Type: Automatic draining, ball check.
4. Size: NPS 3/4.
5. End Connections: Threaded.

2.5 SPRINKLER PIPING SPECIALTIES

A. Branch Outlet Fittings:

1. Standard: UL 213.
2. Pressure Rating: 175-psig minimum.
3. Body Material: Ductile-iron housing with EPDM seals and bolts and nuts.
4. Type: Mechanical-tee and -cross fittings.
5. Configurations: Snap-on and strapless, ductile-iron housing with branch outlets.
6. Size: Of dimension to fit onto sprinkler main and with outlet connections as required to match connected branch piping.
7. Branch Outlets: Grooved, plain-end pipe, or threaded.

B. Flow Detection and Test Assemblies:

1. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
2. Pressure Rating: 175-psig minimum.
3. Body Material: Cast- or ductile-iron housing with orifice, sight glass, and integral test valve.
4. Size: Same as connected piping.
5. Inlet and Outlet: Threaded or grooved.

C. Sprinkler Inspector's Test Fittings:

1. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
2. Pressure Rating: 175-psig minimum.
3. Body Material: Cast- or ductile-iron housing with sight glass.
4. Size: Same as connected piping.
5. Inlet and Outlet: Threaded.

2.6 ALARM DEVICES

A. Alarm-device types shall match piping and equipment connections.

B. Water-Flow Indicators:

1. Standard: UL 346.
2. Water-Flow Detector: Electrically supervised.
3. Components: Two single-pole, double-throw circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-

adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed.
4. Type: Paddle operated.
5. Pressure Rating: 250 psig.
6. Design Installation: Horizontal or vertical.

C. Valve Supervisory Switches:

1. Standard: UL 346.
2. Type: Electrically supervised.
3. Components: Single-pole, double-throw switch with normally closed contacts.
4. Design: Signals that controlled valve is in other than fully open position.
5. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application

2.7 PRESSURE GAGES

A. Standard: UL 393.

B. Dial Size: 3-1/2- to 4-1/2-inch diameter.

C. Pressure Gage Range: 0- to 250-psig minimum.

D. Label: Include "WATER" label on dial face.

PART 3 - EXECUTION

3.1 SERVICE-ENTRANCE PIPING

A. Connect sprinkler piping to water-service piping for service entrance to building.

B. Install shutoff valve, pressure gage, drain, and other accessories indicated at connection to water-service piping.

C. Install shutoff valve, check valve, pressure gage, and drain at connection to water service.

3.2 WATER-SUPPLY CONNECTIONS

A. Connect sprinkler piping to building's interior water-distribution piping. Comply with requirements for interior piping in Section 221116 "Domestic Water Piping."

B. Install shutoff valve, pressure gage, drain, and other accessories indicated at connection to water-distribution piping.

C. Install shutoff valve, check valve, pressure gage, and drain at connection to water supply.

3.3 PIPING INSTALLATION

A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated on approved working plans.

1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.
2. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.

B. Piping Standard: Comply with NFPA 13 requirements for installation of sprinkler piping.

C. Install seismic restraints on piping. Comply with NFPA 13 requirements for seismic-restraint device materials and installation.

D. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

E. Install unions adjacent to each valve in pipes NPS 2 and smaller.

F. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

G. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, and sized and located according to NFPA 13.

H. Install sprinkler piping with drains for complete system drainage.

I. Install automatic (ball drip) drain valve at each check valve for fire-department connection, to drain piping between fire-department connection and check valve. Install drain piping to and spill over floor drain or to outside building.

J. Install alarm devices in piping systems.

K. Install hangers and supports for sprinkler system piping according to NFPA 13. Comply with requirements for hanger materials in NFPA 13.

L. Install pressure gages on riser or feed main, at each sprinkler test connection, and at top of each standpipe. Include pressure gages with connection not less than NPS 1/4 and with soft-metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they are not subject to freezing.

M. Fill sprinkler system piping with water.

N. Install electric heating cables and pipe insulation on sprinkler piping in areas subject to freezing.

O. Install sleeves for piping penetrations of walls, ceilings, and floors.

P. Install sleeve seals for piping penetrations of concrete walls and slabs.

3.4 JOINT CONSTRUCTION

A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.

B. Install unions adjacent to each valve in pipes NPS 2 and smaller.

C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

D. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.

G. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

H. Twist-Locked Joints: Insert plain end of steel pipe into plain-end-pipe fitting. Rotate retainer lugs one-quarter turn or tighten retainer pin.

I. Steel-Piping, Pressure-Sealed Joints: Join lightwall steel pipe and steel pressure-seal fittings with tools recommended by fitting manufacturer.

J. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.
1. Shop weld pipe joints where welded piping is indicated. Do not use welded joints for galvanized-steel pipe.

K. Steel-Piping, Cut-Grooved Joints: Cut square-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe joints.

L. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.

M. Steel-Piping, Pressure-Sealed Joints: Join Schedule 5 steel pipe and steel pressure-seal fittings with tools recommended by fitting manufacturer.

N. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.5 VALVE AND SPECIALTIES INSTALLATION

A. Install listed fire-protection valves, trim and drain valves, specialty valves and trim, controls, and specialties according to NFPA 13 and authorities having jurisdiction.

B. Install listed fire-protection shutoff valves supervised open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.

C. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water-supply sources.

D. Specialty Valves:

1. Install valves in vertical position for proper direction of flow, in main supply to system.
2. Install alarm valves with bypass check valve and retarding chamber drain-line connection.
3. Install deluge valves in vertical position, in proper direction of flow, and in main supply to deluge system. Install trim sets for drain, priming level, alarm connections, ball drip valves, pressure gages, priming chamber attachment, and fill-line attachment.

3.6 IDENTIFICATION

A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13.

B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.7 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
3. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
4. Energize circuits to electrical equipment and devices.
5. Coordinate with fire-alarm tests. Operate as required.
6. Coordinate with fire-pump tests. Operate as required.

B. Sprinkler piping system will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.8 PIPING SCHEDULE

A. Piping between Fire Department Connections and Check Valves: Galvanized, standard-weight steel pipe with grooved ends, grooved-end fittings, grooved-end-pipe couplings, and grooved joints.

B. Sprinkler specialty fittings may be used, downstream of control valves, instead of specified fittings.

C. Standard-pressure, wet-pipe sprinkler system, NPS 2 and smaller, shall be one of the following:

1. Standard-weight or Schedule 30, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.

2. Standard-weight or Schedule 30, black-steel pipe with cut or roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
3. Standard-weight or Schedule 30, black-steel pipe with plain ends; steel welding fittings; and welded joints.
4. Thinwall Schedule 10 nonstandard OD, thinwall or hybrid black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
5. Thinwall Schedule 10 or hybrid black-steel pipe with plain ends; uncoated, plain-end-pipe fittings; and twist-locked joints.
6. Thinwall Schedule 10 nonstandard OD, thinwall or hybrid black-steel pipe with plain ends; welding fittings; and welded joints.
7. Schedule 5 steel pipe; steel pressure-seal fittings; and pressure-sealed joints.

D. Standard-pressure, wet-pipe sprinkler system, shall be one of the following:

1. Standard-weight or Schedule 30, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
2. Standard-weight or Schedule 30, black-steel pipe with cut-or roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
3. Standard-weight or Schedule 30, black-steel pipe with plain ends; steel welding fittings; and welded joints.

E. Standard-pressure, wet-pipe sprinkler system, NPS 5 and larger, shall be one of the following:

1. Standard-weight or Schedule 30, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
2. Standard-weight or Schedule 30, black-steel pipe with cut- or roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
3. Standard-weight or Schedule 30, black-steel pipe with plain ends; steel welding fittings; and welded joints.

END OF SECTION 21 13 13

SECTION 22 05 00 - GENERAL PLUMBING PROVISIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Products under this contract must meet minimum specification requirements in detail without exception unless specifically noted and approved as provided in these Specifications. Equipment submitted for review must clearly state on cover sheet any differences from specified product. Equipment substitution or submittal review does not relieve Contractor from meeting all requirements of specified item.

1.2 CONTRACT DOCUMENTS

A. The Contract Documents are inclusive. All requirements of all Contract Documents shall be binding as if repeated herein and with this Division as required by any other Division or Contract Document. Applicable provisions of Division 1 govern work under this section. This Division does not express or imply separation of the Contract Documents and shall not be considered as separation of the Work. See Advertisement For Bids, Instructions to Bidders, Supplemental Instructions to Bidders, General Conditions, Supplemental General Conditions, Drawings and Specifications, and modifications incorporated in the documents before execution of the Agreement.

B. Conflicts: If any conflicts exist the more stringent Contract Document is required.

1.3 DEFINITIONS

A. Definitions herein are intended as advisory and shall not limit requirements within the Contract Documents. Where a conflict of definitions exists, the more stringent standard shall be used. Where a term is defined on a Drawing the Drawing definition shall be used for that drawing. Not all definitions are included. Trade standard terms are not defined.

1.4 SCOPE OF WORK

A. General: Provide complete and functional plumbing systems are specified, as shown on Drawings, as required, and as intended.

B. Omissions: Contractor shall be responsible for additional labor, or additional material necessary for the proper execution of the Work. Omissions of expressed reference to any item shall not relieve the responsibility to conform to the Contract Documents.

C. Scope of Plumbing Work: All materials and workmanship shall be furnished for complete, tested, and operating plumbing systems as shown on the drawings and specified herein. Plumbing work is to include the water and sanitary service. Complete to the point of connection with the serving utility(ies). Any changes of or work required by the serving utility(ies), are part of this work and shall be fully included in the bid price.

1.5 CODES

A. Comply with the requirements of local, federal, Oregon Administrative Code, and Oregon Plumbing Specialty Code.

1.6 SUBMITTALS

A. Reference: Division 1, General Conditions, Submittals.

B. Shop drawings and Submittals: Bound, labeled, contain the project manual cover page and a material index list page showing item designation, manufacturer and additional items supplied with the installation. Submit for all equipment and systems as indicated in the respective specification sections, marking each submittal with that specification section number. Mark general catalog sheets and drawings to indicate specific items being submitted and proper identification of equipment by name and/or number, as indicated in the contract documents. Include wiring diagrams of electrically powered equipment.

C. Engineer Review: Allow not less than 20 Days.

D. Submit: Not less than Fixtures, Stops, and Piping catalog information.

1.7 CONFORMANCE WITH REQUIREMENTS

A. General: All work shall conform to the reasonable requirements of the project within the scope of the project and authorizations. All work shall conform to the methods and requirements of Code at the location of the Work.

B. Access and inspection: All portions of the Work shall be accessible to inspections and review at all reasonable times during construction. Contractor is responsible for providing access for review and inspection of the Work. Contractor shall secure written inspection reports prior to concealing Work. Contractor is responsible for damages to properly review the Work due to lack of at least 7 Days advance written notification to the Architect, and Engineer that Work is ready for inspection.

C. Accounting: Provide general accounting information as to labor and equipment costs to assist in determination of modifications to the Contract. Provide accounting breakdown when required for securing Owner financing, or for analysis of equipment costs or equipment payback periods, as well as information for Owners incentives.

1.8 COORDINATION OF TRADES

A. Check all other trade drawings to avert potential installation conflicts. Should major changes from the Drawings be required to resolve potential conflicts, notify the Architect and secure written approval and agreement on necessary adjustments prior to start of installation. Check all equipment locations and connections on the site for coordination with other Divisions equipment and connections and structure and the like. Contractor is responsible for scheduling trades to properly execute all the Work as intended.

1.9 STANDARD OF CARE AND QUALIFICATIONS

A. General: Contractor shall be experienced and knowledgeable to Provide Work. Owner is not responsible for improper operation, incompliance, or installation due to Contractor’s lack of knowledge or experience. Upon request, and where requested herein the Contractor shall

supply qualifications and experience. Drawings are presented with industry terms, statements, and trade practices and it is the responsibility of the Contractor to be familiar. Provide written notification prior to Bid to the Architect if any representation is not understood, or outside standard practice.

B. Like Materials and Quality Control: All systems provided shall be new and of like materials provided through manufacturer. Items of the same by different manufacturers will be rejected. Equipment shall conform to all applicable Code and applicable listing criteria as of the date of the Contract Documents. Equipment determined to be manufactured under any other listing or Code prior to the date of the Contract is not acceptable, even if the equipment is new or has not been used. All equipment provided to project shall be listed by an approved listing organization.

1.10 EXAMINATION OF SITE

A. Examine Site of Work prior to making Bid. Ascertain all related physical conditions. Verify at the Site of Work prior to Bid scale dimensions shown due to exact locations, distances, and levels will be governed by actual field conditions. Owner will not be responsible for any loss or costs that may be incurred due to a Bidder's failure to fully inform themselves prior to Bid in regard to conditions pertaining to the Work and nature of the Work.

1.11 MINOR DEVIATIONS

A. Make minor changes in equipment locations and equipment connections as directed or required without extra cost.

1.12 RECORD DRAWINGS

A. Maintain a marked set of prints at job site at all times. Show all changes from the original drawing set whether visible or concealed. Include all addendums, field orders, change orders, clarifications, request for information drawn responses, and deviations. Dimension accurately from building lines, floor, or curb elevations. Show exact location, elevation, and size of conduit/raceway, access panels and doors, equipment, and all other information pertinent to the Work. At project completion, submit marked set to Architect for review.

1.13 WARRANTY

A. Warrant Work, materials, and equipment for not less than one year.

1.14 CONTINUITY OF EXISTING SERVICES

A. Do not interrupt or change existing services without prior written approval from the Owner's Project Representative. When interruption is required, coordinate scheduling of down-time with the Owner to minimize disruption to his activities. Unless specifically stated, all work involved in interrupting or changing existing services is to be done during non-working hours.

1.15 CERTIFICATES AND INSPECTIONS

A. Reference: Division 1, General Conditions, Permits, Regulations, Utilities and Taxes.

B. Inspections: Obtain and pay for all required installation inspections except those provided by the Architect. Deliver the originals of inspection certificates and test records to the Owner's Project Representative. Include copies of the certificates and test records in the Operating and Maintenance Instructions.

1.16 PROTECTION OF FINISHED SURFACES

A. Refer to Division 1, General Requirements, Protection of Finished Surfaces.

1.17 SLEEVES AND OPENINGS

A. Refer to Division 1, General Requirements, Sleeves and Openings.

1.18 SEALING AND FIRESTOPPING

A. Sealing and firestopping of sleeves/openings between piping, etc. and the sleeve or structural opening shall be the responsibility of the contractor whose work penetrates the opening. The contractor responsible shall hire individuals skilled in such work to do the sealing and fireproofing. Provide all fire stopping of fire rated penetrations and sealing of smoke rated penetrations in compliance with Specifications Fire Stopping.

1.19 OPERATION AND MAINTENANCE DATA

A. All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

B. In addition to the general content specified under GENERAL REQUIREMENTS supply the following additional documentation:

1. Records of tests performed a to certify compliance with system requirements
2. Manufacturer's wiring diagrams for electrically powered equipment
3. Certificates of inspection by regulatory agencies
4. Valve schedules
5. Lubrication instructions, including list/ frequency of lubrication
6. Parts lists for fixtures, equipment, valves and specialties
7. Manufacturers installation, operation and maintenance recommendations for fixtures, equipment, valves and specialties
8. Additional information as indicated in the technical specification sections

END OF SECTION 22 05 00

SECTION 22 05 29- HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 CONTRACT CONDITIONS

A. Work of this Section is bound by the Contract Conditions and Division 1, bound herewith, in addition to this Specification and accompanying Drawings.

1.2 SECTION INCLUDES

A. Specifications for supports of all plumbing equipment and materials as well as piping system anchors. Included are the following topics:

1.3 RELATED WORK

A. Section 22 05 00 - Common Work Results for Plumbing

B. Division 3 - Concrete.

1.4 REFERENCE STANDARDS

A. MSS SP-58 Pipe Hangers & Supports-Materials, Design, Manufacture and Installation

B. MSS SP-69 Pipe Hangers & Supports-Selection and Application

1.5 REFERENCE

A. Applicable provisions of Division 1 govern work under this section.

1.6 QUALITY ASSURANCE

A. Substitution of Materials: Refer to Section 01 60 00 Project Requirements.

1.7 DESCRIPTION

A. Provide all supporting devices as required for the installation of mechanical equipment and materials. All supports and installation procedures are to conform to the latest requirements of the ANSI Code for building piping.

B. Do not hang any mechanical item directly from a roof deck or run piping so its rests on the bottom chord of any truss or joist.

C. Fasteners depending on soft lead for holding power or requiring powder actuation will not be accepted.

D. Support apparatus and material under all conditions of operation, variations in installed and operating weight of equipment and piping, to prevent excess stress, and allow for proper expansion and contraction.

E. Protect insulation at all hanger points.

1.8 DESIGN CRITERIA

A. Materials and application of pipe hangers and supports shall be in accordance with MSS Standard Practice SP-58 and SP-69 unless noted otherwise.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Anvil, B-Line, Unistrut, or approved equal.

2.2 STRUCTURAL SUPPORTS

A. Provide all supporting steel required for the installation of mechanical equipment and materials, including angles, channels, beams, etc. to be suspended or floor supported tanks and equipment. All of this steel may not be specifically indicated on the drawings.

2.3 PIPE HANGERS AND SUPPORTS

A. WALL/VERTICAL SUPPORT:

1. Metal C-Channel type with Stainless steel strapping.
2. Rubber Sleeve around pipe strap.
3. Unistrut, B-line, Anvil, approved.

B. HORIZONTAL SUPPORT:

1. Multiple Runs: Rack with 25 percent spare capacity. Maximum width per manufacturer's recommendations.

C. PIPE SUPPORTS:

1. All supports, fasteners, clamps, etc. directly connected to copper piping shall be copper plated. Where dissimilar materials are used, provide isolation collar between supports/clamps/fasteners and copper piping. Cushmen type or approved.
2. Single Hanger- Rod type required.
3. PVC Coated in Exterior, Crawl, Attic, and wet locations.
4. Nylon Strapping: Permitted for Crawl Spaces, and Attics locations only when mechanically secured to structure.

2.4 PIPE HANGER RODS

A. STEEL HANGER RODS:

1. Threaded both ends, threaded one end, or continuous threaded, complete with adjusting and lock nuts.
2. Size rods for individual hangers and trapeze support as indicated in the following schedule.
3. Redundancy cable shall be included for each rod hanger.
4. Total weight of equipment, including valves, fittings, pipe, pipe content, and insulation, are not to exceed the limits indicated.

Maximum Load (Lbs.) (650°F Maximum Temp.)	Rod Diameter (inches)
610	3/8
1,130	1/2
1,810	5/8
2,710	3/4
3,770	7/8
4,960	1
8,000	1-1/4

2.5 CONCRETE INSERTS

A. POURED IN PLACE:

1. MSS SP-69 Type 18 wedge type to be constructed of a black carbon steel body with a removable malleable iron nut that accepts threaded rod to 7/8 inch diameter. Wedge design to allow the insert to be held by concrete in compression to maximize the load carrying capacity. B-Line B2505, Anvil 281.
2. MSS SP-69 Type 18 universal type to be constructed of black malleable iron body with a removable malleable iron nut that accepts threaded rod to 7/8 inch diameter. B-Line B3014N, Anvil 282.

B. DRILLED FASTENERS:

1. Steel expansion anchors, vibration resistant, with ASTM B633 zinc plating. Use drill bit of same manufacturer as anchor. Hilti, Rawl, Redhead.

2.6 ANCHORS

A. Use welded steel shapes, plates, and bars to secure piping to the structure.

B. Nylon Strapping used in permitted locations only shall be mechanically held to the structure.

C. No Anchors shall come in contact with metal piping unless dielectrically isolated as indicated herein.

2.7 NOT PERMITTED FOR ANY SUPPORTING MEANS

A. Metal Plumbers Tape

B. Staples

C. “Zip ties”, plastic cable ties, wire ties

D. Wood Blocks/Wood Anchors/Wood Roof Pipe supports

2.8 CONCRETE PENETRATIONS/ENTRANCE

A. Rubber-Wrapped Isolated

PART 3 - EXECUTION

3.1 INSTALLATION

A. Size, apply and install supports and anchors in compliance with manufacturers recommendations.

B. Install supports to provide for free expansion of the piping system. Support all piping from the structure using concrete inserts, ceiling plates, wall brackets, or floor stands. Fasten ceiling plates and wall brackets securely to the structure and test to demonstrate the adequacy of the fastening.

C. Coordinate hanger and support installation to properly group piping of all trades.

D. Where piping can be conveniently grouped to allow the use of trapeze type supports, use standard structural shapes or continuous insert channels for the supporting steel. Where continuous insert channels are used, pipe supporting devices made specifically for use with the channels may be substituted for the specified supporting devices provided that similar types are used and all data is submitted for prior approval.

E. Size and install hangers and supports, except for riser clamps, for installation on the exterior of piping insulation. Where a vapor barrier is not required, hangers may be installed either on the exterior of pipe insulation or directly on piping.

F. Dielectrically isolate dissimilar materials from metal pipes and metal supports with rubberized isolation sleeves, and blocks as indicated herein.

3.2 HANGER AND SUPPORT SPACING

A. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.

B. Place a hanger within 12 inches of each horizontal elbow, valve, strainer, or similar piping specialty item.

C. Use hangers with 1-1/2 inch minimum vertical adjustment.

D. Where several pipes can be installed in parallel and at the same elevation, provide multiple or trapeze hangers.

E. Support riser piping independently of connected horizontal piping.

F. Adjust hangers to obtain the slope specified in the piping section of these specifications.

G. Space hangers for pipe as follows:

Pipe Material	Pipe Size	Max. Horiz. Spacing	Max. Vert. Spacing
Cast Iron	2" and larger	5'-0"	15'-0"
Copper	Less than 1-1/4"	6'-0"	10'-0"
Copper	1-1/4" through 1-1/2"	10'-0"	10'-0"
Copper	Larger than 1-1/2"	12'-0"	10'-0"
Ductile Iron	All	10'-0"	20'-0"
Steel	1/2" through 1-1/4"	7'-0"	15'-0"
Steel	1-1/2" through 6"	12'-0"	15'-0"
Plastic	Drain and Vent	4'-0"	10'-0"
Plastic	1" or less	32"	10'-0"
Plastic	1-1/4" and over	4'-0"	10'-0"

3.3 CONCRETE INSERTS

A. Select size based on the manufacturer's stated load capacity and weight of material that will be supported.

3.4 ANCHORS

A. Install where indicated on the drawings and details. Where not specifically indicated, install anchors at ends of principal pipe runs and at intermediate points in pipe runs between expansion loops. Make provisions for preset of anchors as required accommodating both expansion and contraction of piping.

END OF SECTION 22 05 29

SECTION 22 05 53- IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 CONTRACT CONDITIONS

A. Work of this Section is bound by the Contract Conditions and Division 1, bound herewith, in addition to this Specification and accompanying Drawings.

1.2 RELATED DOCUMENTS

A. See Section 22 05 00, “Common Work Results for Plumbing” for additional requirements for this section

1.3 REFERENCE REQUIREMENTS

A. Unless otherwise required by this specification, conform to the requirements of ASME/ANSI A13.1. Where label backgrounds and lettering colors are not specifically called out in these Contract Documents, conform to requirements of ASME/ANSI A13.1.

B. Unless specified otherwise, all piping systems and equipment shown on Contract Documents shall be labeled to comply with ASME/ANSI A13.1.

1.4 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Pipe labels.

1.5 SUBMITTALS

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

B. Samples: For color, letter style, and graphic representation required for each identification material and device. Chain hung phenolic sign example shall be submitted.

C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

1.6 COORDINATION

A. Finished Surfaces: Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Access Panel Locations: Coordinate installation of identifying devices with locations of access panels and doors.

C. Scheduling: Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 PIPE MAINS, EQUIPMENT, AND FIRE SPRINKLER LABELS

A. Chain Hung Phenolic Labels for Equipment:

1. Material and Thickness: Multilayer, multicolor, phenolic labels for mechanical engraving, 0.125 inch thick, and having predrilled holes for attachment hardware.
2. Letter Color: White.
3. Background Color: Black.
4. Maximum Temperature: Able to withstand temperatures up to 160 degrees F.
5. Minimum Label Size: Length and width vary for required label content, but not less than 2.50 by 0.75 inch.
6. Minimum Letter Size: 0.25 inch for name of units if viewing distance is less than 24.00 inches, 0.50 inch for viewing distances up to 72.00 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three fourths the size of principal lettering.
7. Fasteners: Stainless steel rivets or self-tapping screws.

B. Label Content: Include equipment's drawing designation or unique equipment number, drawing numbers where equipment is indicated (plans, details, and schedules), plus the specification section number and title where equipment is specified.

C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and identify drawing numbers where equipment is indicated (plans, details, and schedules), plus the specification section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 ON-PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

C. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction printed on display side only.
2. Lettering Size: At least 1.50 inches-high.

PART 3 - EXECUTION

3.1 PREPARATION

A. Cleaning: Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulates.

3.2 EQUIPMENT LABEL INSTALLATION

A. Mechanical Equipment: Install or permanently fasten labels on each major item of mechanical equipment.

B. Locations: Locate equipment labels where accessible and visible. Affix prominently on equipment except in finished areas where nameplate shall be inside access panel. Affix on general construction access doors/panels with sequential numbering system. Include complete list in O & M and provide Owner Representative with list in MS Excel electronic format.

3.3 ON-PIPE LABEL INSTALLATION

A. On-Pipe Labels: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 30.00 feet along each run. Reduce intervals to 10.00 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

B. Pipe Label Color Schedule:

1. Domestic Cold Water Piping:
   a) Background Color: Green.
   b) Letter Color: White.
2. Domestic Hot Water Piping:
   a) Background Color: Yellow
   b) Letter Color: Black

3.4 LABELING & IDENTIFICATION ALLOWANCE

A. In addition to labeling specified herein, and shown; provide labeling as directed by Owner. Include $500 label allowance in addition to labels required. Return as a credit to Contract full $500 label allowance to Owner if no additional identification is requested. Return as a credit to Contract any portion of allowance not used. Engineer shall review and accept cost of requested labeling prior to any allowing being spent.

END OF SECTION 22 05 53

SECTION 22 11 16 DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 CONTRACT CONDITIONS

A. Work of this Section is bound by the Contract Conditions and Division 1, bound herewith, in addition to this Specification and accompanying Drawings.

1.2 RELATED WORK

A. 22 05 00 - Common Work Results for Plumbing

B. 22 05 29 - Hangers and Supports for Plumbing Piping and Equipment

1.3 REFERENCE STANDARDS

A. ANSI B16.5 Pipe Flanges and Flanged Fittings

B. ANSI B16.22 Wrought Copper and Wrought Copper Alloy Solder Joint Pressure Fittings

C. ANSI B16.29 Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings – DWV

D. ANSI/NSF Standard 14: Plastics Piping System Components and Related Materials

E. ANSI/NSF Standard 61: Drinking Water System Components – Health Effects

F. ASTM B32 Solder Metal

G. ASTM B88 Seamless Copper Water Tube

H. ASTM B813 Liquid and Paste Fluxes for Soldering Applications of Copper and Copper Alloy Tube

I. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials

J. ASTM E119 Standard Test Methods for Fire Tests of Building

Construction and Materials

K. ASTM E814 Standard Test Method for Fire Tests of Through-

Penetration Fire Stops

L. ASTM F876 Standard Specification for Cross-linked Polyethylene

(PEX) Tubing

M. ASTM F877 Standard Specification for Cross-linked Polyethylene

(PEX) Plastic Hot- and Cold-Water Distribution Systems

N. ASTM F1960 Standard Specification for Cold Expansion Fittings with

PEX Reinforcing Rings for Use with Cross-linked Polyethylene (PEX) Tubing

O. AWS A5.8 Brazing Filler Metal

P. AWWA C651 Disinfecting Water Mains

1.4 QUALITY ASSURANCE

A. Substitution of Materials: Refer to Section 01 60 00 Project requirements. No Pex Piping substitutions permitted.

B. Order copper, and PEX pipe with each length marked with the name or trademark of the manufacturer and type of pipe; with each shipping unit marked with the purchase order number, metal or alloy designation, temper, size, and name of supplier.

C. Any installed material not meeting the specification requirements must be replaced with material that meets these specifications without additional cost to the Owner.

D. Pex Piping:

1. Test Reports: Upon request, submit test reports from recognized testing laboratories.
2. Certificates: Submit manufacturer’s certificate that products comply with specified requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Promptly inspect shipments to insure that the material is undamaged and complies with specifications.

B. Cover pipe to prevent corrosion or deterioration while allowing sufficient ventilation to avoid condensation. Do not store materials directly on grade. Protect pipe, tube, and fitting ends so they are not damaged. Where end caps are provided or specified, take precautions so the caps remain in place. Protect fittings, flanges, and unions by storage inside or by durable, waterproof, above ground packaging.

C. Storage and protection methods shall allow inspection to verify products.

D. Pex Piping:

1. General: Comply with Division 1 Product Requirement Section.
2. Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.
3. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
4. Storage and Protection: Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.
    a. Store PEX tubing in cartons or under cover to avoid dirt or foreign material from being introduced into the tubing.
    b. Do not expose PEX tubing to direct sunlight for more than 30 days. If construction delays are encountered, provide cover to portions of tubing exposed to direct sunlight.

1.6 DESIGN CRITERIA

A. Not smaller than ½ inch size.

B. Use only new material, free of defects, rust and scale, and meeting the latest revision of ASTM, AWWA or CISPI specifications as listed herein.

C. Construct all piping for the highest pressures and temperatures in the respective system and add an additional 25% safety factor.

D. Non-metallic piping will be acceptable only for the services indicated.

E. Where ASTM A53 type F pipe is specified, grade A type E or S, or grade B type E or S may be used at Contractor's option. Where the grade or type is not specified, Contractor may choose from those commercially available that meet or exceed grade/type of required service.

F. Where ASTM B88, type L, H (drawn) temper copper tubing is specified, ASTM B88, type K, H (drawn) temper copper tubing may be used at Contractor's option.

G. Contractor is required to meet application criteria and requirements where stated other may be used at Contractor's option herein.

G. Standard grade hydrostatic pressure ratings from Plastics Pipe Institute (PPI) in accordance with TR-3 as listed in TR-4. The following three standard-grade hydrostatic ratings are required for Pex piping:

1. 200°F (93°C) at 80 psi (551 kPa)
2. 180°F (82°C) at 100 psi (689 kPa)
3. 73.4°F (23°C) at 160 psi (1,102 kPa)

H. Certification of flame spread/smoke development rating of 25/50 in accordance with ASTM E84 provided the Pex installation meets one of the following requirements:

1. Tubing spacing is a minimum of 18 inches apart for the following sizes.
    a. ½ inch [12.7mm]
    b. ⅝ inch [15.88mm]
    c. ¾ inch [19.05mm]

2. PEX Tubing is wrapped with acceptable fire rated insulation (fiberglass wrap is not acceptable) with a flame spread of not more than 20 and a smoke-developed rating of not more than 30 and a nominal density of 4.0 to 4.5 pcf. Tubing can run with three tubes separated by zero inches and then 18 inches between the next group of three tubes for the following sizes.
    a. ½ inch [12.7mm]
    b. ⅝ inch [15.88mm]
    c. ¾ inch [19.05mm]
    d. 1 inch [25.4mm]
    e. 1¼ inch [31.75mm]
    f. 1½ inch [38.1mm]
    g. 2 inch [50.8mm]
    h. or greater

I. Provide Copper if more stringent fire/smoke rating is required.

1.7 WARRANTY

A. Provide 25 year manufacturer warranty.

PART 2 - PRODUCTS

2.1 DOMESTIC WATER

A. ABOVE GROUND:

1. Type L copper water tube, H (drawn) temper, ASTM B88; wrought copper pressure fittings, ANSI B16.22; lead free (<0.2%) solder, ASTM B32; flux, ASTM B813; copper phosphorous brazing alloy, AWS A5.8 BCuP. Mechanically formed brazed tee connections may be used in lieu of specified tee fittings for branch takeoffs up to one-half (1/2) the diameter of the main.

B. BELOW GROUND 2-1/2" AND SMALLER:

1. Type K copper water tube, O (annealed) temper, ASTM B88; with cast copper pressure fittings, ANSI B16.18; wrought copper pressure fittings, ANSI B16.22; lead free (<0.2%) solder, ASTM B32; flux, ASTM B813; or cast copper flared pressure fittings, ANSI B16.26. Utilize existing.

C. STUBBING TO VISIBLE SPACE

1. For PEX installations, provide copper where stubbing to interior side of wall to stop. Provide 100% fully backed, braced, bracketed copper extending into visible space (stub out in copper). Transition to from copper to PEX behind wall. Copper shall be fully braced and bracketed to prevent damage of PEX or copper.

D. FREEZE PROTECTION

1. Provide where installed in attics, crawl spaces, or other above grade unheated spaces.
2. Electrical heating tape with integrated thermostat mounted against pipe, with an activation temperature not less than 37-Degrees F.

3. Connect via Ground Fault Circuit Interrupter Breaker.
4. Do not exceed 10 Amps. total load/length per circuit.
5. UL Listed.

E. AMERICAN MANUFACTURED:

1. ALL Domestic Water tubing, piping and fittings are to be U.S. Manufactured. The contractor shall furnish proof of manufacture's location(s) to the Owner upon request.

F. PEX HOT AND COLD POTABLE WATER DISTRIBUTION PIPING

1. Manufacturer: Uponor, or approved
2. Materials:
    a) Tubing:
        1) Material: Crosslinked polyethylene (PEX) manufactured by PEX-a or Engel method.
        2) Type: Wirsbo AQUAPEX, or approved
        3) Material Standard: Manufactured in accordance with ASTM F876 and ASTM F877 and tested for compliance by an independent third party agency.
        4) Standard grade hydrostatic design and pressure ratings from PPI
        5) Fire-rated assembly listings in accordance with ANSI/UL 263
            a) UL Design No. L557 — 1-hour wood frame floor/ceiling assemblies
            b) UL Design No. K913 — 2-hour concrete floor/ceiling assemblies
            c) UL Design No. U372 — 1-hour wood stud/gypsum wallboard wall assemblies
            d) UL Design No. V444 — 1-hour steel stud/gypsum wallboard wall assemblies
        6) Minimum Bend Radius (cold bending): No less than six times the outside diameter. Use a bend support as supplied by the PEX tubing manufacturer for tubing with a bend radius less than stated.
        7) Nominal Inside Diameter: Provide tubing with nominal inside diameter, in accordance with ASTM F876 as indicated.
            a) ½ inch [12.7mm] (No Smaller Permitted)
            b) ¾ inch [19.05mm]
            c) 1 inch [25.4mm]
            d) 1¼ inch [31.75mm]
            e) 1½ inch [38.1mm]
            f) 2 inch [50.8mm]
            g) or greater as listed in the Drawings
        8) Colors: Hot/Hot Return- Red
            Cold- Blue
            See Insulation for additional color requirements.
    b) Fittings
        1) Material: Fitting assembly is manufactured from material listed in paragraph 5.1 of ASTM F1960.
        2) Material Standard: Comply with ASTM F1960.
        3) Type: PEX-a cold expansion fitting.
            a) Assembly consists of the appropriate ProPEX insert with a corresponding ProPEX Ring.
    b) PEX to Metal Transition Fittings

1) Manufacturers: Provide fittings from the same manufacturer of the piping.
2) PEX-a to Thread Transition: One-piece brass fitting with male or female threaded adapter and ASTM F 1960 cold-expansion end, with PEX-a reinforcing cold-expansion ring.
3) PEX-a to Copper Sweat Transition: One-piece brass fitting with sweat adapter and ASTM F 1960 cold-expansion end, with PEX-a reinforcing cold-expansion ring.
4) PEX-a to Copper Press Transition: One-piece lead free (LF) brass fitting with one ASME B16.51 copper press end and one ASTM F1960 cold-expansion end, with PEX-a reinforcing cold-expansion ring.
5) PEX-a to Flange Transition: Two-piece fitting with one steel flange conforming to ASME B 16.5and one lead free (LF) brass adapter conforming to ASTM F 1960.
6) PEX-a to Groove Transition: One-piece lead free (LF) brass fitting with one CSA B242-05 groove end in either iron pipe size (IPS) or copper tube size (CTS) and one ASTM F1960 cold-expansion end, with PEX-a reinforcing cold-expansion ring.
7) PEX-a to Water Meter Transition: Two-piece fitting with one NPSM union thread and one ASTM F 1960 cold-expansion end, with PEX-a reinforcing cold-expansion ring.

c) Manifolds
1) Material:
a) Type L copper body with UNS 3600 series brass ProPEX outlet connections.
b) Engineered Plastic (EP) body with ProPEX outlet connections.
2) Manifold Type:
a) Uponor ProPEX 1" Copper Manifold, or approved
b) Uponor engineered plastic (EP) Manifold, or approved
3) All manifolds manufactured with the appropriate-sized ProPEX fittings on the manifold supply inlets.

d) Valves
1) PEX-to-PEX, Lead Free (LF) Brass Ball Valves (1/2 inch through 2 inch nominal pipe size)
a) Manufacturers: Provide ball valve(s) from the same manufacturer as the piping system.
b) Full-port ball valve: two-piece, ASTM F1960 cold-expansion ends, with PEX-a reinforcing cold-expansion ring.
c) LF brass valve with a positive stop shoulder manufactured from C69300 brass.
d) In compliance with: 250 CWP, ANSI/NSF 359, ANSI/NSF 14/61, cNSF-us-pw_G lead free 0.25% Lead max., ASTM F1960, ASTM F 877 (CAN/CSA B137.5).

d) Accessories:
1) Angle stops and straight stops that are compatible with PEX tubing are supplied by the PEX tubing manufacturer.
a) ¼ turn type Stops only.
2) Bend supports designed for maintaining tight radius bends are supplied by the PEX tubing manufacturer.
3) ProPEX expander tool to install the ASTM F1960 compatible fittings are supplied by the PEX tubing manufacturer.
4) The tubing manufacturer provides clips and/or PEX rails for supporting tubing runs.

5) All horizontal tubing hangers and riser clamps are epoxy-coated material.

2.2 DIELECTRIC UNIONS AND FLANGES

A. Watts Regulator Company, Lochinvar, Wilkins, EPCO Sales, or approved dielectric unions 2" and smaller; with iron female pipe thread to copper solder joint or brass female pipe thread end connections, non-asbestos gaskets, having a pressure rating of not less than 175 psig at 180 degrees.

2.3 UNIONS AND FLANGES

A. Unions, flanges and gasket materials to have a pressure rating of not less than 150 psig at 180 degrees. Gasket material for flanges and flanged fittings shall be teflon type. Treated paper gaskets are not acceptable.

B. 2" and Smaller Copper: ANSI B16.18 cast bronze union coupling or ANSI B15.24 Class 150 cast bronze flanges.

2.4 NOT PERMITTED

A. Galvanized pipe is not permitted under any circumstances, even if existing/already within an existing facility. Repairs/Extensions and the like shall be by materials specified herein, no exceptions.

PART 3 - EXECUTION

3.1 GENERAL

A. Install pipe and fittings in accordance with reference standards, manufacturer's recommendations and recognized industry practices.

3.2 PREPARATION

A. Cut pipe ends square. Ream ends of piping to remove burrs. Clean scale and dirt from interior and exterior of each section of pipe and fitting prior to assembly.

3.3 EXAMINATION

A. Site Verification of Conditions:

1. Verify that site conditions are acceptable for installation of the PEX potable water system.
2. Do not proceed with installation of the PEX potable water system until unacceptable conditions are corrected.

3.4 ERECTION

A. Install all piping parallel to building walls and ceilings and at heights which do not obstruct any portion of a window, doorway, stairway, or passageway. Where interferences develop in the field, offset or reroute piping as required to clear such interferences. Coordinate locations of plumbing piping with piping, ductwork, conduit and equipment of other trades to allow sufficient clearances. In all cases, consult drawings for exact location of pipe spaces, ceiling heights, door and window openings, or other architectural details before installing piping.

B. Where copper piping is embedded in masonry or concrete, provide protective sleeve covering of elastomeric pipe insulation.

C. Install underground warning tape 6"-12" below finished grade above all exterior below ground piping. Where existing underground warning tape is encountered, repair and replace.

D. Maintain piping in clean condition internally during construction.

E. Provide clearance for installation of insulation, access to valves and piping specialties.

F. Provide anchors, expansion joints, swing joints and/or expansion loops so that piping may expand and contract without damage to itself, equipment, or building.

G. Do not route piping through transformer vaults or above transformers, panelboards, or switchboards, including the required service space for this equipment, unless the piping is serving this equipment

H. Install all valves and piping specialties, including items furnished by others, as specified and/or detailed. Provide access to valves and specialties for maintenance. Make connections to all equipment, fixtures and systems installed by others where same requires the piping services indicated in this section.

3.5 COPPER PIPE JOINTS

A. Remove all slivers and burrs remaining from the cutting operation by reaming and filing both pipe surfaces. Clean fitting and tube with metal brush, emery cloth or sandpaper. Remove residue from the cleaning operation, apply flux and assemble joint to socket stop. Apply flame to fitting until solder melts when placed at joint. Remove flame and feed solder into joint until full penetration of cup and ring of solder appears. Wipe excess solder and flux from joint.

3.6 THREADED PIPE JOINTS

A. Use a thread lubricant or teflon tape when making joints; no hard setting pipe thread cement or caulking will be allowed.

3.7 MECHANICALLY FORMED TEE FITTINGS

A. Form mechanically extracted collars in a continuous operation, consisting of drilling a pilot hole and drawing out the tube surface to form a collar having a height of not less than three times the thickness of the tube wall. Use an adjustable collaring device. Notch and dimple the branch tube. Braze the joint with neutral flame oxy-acetylene torch, applying heat properly so that pipe and tee do not distort; remove distorted connections.

3.8 DOMESTIC WATER

A. Maintain piping system in clean condition during installation. Remove dirt and debris from assembly of piping as work progresses. Cap open pipe ends where left unattended or subject to contamination.

B. Install exterior water piping below predicted frost level in accordance with code, but in no case less than 18” bury depth to top of pipe.

C. Install interior water piping with drain valves where indicated and at low points of system to allow complete drainage. Install shutoff valves where indicated and at the base of risers to allow isolation of portions of system for repair. Do not install water piping within exterior walls.

D. Prior to use, and after leak testing, isolate and fill system with potable water. Allow to stand 24 hours. Flush each outlet proceeding from the service entrance to the furthest outlet for minimum of 5 minutes and until water appears clear. Fill system with a solution of water and chlorine containing at least 50 parts per million of chlorine and shall stand for 24 hours. Flush system with potable water until chlorine concentration is no higher than source water level.

E. Wait 24 hours after final flushing. Take samples of water for lab testing. The number and location of samples shall be representative of the system size and configuration and are subject to approval by Engineer. Test shall show the absence of coliform bacteria. If test fails, repeat disinfection and testing procedures until no coliform bacteria are detected. Submit test report indicating date and time of test along with test results.

3.9 UNIONS AND FLANGES

A. Install a union or flange at each connection to each piece of equipment and at other items which may require removal for maintenance, repair, or replacement. Where a valve is located at a piece of equipment, locate the flange or union connection on the equipment side of the valve. Concealed unions or flanges are not acceptable.

3.10 PEX PIPING INSTALLATION

A. Uponor (Wirsbo AQUAPEX or approved Tubing

1. Install tubing in accordance with the tubing manufacturer's recommendations and as indicated in the installation handbook.
   a) Shrink-Heat method is preferred.
   b) If Contractor does not have tools for Shrink-Heat method, “shark-bite” method is permitted.
   c) Gluing/Glue method, is not permitted.
2. Do not install PEX tubing within 6 inches [152 mm] of gas appliance vents or within 12 inches [305 mm] of any recessed light fixtures.
3. Do not solder within 18 inches [457 mm] of PEX tubing in the same waterline. Make sweat connections prior to making PEX connections.
4. Do not expose PEX tubing to direct sunlight for more than 30 days.
5. Ensure no glues, solvents, sealants, or liquid chemicals come in contact with the tubing that is not permitted by the tubing manufacturer. Gluing tubing is not permitted.
6. Use grommets or sleeves at the penetration for PEX tubing passing through metal studs.
7. Protect PEX tubing with sleeves where abrasion may occur.

8. Use strike protectors where PEX tubing penetrates a stud or joist and has the potential for being struck with a screw or nail.
9. Use tubing manufacturer-supplied bend supports where bends are less than six times the outside tubing diameter.
10. Minimum horizontal supports are installed not less than 32 inches between hangers in accordance with model plumbing codes and the installation handbook.
11. PEX riser installations require epoxy-coated riser clamps installed at the base of the ceiling per floor.
12. A mid-story support is required for riser applications.
13. Pressurize Wirsbo AQUAPEX tubing with air in accordance with applicable codes or in the absence of applicable codes to a pressure of 150 psi.
14. Comply with safety precautions when pressure testing, including use of compressed air, where applicable. Do not use water to pressurize the system if ambient air temperature has the possibility of dropping below 32°F (0°C).

B. Through-penetration Firestop

1. Ensure compliance of one- and two-hour rated through penetration assemblies in accordance with ASTM E814.
2. A list of firestop manufacturers that list PEX tubing with their firestop systems is available from the PEX tubing manufacturer.

3.11 PEX PIPING CLEANING

A. Remove temporary coverings and protection of adjacent work areas.

B. Repair or replace damaged installed products.

C. Clean installed products in accordance with manufacturer’s instructions prior to Owner’s acceptance.

D. Remove construction debris from project site and legally dispose of debris.

3.12 PEX PIPING PROTECTION

A. Protect installed work from damage due to subsequent construction activity on the site.

3.13 FREEZE PROTECTION

B. Provide Freeze Protection where installed in attics, in crawl spaces, and other above-ground unheated spaces.

3.14 PIPING SYSTEM LEAK TESTS

A. Do not test with any fixtures installed, rough-in only. Remove components from system which are specified as rated for test pressure. Test piping in sections or entire system as required by sequence of construction, and AHJ. Do not insulate or conceal pipe until it has been successfully tested.

B. If required for the additional pressure load under test, provide temporary restraints at fittings or expansion joints. Backfill underground water mains prior to testing with the exception of thrust restrained valves which may be exposed to isolate potential leaks.

C. For hydrostatic tests, use clean water and remove all air from the piping being tested by means of air vents or loosening of flanges/unions. Measure and record test pressure at the high point in the system.

D. Inspect system for leaks. Where leaks occur, repair the area with new materials and repeat the test; caulking will not be acceptable.

E. Entire test shall be witnessed as required by the Owner's Representative.

Test System	Medium	Pressure	Duration
Below Ground Domestic Water	Water	150 psig	24 hr
Above Ground Domestic Water	Water	150 psig	24 hr

Durations of leak test shall be longer if required by AHJ

F. Flush, and clean system utilizing choline method indicated above after testing.

END OF SECTION 22 11 16

SECTION 22 13 16 SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 CONTRACT CONDITIONS

A. Work of this Section is bound by the Contract Conditions and Division 1, bound herewith, in addition to this Specification and accompanying Drawings.

1.2 RELATED WORK

A. Section 22 05 00 - Common Work Results for Plumbing

B. Section 22 05 29 - Hangers and Supports for Plumbing Piping and Equipment

C. Section 22 11 19 - Domestic Water Piping Specialties

1.3 REFERENCE

A. Applicable provisions of Division 1 govern work under this section.

1.4 REFERENCE STANDARDS

A. ANSI B16.29 Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV

B. ASTM A74 Cast Iron Soil Pipe and Fittings

C. ASTM A105 Forgings, Carbon Steel, for Piping Components

D. ASTM A126 Gray Cast Iron Castings for Valves, Flanges, and Pipe Fittings

E. ASTM A861 High Silicon Iron Pipe and Fittings

F. ASTM A888 Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications

G. ASTM B32 Solder Metal

H. ASTM B306 Copper Drainage Tube (DWV)

I. ASTM B813 Liquid and Paste Fluxes for Soldering Applications of Copper and Copper Alloy Tube

J. ASTM C564 Standard Specifications for Rubber Gaskets for Cast Iron Soil Pipe and Fittings

K. ASTM C1540 Standard Specifications for Heavy Duty Shielded Couplings Joining Hubless Cast Iron Soil Pipe and Fittings

L. ASTM D1785 Poly Vinyl Chloride (PVC) Plastic Pipe

M. ASTM D2241 Poly Vinyl Chloride (PVC) Pressure-Rated Pipe (SDR Series)

N. ASTM D2466 Poly Vinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 40

O. ASTM D2564 Solvent Cements for Poly Vinyl Chloride (PVC) Plastic Pipe and Fittings

P. ASTM D2665 Poly Vinyl Chloride (PVC) Plastic Drain, Waste and Vent Pipe and Fittings

Q. ASTM D2729 Poly Vinyl Chloride (PVC) Sewer Pipe and Fittings

R. ASTM D2855 Making Solvent Cemented Joints with Poly Vinyl Chloride (PVC) Pipe and Fittings

S. ASTM D3034 Type PSM Poly Vinyl Chloride (PVC) Sewer Pipe and Fittings

T. ASTM D3212 Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals

U. ASTM D3311 Drain, Waste and Vent (DWV) Plastic Fitting Patterns

V. AWS A5.8 Brazing Filler Metal

W. CISPI 301 Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications

X. CISPI 310 Couplings For Use In Connection With Hubless Cast Iron Soil Pipe And Fittings For Sanitary And Storm Drain, Waste And Vent Piping Applications

1.5 QUALITY ASSURANCE

A. Substitution of Materials: Refer to Section 01 60 00 Project requirements.

B. Order all copper, ductile iron, and PVC pipe with each length marked with the name or trademark of the manufacturer and type of pipe; with each shipping unit marked with the purchase order number, metal or alloy designation, temper, size, and name of supplier.

C. Any installed material not meeting the specification requirements must be replaced with material that meets these specifications without additional cost to the owner.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Promptly inspect shipments to insure that the material is undamaged and complies with specifications.

B. Cover pipe to prevent corrosion or deterioration while allowing sufficient ventilation to avoid condensation. Do not store materials directly on grade. Protect pipe, tube, and fitting ends so they are not damaged. Where end caps are provided or specified, take precautions so the caps remain in place. Protect fittings, flanges, and unions by storage inside or by durable, waterproof, above ground packaging.

C. Storage and protection methods must allow inspection to verify products.

1.7 DESIGN CRITERIA

A. Use only new material, free of defects, rust and scale, and meeting the latest revision of ASTM, or CISPI specifications as listed in this specification.

B. Construct all piping for the highest pressures and temperatures in the respective system.

C. Non-metallic piping will be acceptable only for the services indicated.

D. Where ASTM B88, type L H (drawn) temper copper tubing is specified, ASTM B88, type K H (drawn) temper copper tubing may be used at Contractor's option.

E. Contractor is required to meet application criteria and requirements where stated other may be used at Contractor’s option herein.

F. Conceal work.

PART 2 - PRODUCTS

2.1 SANITARY WASTE AND VENT

A. Interior Above Ground

1. PVC plastic pipe, Schedule 40 or 80 as required by AHJ, Class 12454-B (PVC 1120), ASTM D1785; PVC plastic drain, waste and vent pipe and fittings, ASTM D2665; socket fitting patterns, ASTM D3311; primer, ASTM F656; solvent cement, ASTM D2564. Color: Black
2. ABS Plastic, Schedule 40 or 80 as required by AHJ; ABS plastic drain, waste and vent pipe and fittings. ASTM listed with socket fitting patterns. ASTM approved primer, and solvent. Color: Black

B. Match existing for below ground unless not approved by AHJ, Provide Ductile Iron under parking lots, otherwise Provide PVC below ground unless not permitted.

PART 3 - EXECUTION

3.1 GENERAL

A. Install pipe and fittings in accordance with reference standards, manufacturer’s recommendations and recognized industry practices.

3.2 PREPARATION

A. Cut pipe ends even. Ream ends of piping to remove burrs. Clean scale and dirt from interior and exterior of each section of pipe and fitting prior to assembly.

3.3 ERECTION

A. Install all piping parallel to building walls and ceilings and at heights which do not obstruct any portion of a window, doorway, stairway, or passageway. Where interferences develop in the field, offset or reroute piping as required to clear such interferences. Coordinate locations of

plumbing piping with piping, ductwork, conduit and equipment of other trades to allow sufficient clearances. In all cases, consult drawings for exact location of pipe spaces, ceiling heights, door and window openings, or other architectural details before installing piping.

B. Where copper or steel piping is embedded in masonry or concrete, provide protective sleeve covering of elastomeric pipe insulation.

C. Install underground warning tape with integrated tracer wire 6"-12" below finished grade above all exterior below ground piping. Where existing underground warning tape is encountered, repair and replace.

D. Maintain piping in clean condition internally during construction.

E. Provide clearance for installation of insulation, access to valves and piping specialties.

F. Provide anchors, expansion joints, swing joints and/or expansion loops so that piping may expand and contract without damage to itself, equipment, or building.

G. Do not route piping through transformer vaults or above transformers, panelboards, or switchboards, including the required service space for this equipment, unless the piping is serving this equipment

H. Install all valves and piping specialties, including items furnished by others, as specified and/or detailed. Provide access to valves and specialties for maintenance. Make connections to all equipment, fixtures and systems installed by others where same requires the piping services indicated in this section.

3.4 THREADED PIPE JOINTS

A. Use a thread lubricant or teflon tape when making joints; no hard setting pipe thread cement or caulking will be allowed.

3.5 SOLVENT WELDED PIPE JOINTS

A. Install in accordance with ASTM D2855 "Making Solvent Cemented Joints With PVC Pipe and Fittings". Saw cut piping square and smooth. Tube cutters may be used if they are fitted with wheels designed for use with PVC/CPVC pipe that do not leave a raised bead on pipe exterior. Support and restrain pipe during cutting to prevent nicks and scratches. Bevel ends 10-15 degrees and deburr interior. Remove dust, drips, moisture, grease and other superfluous materials from pipe interior and exterior. Check dry fit of pipe and fittings. Reject materials which are out of round or do not fit within close tolerance. Use heavy body solvent cement for large diameter fittings.

B. Maintain pipe, fittings, primer and cement between 40 and 100 degrees during application and curing. Apply primer and solvent using separate daubers (3" and smaller piping only) or clean natural bristle brushes about 1/2 the size of the pipe diameter. Apply primer to the fitting socket and pipe surface with a scrubbing motion. Check for penetration and reapply as needed to dissolve surface to a depth of 4-5 thousandths. Apply solvent cement to the fitting socket and pipe in an amount greater than needed to fill any gap. While both surfaces are wet, insert pipe into socket fitting with a quarter turn to the bottom of the socket. Solvent cement application and insertion must be completed in less than 1 minute. Minimum of 2 installers is required on piping 4" and larger. Hold joint for 30 seconds or until set. Reference manufacturers recommendations for initial set time before handling and for full curing time before pressure testing. Cold weather

solvent/cement may be utilized only under unusual circumstances and when specifically approved by the Owner.

3.6 MECHANICAL HUBLESS PIPE CONNECTIONS

A. For above-ground installation only, and where permitted. Below ground requires sealant.

B. Place the gasket on the end of one pipe or fitting and the clamp assembly on the end of the other pipe or fitting. Firmly seat the pipe or fitting ends against the integrally molded shoulder inside the neoprene gasket. Slide the clamp assembly into position over the gasket. Tighten fasteners to manufacturers recommended torque.

3.7 SANITARY WASTE AND VENT

A. Verify invert elevations and building elevations prior to installation. Install exterior piping pitched to drain at indicated elevations and slope. Install interior piping pitched to drain at minimum slope of 1/4 inch per foot where possible and in no case less than Code per foot for piping 3" and larger.

B. Install exterior piping below predicted frost level and not less than 24”bury depth to top of pipe wherever possible. Where piping is located above predicted frost level, provide frost protection.

C. Flush piping inlets (floor drains, fixtures, etc.) with high flow of water at completion of project to demonstrate full flow capacity. Remove blockages and make necessary repairs where flow is found to be impeded.

D. Ductile Iron shall be slopped not less than 1/4 inch per foot or greater as required to prevent formation of hydrogen sulfide gas. Seal from oxygen intrusion, not less than two feet per minute flow rate.

3.8 PIPING SYSTEM LEAK TESTS

A. Isolate or remove components from system which are not rated for test pressure. Test piping in sections or entire system as required by sequence of construction. Do not insulate or conceal pipe until it has been successfully tested.

B. If required for the additional pressure load under test, provide temporary restraints at fittings or expansion joints. Backfill underground water mains prior to testing with the exception of thrust restrained valves which may be exposed to isolate potential leaks.

C. For hydrostatic tests, use clean water and remove all air from the piping being tested by means of air vents or loosening of flanges/unions. Measure and record test pressure at the high point in the system.

D. Inspect system for leaks. Where leaks occur, repair the area with new materials and repeat the test; caulking will not be acceptable.

Test System	Medium	Pressure		Duration
Sanitary Waste and Vent	Water	N/A	10' water	2 hr

END OF SECTION 22 13 16

SECTION 22 14 29 – SUMP PUMPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Submersible sump pumps.

1.2 SUBMITTALS

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

B. Wiring Diagrams: For power, signal, and control wiring.

C. Operation and maintenance data.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. UL Compliance: Comply with UL 778 for motor-operated water pumps.

1.4 WARRANTY

A. One (1) year manufacturer's warranty from the universal warranty start date defined in front end documents.

PART 2 - PRODUCTS

2.1 ELEVATOR SUMP PUMP (FOR ELEVATOR HOISTWAY)

A. Submersible, Fixed-Position, Single-Seal Sump Pump:

1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
   (a) Liberty Pumps
   (b) Zoeller Company.
   (c) Stancor, Inc.
   (d) Weil Pump Co.
   (e) Bell & Gossett
2. Provide pump and control systems capable of pumping water while containing oil. The system shall function automatically and shall provide for an alarm and separate LED lights in the event of (a) the presence of oil in the sump, (b) high liquid in the sump, or (c) high amps or a locked rotor condition. In addition, LED lights shall be provided for (1)

power and (2) pump run function. An alarm that sounds only in the event of a high liquid condition or does not separately identify the above five functions shall not be acceptable.

3. The pump shall be a submersible type and shall be approved to UL 778 standards and shall include thermal and overload protection. The motor housing shall be constructed of #304 stainless steel and mechanical seals shall be housed in a separate oil-filled compartment.
4. The main control shall be approved to UL 508 standards and housed in a gasketed NEMA 4X enclosure with a see-through window for observation of operating functions. The control shall be equipped with an 8-pin twist lock receptacle, dual solid state OilMinder relays with variable sensitivity settings, an over current relay, self-cleaning stainless steel sensor probe, high decibel warning horn with alarm silencing switch, dual floats, clearly marked terminal board and remote monitoring contact. A NEMA 4X junction box with 8-pin twist-lock electrical receptacle and 25' (additional lengths if required shall be provided) of mating 8 conductor cable shall be provided. All cables between the pump and junction box shall be 16' long and the cable and plug from the control unit shall be 8' long. The control unit, junction box, pump, floats and sensor shall be factory assembled as a complete, ready-to-use system and shall be tested and approved as a complete system by a nationally recognized testing laboratory such as ENTELA. The system shall allow for the main control to be located outside of the elevator hoistway to be monitored for all functions without having to enter the elevator shaft.

2.2 SUMP PUMP CAPACITIES AND CHARACTERISTICS

A. For capacities and electrical characteristics see schedule on drawings.

B. Number of Pumps: See schedule on drawings.

2.3 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Division 22 Section "Common Motor Requirements for Plumbing Equipment."

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
2. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Division 26 Sections.

B. Motors for submersible pumps shall be hermetically sealed.

2.4 SUMP-PUMP BASINS AND BASIN COVERS

A. Basins: Factory-fabricated, watertight, cylindrical, basin sump with top flange and sidewall openings for pipe connections.

1. Material: Cast iron, fiberglass, or HDPE.
2. Reinforcement: Mounting plates for pumps, fittings, and accessories.
3. Anchor Flange: Same material as or compatible with basin sump, cast in or attached to sump, in location and of size required to anchor basin in concrete slab.
4. Size: Minimum 18" diameter x 30" deep, but as required for project conditions and inverts.

B. Basin Covers: Fabricate metal cover with openings having gaskets, seals, and bushings; for access to pumps, pump shafts, control rods, discharge piping, vent connections, and power cables.

1. Reinforcement: Steel or cast iron, capable of supporting foot traffic for basins installed in foot-traffic areas.

PART 2 - EXECUTION

3.1 EARTHWORK

A. Excavation and back-filling are specified in applicable Division 31 Section for Earth Moving.

3.2 INSTALLATION

A. Pump Installation Standard: Comply with ANSI/HI 1.4 for installation of sump pumps.

B. Install with check valves.

END OF SECTION 22 14 29

SECTION 22 42 00 - PLUMBING FIXTURES

PART 1 - GENERAL

1.1 CONTRACT CONDITIONS

A. Work of this Section is bound by the Contract Conditions and Division 1, bound herewith, in addition to this Specification and accompanying Drawings.

1.2 RELATED WORK

A. Section 22 05 00 – Common Work Results for Plumbing

B. Section 22 11 16 – Domestic Water Piping

C. Section 22 13 16 – Sanitary Waste and Vent Piping

D. Section 22 05 29 – Hangers and Supports for Plumbing Piping and Equipment

1.3 QUALITY ASSURANCE

A. Substitution of Materials: Section 01 60 00 Product Requirements.

1.4 SHOP DRAWINGS

A. Include data concerning sizes, utility sizes, rough in-dimensions, capacities, materials of construction, ratings, weights, trim, finishes, manufacturer's installation requirements, manufacturer's performance limitations, and appropriate identification.

1.5 OPERATION AND MAINTENANCE DATA

A. All operations and maintenance data shall comply with the submission and content requirements specified under section 01 78 00.

1.6 DESIGN CRITERIA

A. ANSI A112.6.1M-88 - Supports for Off-the Floor Plumbing Fixtures for Public Use.

B. ANSI A112.18.1-94 - Finished and Rough Brass Plumbing Fixture Fittings.

C. ANSI A112.19.1-90 - Enameled Cast Iron Plumbing Fixtures.

D. ANSI A112.19.2M-82 - Vitreous China Plumbing Fixtures.

E. ANSI A112.19.5-79(R1990) - Trim for Water Closet Bowls, Tanks and Urinals.

1.7 ENERGY EFFICIENCY

A. Plumbing fixtures must meet the following maximum water usage requirements:

1. Lavatory Faucets public, flow of 0.5 gpm or less (based on inlet pressure of 60 psi.)
2. Lavatory Faucets private, flow of 2.2 gpm or less (based on inlet pressure of 60 psi.)
3. Water Closets, 1.6 gallon per flush or less.
4. Urinals, 1 gallon per flush or less

PART 2 - PRODUCTS

2.1 PIPING

A. Piping, fittings, and related items as specified in related Sections 22 10 00.

2.2 INTERIOR PLUMBING MATERIALS

A. Shock Arrester: Precharged bellows or sealed piston type manufactured to meet PDI WH-201 and ASSE1010 Standards. Size in accordance with PDI Procedures. J.R. Smith, PPP, Sioux Chief, Wade, Zurn, Watts, Josam, or approved.

B. Traps: Except chrome plated fixture traps. Recessed drainage pattern for threaded pipe and same grade as pipe for cast iron pipe; with cleanout plugs in trap body in all above grade locations.

D. Hand sink Tempering Valve: Pressure compensating water mixing valve. Precision Plumbing Products "Tempera" valve or approved.

E. Secondary piping supports: Install manufactured secondary piping supports for support and positioning of fixture rough-in piping from framing members. Hubbard, Sioux Chief, or approved.

2.3 PLUMBING TRIM

A. Stops: Furnish stop valves for all fixtures. ¼ turn handle style, in wall, angle or straight through pattern to fit installation. Stops to be all brass with ¼ turn brass stem and replaceable washer, no plastic. Compression nuts to be high copper content brass. Finish to be copper nickel chrome plate. Product to carry manufacturer’s name. Risers to be chrome plated copper. Provide chrome plated shallow escutcheons. McGuire, Chicago, Brasskraft, Keeney, Zurn, or approved.

B. Fixture Traps: Exposed fixture tail pieces, traps, and wastes shall be smooth tubular plastic unless plastic not permitted, use non-combustible iron.

C. Provide compliant fixture piping ADA protector kit on all exposed accessible fixture traps and water supplies. Provide fire rated where required.

D. Supplies: Braided Stainless Steel, flexible. Stainless steel connectors, 200 psig rated, with burst pressure at 2000 psi at 70-degrees F. Integrated EPDM rubber washers, Ferguson ProFlo, or approved.

2.4 PLUMBING FIXTURES- See Drawings for Schedule(s), Locations, and Additional Requirements

A. Description: L-1 Lavatory:

1. Model, or approved: See fixture schedule or approved.
2. Color/Finish:, White, Porcelain
3. Features: Under counter mounted with overflow
4. Faucet: See fixture schedule or approved.

B. Description: WC-1 Water Closet Assembly

1. Model, or approved: See fixture schedule or approved.
2. Color/Finish: White Vitreous China Tank/Bowls, White Solid Polypropylene Seats
3. Features: ADA, elongated bowl, floor mounted, 1.28 gal/flush.

2.5 WATER HEATER

A. Description: Electric Point-of-Use water heater

1. Model, or approved: Bosch 2.5 Gallon Tronic 3000T or approved.
2. Features: Under counter mounted
3. Temperature: Set temperature to 110° F.
4. Installation: Install per manufacturer instructions. Mount underneath sink in a location that will not interfere with ADA requirements.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install plumbing fixtures in accordance with manufacturer's instructions. Set level and plumb. Secure in place to counters, floors and walls providing solid bearing and secure mounting. Bolt fixture carriers to floor and wall. Secure rough-in fixture piping to prevent movement of exposed piping.

B. Install each fixture with trap easily removable for servicing and cleaning. Install fixture stops in readily accessible location for servicing.

C. Provide barrier free fixtures in compliance with local code, and Federal ADA Accessibility Guidelines. Install barrier free lavatory traps parallel and adjacent to wall and supplies and stops elevated to 27" above floor to avoid contact by wheelchair users.

D. Provide ADA protection wraps/shields guards around exposed piping/stops/supplies at every sink. See Piping Insulation Specification.

E. Each fixture shall have a stop valve installation to control the fixture. Stop valves shall be heavy duty type, ¼ turn, with brass stems and screwed or sweat inlet connections. Compression type inlets are not acceptable.

F. Cover pipe penetrations with escutcheons. Exposed traps, stops, piping and escutcheons to be chrome plated brass, same items in concealed locations may be of rough brass finish.

G. Set floor mounted water closets; counter mounted lavs and sinks; lav and sink faucets and drains with full setting bed of flexible non-staining plumber's putty. Cover exposed water closet bolts with bolt covers.

H. Seal openings between walls, floors and fixtures with mildew-resistant silicone sealant same color as fixture. Fixtures in contact with finished walls and floors shall be caulked with waterproof, non-hardening sealant which will not crack, shrink or change color with age. Color to match fixture.

I. Test fixtures to demonstrate proper operation. Replace malfunctioning units or components. Adjust valves for intended water flow rate to fixtures without splashing, noise or overflow.

J. Protect fixtures during construction. At completion clean plumbing fixtures and trim using manufacturer's recommended cleaning methods and materials.

END OF SECTION 22 42 00

SECTION 23 00 00 - GENERAL MECHANICAL PROVISIONS

PART 1 - GENERAL

1.1 CONTRACT DOCUMENTS

A. The Contract Documents are inclusive. All requirements of all Contract Documents shall be binding as if repeated herein and within this Division as required by any other Division or Contract Document. Applicable provisions of Division 1 govern work under this section. This Division does not express or imply separation of the Contract Documents and shall not be considered as separation of the Work. See Advertisement For Bids, Instructions to Bidders, Supplemental Instructions to Bidders, General Conditions, Supplemental General Conditions, Drawings and Specifications, and modifications incorporated in the documents before execution of the Agreement.

B. Conflicts: If any conflicts exist, the more stringent Contract Document is required.

1.2 SUMMARY

A. Products under this contract must meet minimum specifications requirements in detail without exception unless specifically noted and approved as provided in these Specifications. Equipment submitted for review must clearly state on cover sheet any differences from specified product. Equipment substitution or submittal review does not relieve Contractor from meeting all requirements of specified item.

1.3 DEFINITIONS

A. Definitions herein are intended as advisory and shall not limit requirements within the Contract Documents. Where a conflict of definitions exists, the more stringent standard shall be used.

B. Where a term is defined on a Drawing the Drawing definition shall be used for that drawing. Not all definitions are included. Trade standard terms are not defined.

1.4 SCOPE OF WORK

A. General: Provide complete and functional mechanical systems as specified, as shown on Drawings, as required, and as intended.

B. Omissions: Contractor shall be responsible for additional labor, or additional material necessary for the proper execution of the Work. Omissions of expressed reference to any item shall not relieve the responsibly to conform to the Contract Documents.

C. Scope of Mechanical Work: All materials and workmanship shall be furnished for complete, tested, and operating mechanical systems as shown on the drawings and specified herein.

D. Mechanical work is to include the fuel utility service. Complete to the point of connection with the serving utility(ies). Any changes of or work required by the serving utility(ies), are part of this work and shall be fully included in the bid price.

1.5 CONFORMANCE WITH REQUIREMENTS

A. General: All Work shall conform to the reasonable requirements of the project within the scope of the project and authorizations. All work shall conform to the methods and requirements of Code at the location of the Work.

B. Access and inspection: All portions of the Work shall be accessible to inspections and review at all reasonable times during construction. Contractor is responsible for providing access for review and inspection of the Work. Contractor shall secure written inspection reports prior to concealing Work. Contractor is responsible for damages to properly review the Work due to lack of at least 7 Days advance written notification to the Architect, and Engineer that Work is ready for inspection.

C. Accounting: Provide general accounting information as to labor and equipment costs to assist in determination of modifications to the Contract. Provide accounting breakdown when required for securing Owner financing, or for analysis of equipment costs or equipment payback periods, as well as information for Owner incentives.

1.6 COORDINATION OF TRADES

A. Check all other trade drawings to avert potential installation conflicts. Should major changes from the Drawings be required to resolve potential conflicts, notify the Architect and secure written approval and agreement on necessary adjustments prior to start of installation. Check all equipment locations and connections on the site for coordination with other Divisions equipment and connections and structure and the like. Contractor is responsible for scheduling trades to properly execute all the Work as intended.

1.7 STANDARD OF CARE AND QUALIFICATIONS

A. General: Contractor shall be experienced and knowledgeable to Provide Work. Owner is not responsible for improper operation, incompliance, or installation due to Contractor's lack of knowledge or experience. Upon request, and where requested herein the Contractor shall supply qualifications and experience. Drawings are presented with industry terms, statements, and trade practices and it is the responsibility of the Contractor to be familiar. Provide written notification prior to Bid to the Architect if any representation is not understood, or outside standard practice.

B. Like Materials and Quality Control: All systems provided shall be new and of like materials provided through manufacturer authorized distributors. Provide equipment of same system and type by same manufacturer. Items of the same by different manufacturers will be rejected. Equipment shall conform to all applicable Code and applicable listing criteria as of the date of the Contract Documents. Equipment determined to be manufactured under any other listing or Code prior to the date of the Contract is not acceptable, even if the equipment is new or has not been used. All equipment provided to project shall be listed by an approved listing organization.

1.8 EXAMINATION OF SITE

A. Examine Site of Work prior to making Bid. Ascertain all related physical conditions. Verify at the Site of Work prior to Bid scale dimensions shown due to exact locations, distances, and levels will be governed by actual field conditions. Owner will not be responsible for any loss or costs that may be incurred due to a Bidder's failure to fully inform themselves prior to Bid in regard to conditions pertaining to the Work and nature of the Work.

1.9 MINOR DEVIATIONS

A. Make minor changes in equipment locations and equipment connections as directed or required without extra cost.

1.10 RECORD DRAWINGS

A. Maintain a marked set of prints at job site at all times. Show all changes from the original drawing set whether visible or concealed. Include all addendums, field orders, change orders, clarifications, request for information drawn responses, and deviations. Dimension accurately from building lines, floor, or curb elevations. Show exact location, elevation, and size of conduit/raceway, access panels and doors, equipment, and all other information pertinent to the Work. At project completion, submit marked set to Architect for review.

1.11 WARRANTY

A. Warrant Work, materials, and equipment for not less than one year.

1.12 CONTINUITY OF EXISTING SERVICES

A. Do not interrupt or change existing services without prior written approval from the Owner's Project Representative. When interruption is required, coordinate scheduling of down-time with the Owner to minimize disruption to his activities. Unless specifically stated, all work involved in interrupting or changing existing services is to be done during none working hours.

1.13 CODES

A. Comply with requirements of local, federal, Oregon Administrative Code, Oregon Mechanical Specialty Code, and Oregon Energy Efficiency Specialty Code.

1.14 CERTIFICATES AND INSPECTIONS

A. Refer also to Division 1, General Conditions, Permits, Regulations, Utilities and Taxes.

B. Obtain and pay for all required installation inspections except those provided by the Architect. Deliver the originals of inspection certificates and test records to the Owner's Project Representative. Include copies of the certificates and test records in the Operating and Maintenance Instructions.

1.15 SEISMIC DESIGN CRITERIA

A. Seismic restraints and bracing: Sized to accommodate dynamic loads as specified in the Oregon Structural Specialty Code based on the seismic criteria identified in the project general structural notes. Rigidity of bracing and/or the attachment shall be considered in determining the dynamic loads.

B. Vibration Isolation: Mechanical equipment shall be isolated from the building structure. Refer to individual equipment specifications for isolators, unless specifically specified herein.

C. Equipment Seismic Restraint: Provide seismic restraint bracing for mechanical equipment which has vibration isolators. Mechanical equipment, with or without vibration isolators, shall be anchored to the supporting floor, platform, or roof structure. Anchoring devices or equipment shall comply with the Seismic Criteria listed above.

1.16 SUBMITTALS

A. Refer to Division 1, General Conditions, Submittals.

B. Shop drawings and Submittals: Bound, labeled, contain the project manual cover page and a material index list page showing item designation, manufacturer and additional items supplied with the installation. Submit for all equipment and systems as indicated in the respective specification sections, marking each submittal with that specification section number. Mark general catalog sheets and drawings to indicate specific items being submitted and proper identification of equipment by name and/or number, as indicated in the contract documents. Include wiring diagrams, and mechanical nameplate, and electrical nameplate ratings of electrically powered equipment.

C. Engineer's Review: Allow not less than 20 Days review.

D. Submit: Not less than Air Distribution, Controls, Split System catalog information.

1.17 OPERATION AND MAINTENANCE DATA

A. All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

B. In addition to the general content specified under GENERAL REQUIREMENTS supply the following additional documentation:

1. Records of tests performed a to certify compliance with system requirements
2. Manufacturer's wiring diagrams for electrically powered equipment
3. Certificates of inspection by regulatory agencies
4. Mechanical schedules

C. Parts lists for fixtures, equipment, valves and specialties.

D. Manufacturers installation, operation and maintenance recommendations for, equipment, thermostat, and control systems.

E. Additional information as indicated in the technical specification sections.

PART 2 – PRODUCTS

2.1 IDENTIFICATION

A. Adhesive Labels: Pressure-sensitive, adhesive backed, vinyl markers with applicable labeling, ¾" min. size for lettering and surrounding tape on both ends. With flow arrows on piping. Conforming to ANSI, ANSI and NFPA standards. Seton Opti-Code, MSI, Brady or approved equal.

2.2 NON-RATED PENETRATIONS

A. At pipe penetrations of non-rated interior partitions, floors and exterior walls, use urethane caulk in annular space around penetration. For non-rated drywall, plaster or wood partitions where sleeve is not required use urethane caulk in annular space between pipe insulation and wall material

2.3 SEISMIC RESTRAINTS AND SUPPORTS

A. Seismic Cable Restraint: Slack cables rigidly attached to suspended equipment. Attachment to structure shall include an interlocking steel element with a minimum ¼" thick neoprene pad between the interlocking steel members. Cables shall be slack during normal operation of equipment and shall not compromise the efficiency of the vibration isolation hangers.

B. Manufacturers: Mason cable assemblies Type SCB, or approved.

C. Channel Support Systems: Galvanized steel. Size as indicated on drawing details or required, 12 gauge minimum. Provide complete with necessary appurtenances; including, but not limited to, threaded rod supports, closure strips, hanger supports, joiners, swivel covers, etc.

D. Manufacturers: Super Strut, Unistrut, or approved. Similar to Unistrut P1000.

E. Vibration Isolator Pad (Neoprene waffle pad): One or two layers equal to ¾" minimum thick neoprene ribbed or waffled pad. Bonded to galvanized steel load distribution plate.

F. Manufacturer: Mason type Super W, Kinetics, Amber Booth, or approved.

PART 3 – EXECUTION

3.1 IDENTIFICATION

A. Identify mechanical equipment with engraved phenolic or other engraved plastic.

1. Material and Thickness: Multilayer, multicolor, plastic or phenolic labels for mechanical engraving, 0.125 inch thick, and having predrilled holes for attachment hardware.
2. Letter Color: White.
3. Background Color: Black.
4. Maximum Temperature: Able to withstand temperatures up to 160 degrees F.
5. Minimum Label Size: Length and width vary for required label content, but not less than 2.50 by 0.75 inch.
6. Minimum Letter Size: 0.50 inch
7. Fasteners: Stainless steel rivets or self-tapping screws. Fasteners may not penetrate into areas under pressure (liquid or air) or under vacuum and must not impact equipment performance.

B. Label Content: Include equipment's drawing designation or unique equipment number.

C. Identify interior piping not less than once every 30 feet, not less than once in each room, adjacent to each access door or panel, and on both side of the partition where accessible piping passes through walls or floors. Place flow directional arrows at each pipe identification location.

Use one coat of black enamel against a light background or white enamel against a dark background.

3.2 PROTECTION OF FINISHED SURFACES

A. Refer to Division 1, General Requirements, Protection of Finished Surfaces.

3.3 BUILDING ACCESS

A. Arrange for the necessary openings in the building to allow for admittance or removal of all apparatus. When the building access was not previously arranged and must be provided by this contractor, restore any opening to its original condition after the apparatus has been brought into the building.

3.4 EQUIPMENT ACCESS

A. Install all piping, conduit and accessories to permit access to equipment for maintenance and service. Coordinate the exact location of wall and ceiling access panels and doors with the General Prime Contractor, making sure that access is available for all equipment and specialties. Access doors in general construction are to be furnished by the Mechanical Contractor and installed by the General Prime Contractor.

3.5 DEMOLITION

A. Perform all demolition as indicated on the drawings and required to accomplish new Work. Where demolition work is to be performed adjacent to existing work that remains in an occupied area, construct temporary dust partition to minimize the amount of contamination of the occupied space. Where pipe is removed and not reconnected with new work, cap ends of existing services as if they were new work. Coordinate work with the Owner to minimize disruption to the existing building occupants.

B. All ducts, fixtures, equipment, wiring and associated conduit, insulation and similar items demolished, abandoned, or deactivated are to be removed from the site by the Contractor except as specifically noted otherwise. All designated equipment is to be turned over to the user agency for their use at a place and time so designated. Maintain the condition of material and/or equipment that is indicated to be reused equal to that existing before work began.

3.6 SLEEVES AND OPENINGS

A. Refer to Division 1, General Requirements, Sleeves and Openings. Pipe penetrations in new poured concrete horizontal construction requiring F and T rating: Form opening using hole form or core drill opening. Alternatively provide cast in place fire stopping devices/sleeves.

B. Pipe penetrations in new poured concrete horizontal construction requiring F rating but no T rating: Same as pipe penetrations in new poured concrete construction requiring F and T ratings except that schedule 40 steel sleeves may also be used.

C. Pipe penetrations in new poured concrete horizontal construction that do not require F or T ratings: Provide schedule 40 steel pipe sleeve, form opening using hole form or core drill opening.

D. Pipe penetrations in existing concrete floors: Core drill openings.

3.7 SEALING AND FIRESTOPPING

A. Sealing and firestopping of sleeves/openings between piping, etc. and the sleeve or structural opening shall be the responsibility of the contractor whose work penetrates the opening. The contractor responsible shall hire individuals skilled in such work to do the sealing and fireproofing. Provide all fire stopping of fire rated penetrations and sealing of smoke rated penetrations in compliance with Specifications Fire Stopping.

3.8 MECHANICAL JOINT PIPE CONNECTIONS

A. Comply with AWWA C600/C605 installation requirements. Clean pipe end and socket. Clean and lubricate pipe end, socket and gasket with soapy water or gasket lubricant. Place gland and gasket, properly oriented, on pipe end. Insert pipe end fully into socket and press gasket evenly into recess keeping joint straight. Press gland evenly against gasket, insert bolts and hand tighten nuts. Make joint deflection prior to tightening bolts. Evenly tighten bolts in sequence to recommended torque.

3.9 SEISMIC RESTRAINTS

A. Verify that restraints, bracing and anchors are attached to structural members capable of withstanding the required forces.

3.10 TRAINING

A. Provide training of Owner's selected staff for all electrical systems specified herein.

B. Training of all systems shall be videotaped, and two copies shall be distributed to Owner.

C. Notify and Coordinate with Owner for training and attendance not later than 15 days prior to training.

D. Provide 8 hours of general HVAC system training in addition to training indicated below.

1. Central HVAC Equipment – 4 hours.
2. DDC System for HVAC – As specified therein.

E. Training shall be conducted by qualified individuals familiar with the Work, and with the equipment.

F. Instructor shall be familiar with programming and operations of equipment and shall provide instruction to do such.

G. Provide contact information to Owner for an additional 4 hours support for all Plumbing systems.

H. Provide Owner with survey after training on each system is complete. Execute a survey prepared by the Owner and Contractor for evaluation of the training. Survey shall show Owner's satisfaction with training received.

I. Training shall not occur prior to systems being fully inspected, operational, and complete.

J. Utilize necessary training materials, conduct training at project location including walk-through of equipment on-site.

K. Provide Owner with all required Operation, Maintenance, and Programing manuals provided by equipment manufacturer.

L. Owner shall determine attendee's at training, not the Contractor. Contractor shall retrain if attendee's were not selected by the Owner.

END OF SECTION 23 00 00

SECTION 23 05 93 -TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.1 SUMMARY

A. Testing, adjusting, and balancing of air systems. Measurement of final operating conditions of HVAC equipment.

1.2 SUBMITTALS

A. Submit final report containing all data required herein on Contractor forms approved by the Engineer.

B. Provide reduced blueprint relating all reference points in report to contract drawings by room number and points per room.

C. Provide cover sheet containing:

1. Project name and location.
2. Engineer.
3. Mechanical Contractor.
4. Balancing Firm.
5. Provide Table of Contents.
6. Bind report in 3 ring binder properly indexed.
7. Submit three copies.

1.3 QUALITY ASSURANCE

A. Work of this Section shall be done in accordance with the latest edition of the NEBB Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems and ASHRAE HVAC Applications handbook chapter on Testing, Adjusting, and Balancing.

B. Measuring instruments shall be maintained and calibrated in accordance with NEBB standards. Technicians on this project must have satisfactorily completed work on a minimum of (3) three projects of at least this size, and of similar complexity.

C. Submit Qualifications of project staff to Architect upon request.

1.4 REQUIREMENTS

A. Accomplish testing, adjusting, and balancing work in a timely manner that allows partial occupancy of building.

PART 2 - PRODUCTS
THIS PART NOT USED

PART 3 - EXECUTION

3.1 GENERAL

A. Check the following and report to Contractor for necessary corrections: Noise and vibration.

3.2 ADJUSTMENT AND BALANCING

A. Mechanical Equipment:

1. Provide unit designation and area served.
2. Provide motor nameplate data including manufacturer, frame, HP, volts, phase, FLA, RPM.
3. Provide fan nameplate data including manufacturer, model, size, type, and serial number.
4. Provide sheave data if applicable.
5. Provide belt manufacturer, size, and model number.
6. List designs data including CFM/TSP, SP, HP, RPM.
7. List actual test data including FLA, fan rpm, TSP, outside air CFM, Heating and Cooling BTU's.

B. Verify the following:

1. Equipment is operable and normal condition.
2. Temperature control systems are installed complete and operable.
3. Final filters are clean and in place.
4. Duct systems are clean of debris.
5. Fan rotation is correct.
6. Dampers are in place and open.
7. System Supply, Return, Exhaust outlets:
    a. Measurements with Diffuser Hood.
    b. List required design cfm, velocity.
    c. List initial velocities and cfm at all inlets/outlets.

C. Adjust and list until volumes are within 10% of the design cfm as follows:

1. Fans
2. Supply grilles, resisters, diffusers 0% to +10%
3. Return/exhaust grilles, registers 0% to -10%

END OF SECTION 23 05 93

SECTION 23 07 13 DUCT INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Ductwork Insulation - Materials and installation of duct insulation including the following applications:

1. Air conditioning and heating ductwork.
2. Outside air ductwork.
3. Equipment related to air handling systems.
4. Exterior louver blank-off areas.

1.2 QUALITY ASSURANCE

A. Qualification of Workers: Use proficient journeyman insulators and supervisors in the execution of this portion of the work to ensure proper and adequate installation of insulation throughout. A firm with at least 5 years successful installation experience on projects with installations similar to that required for this project.

B. Compliance with Specifications: Whenever required during progress of the work, furnish proof acceptable to the Owner that items installed are equal to or exceed requirements specified for this work. In the event such proof is not available, or is not acceptable to the Owner, the Owner may require the Contractor to remove the item or items and replace with material meeting the specified requirements and to repair damage caused in the removal and replacement, at no additional cost to the Owner. Install per manufacturer's written instructions. As a minimum, comply with appropriate state energy code and other applicable codes.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's technical data and installation instructions for each type of insulation, jacket, glue, paint, fitting cover, and accessory. Submit schedule showing manufacturer's product number, thickness, and furnished accessories for each piping, equipment and duct system requiring insulation. All products utilized shall only be used as recommended by the product’s manufacturer, or as otherwise approved.

1.4 PRODUCT HANDLING

A. Protection: Use all means necessary to protect insulation materials before, during and after installation.

B. Replacements: In the event of damage, immediately make repairs and replacements necessary.

1.5 FIRE HAZARD CLASSIFICATION

A. Maximum fire hazard classification of the composite insulation construction as installed to be not more than a flame spread of 25, fuel contributed of 50 and smoke developed of 50 as tested by ASTM E84 (NFPA 255) method.

B. Pipe insulation to comply with testing requirements of UL "Pipe and Equipment Coverings R5583 400 8.15."

C. Duct insulation to comply with ASTM E84 testing and bear the UL label.

1.6 LINING MATERIALS

D. Materials to be mold-, humidity-, and erosion-resistant surface that meet the requirements of UL 181.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Ductwork: Armacell LLC Armaflex, Certainteed, Johns Manville, Knauf, Owens-Corning, PPG, or approved.

B. Fire Protection Duct Wrap: Firemaster, Unifrax, or approved.

2.2 TYPE 10, FLEXIBLE FIBERGLASS BLANKET

A. ASTM C553, Type 1, Class B-2; flexible blanket.

B. 'K' Value: 0.27 at 75F installed.

C. Density: 0.75 lb./cu.ft.

D. Vapor Barrier Jacket: FSK aluminum foil reinforced with fiberglass yarn and laminated to fire resistant Kraft, secured with UL listed pressure sensitive tape or outward clinched expanded staples and vapor barrier mastic as needed.

2.3 TYPE 11, DUCT LINER

A. ASTM C1071; flexible blanket.

B. 'K' Value: ASTM C518, 0.25 at 75F.

C. Noise Reduction Coefficient: 0.65 or higher based on "Type A mounting."

D. Maximum Velocity on Mat or Coated Air Side: 5,000 FPM

E. Adhesive: UL listed waterproof type ASTM C 916.

F. Fasteners: Duct liner galvanized steel pins, welded or mechanically fastened and conform to Mechanical Fastener Standard from SMACNA.

G. Internal Duct Lining shall be 1” unless otherwise called out, 1.5 lb/ft^3 minimum density and shall meet the requirements of NFPA 90-A and 90-B.

H. Mold-, Humidity-, and Erosion-Resistant Surfaces: UL 181.

2.4 DUCT WRAP

A. Weather-proofing cladding, self-adhesive, self-healing, rubberized bituminous membrane with UV-resistant aluminum foil/polymer outer covering, which meets, or exceeds Energy Star requirements. Polyguard Alumaguard All-Weather, or Approved.

2.5 ACCESSORIES

A. Equipment Insulation Jacketing: Pre-sized glass cloth, not less than 7.8 ounces/sq.yd., except as otherwise indicated. Coat with gypsum based cement.

B. Equipment Insulation Compounds: Provide adhesives, cement, sealers, mastics and protective finishes as recommended by insulation manufacturer for applications indicated.

C. General: Provide staples, bands, wire, wire netting, tape corner angles, anchors, stud pins and metal covers as recommended by insulation manufacturer for applications indicated. Accessories, i.e., adhesives, mastics, cements and tape to have the same flame and smoke component ratings as the insulation materials with which they are used. Shipping cartons to bear a label indicating that flame and smoke ratings do not exceed those listed above. Provide permanent treatment of jackets or facings to impart flame and smoke safety. Provide non-water soluble treatments.

D. Pins:

1. Weld Pins:
    a) Type: Retainer disk attached to pin, for resistance welding to duct surface after liner is in place.
    b) Retainer Disk: Not less than 0.75 square inches.
    c) Pin: 0.1 inch shorter than liner thickness. Pins shall not protrude into airstream.
    d) Manufacturer: Similar to Duro-Dyne "CP Series Clip-Pins."
2. Stick Pins:
    a) Type: Perforated base with protruding pin, for gluing to duct surface prior to application of liner.
    b) Pin: 0.25 inches longer than liner thickness.
    c) Self-locking Washer: Attaches to pin after application of liner.
    d) Manufacturer: Similar to Gemco series PH.

PART 3 - EXECUTION

3.1 VERIFICATION OF CONDITIONS

A. Do not apply insulation until the duct has been inspected.

B. Examine areas and conditions under which duct insulation will be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean and dry surfaces to be insulated.

3.3 INSTALLATION

A. Insulation: Continuous through walls, floors, partitions except where noted otherwise.

B. Ductwork:

1. Install insulation in conformance with the manufacturer's recommendations to completely cover the duct.
2. Butt insulation joints firmly together and install jackets and tapes smoothly and securely.
3. Apply duct insulation continuously through sleeves and prepared openings, except as otherwise specified. Apply vapor barrier materials to form a complete unbroken vapor seal over the insulation.
4. Coat staples and seals with vapor barrier coating.
5. Cover breaks in the jacket material with patches of the same material as the vapor barrier. Extend the patches not less than 2 inches beyond the break or penetration in all directions and secure with adhesive and staples. Seal staples and joints with brush coat of vapor barrier coating.
6. Fill jacket penetrations, i.e., hangers, thermometers and damper operating rods, and other voids in the insulation with vapor barrier coating. Seal the penetration with a brush coat of vapor barrier coating.
7. Seal and flash insulation terminations and pin punctures with a reinforced vapor barrier coating.
8. Do not conceal duct access doors with insulation. Install insulation terminations at access doors in accordance with the above.
9. Duct Liners: Install mat finish surface on air stream side. Secure insulation to cleaned sheet metal duct with a continuous 100 percent coat of adhesive. For widths over 20 inches, additionally secure the liner with mechanical fasteners 15 inches on center. Accurately cut liner and thoroughly coat ends with adhesive. Butt joints tightly. Top and bottom sections of insulation overlap sides. Keep duct liner clean and free from dust. At completion of project, vacuum duct liner if it is dirty or dusty. Cut studs off near washers. Do not use small pieces. If insulation is installed without horizontal, longitudinal, and end joints butted together, installation will be rejected and work removed and replaced with work that conforms to this Specification.
10. Duct Wrap: Cover supply air ducts except ducts internally lined. Wrap tightly with circumferential joints butted and longitudinal joints overlapped minimum of 2 inches. Adhere insulation with 4-inch strips of insulating bending adhesive at 8 inches on center. On ducts over 24 inches wide, additionally secure insulation with suitable mechanical fasteners at 18 inches on center. Circumferential and longitudinal joints stapled with flare staples 6 inches on center and covered with 3-inch-wide, foil reinforced tape.

3.4 PROTECTION AND REPLACEMENT

A. Protect installed insulation during construction. Replace damaged insulation which cannot be repaired satisfactorily, including units with vapor barrier damage and moisture saturated units.

3.5 DUCT INSULATION SCHEDULE

Item	System Insulation Type	Duct Size	Minimum R-Value
Ductwork located within conditioned space	None	All	N/A
Supply and Return ductwork (where duct is outside the building thermal shell, including outdoors and attic space).	10,11	All	R=8
Outside air ductwork (all duct carrying unconditioned outside air to mechanical equipment)	10,11	All	R=8
Where shown on Drawings	11	As Shown	R=8

Note: Insulation thickness is a minimum. Provide code required additional thickness to meet R-Value per Code.

Note: Flexible, return, and supply air ductwork not indicated above does not require additional insulation.

3.6 FIBERGLASS BLANKET INSULATION WITH VAPOR BARRIER

A. Fully wrap duct, with facing to the outside.

B. Overlap vapor barrier facing 2 inches minimum at seams and joints.

C. Secure insulation with tie wires.

D. Seal all seams, joints, and penetrations with foil-faced pressure sensitive tape of same material as insulation facing, to provide a continuous vapor barrier.

E. On ducts 24 inches or more in width, secure insulation on underside of ducts with stick pins 18 inches maximum on center. Cut pins off flush with washer and seal with vapor barrier tape.

3.7 DUCT LINER

A. Apply 100% coverage of approved adhesive to inside of duct.

B. Cover interior of duct with liner, with mat coating of liner toward the airstream.

C. Seams and joints shall be neatly butted, with edges coated with adhesive.

D. Coat leading edges with adhesive or provide liner with factory-applied edge coating. For duct velocities above 2000 fpm, provide metal nosing around leading edges.

E. Install weld pins, spaced according to liner manufacturer's instructions, not greater than 18 inches on center or greater than 3 inches from any edge.

F. Weld pins shall be resistance welded to duct with a machine similar to buro-Dyne "Pinspotter."

3.8 DUCT WRAP

A. Duct exposed to weather (outside the building envelope) shall be wrapped in weather-proofing Duct Wrap to protect against UV damage and heat loss/gain.

3.9 APPLICATION TO DUCT SYSTEMS

A. Supply Air Ducts and Outside Air Ducts, Except Ducts with Duct Liner:

1. Insulation Type: Fiberglass Blanket with Vapor Barrier.
2. Supply Duct Insulation Thickness: 1.5 inches.
3. Outside Air Duct Insulation Thickness: 1 inches

B. Supply Air Ducts and Outside Air Ducts, With Duct Liner:

1. Includes ducts indicated on Drawings to have liner.
2. Insulation Type: Duct Liner.
3. Insulation Thickness: 1 inch

C. Return and Exhaust Air Ducts, With Duct Liner:

1. Includes ducts indicated on Drawings to have liner.
2. Insulation Type: Duct Liner.
3. Insulation Thickness: 1 inch.

D. Supply and Return Plenums:

1. Includes plenums connected to, but not part of, air handling equipment.
2. Insulation Type: Duct Liner.
3. Insulation Thickness: 2 inch.

END OF SECTION 23 07 13

SECTION 23 11 23 - NATURAL-GAS PIPING

PART 1 - GENERAL

1.1 CONTRACT CONDITIONS

A. Work of this Section is bound by the Contract Conditions and Division 1, bound herewith, in addition to this Specification and accompanying Drawings.

1.2 SUMMARY

A. Section Includes:

1. Pipes, tubes, and fittings.
2. Piping specialties.
3. Piping and tubing joining materials.
4. Valves.
5. Pressure regulators.

1.3 PERFORMANCE REQUIREMENTS

A. Minimum Operating-Pressure Ratings:
1. Piping and Valves: 100 psig minimum unless otherwise indicated, or required.
2. Service Regulators: 65 psig minimum unless otherwise indicated, or required.

B. Natural-Gas System Pressures within Buildings: Primary pressure is more than 0.5 psig but not more than 2 psig, and is reduced to secondary pressure of 0.5 psig or less.

C. Delegated Design: Design restraints and anchors for natural-gas piping and equipment, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

1.4 SUBMITTALS

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

B. Shop Drawings: For facility natural-gas piping layout. Include plans, piping layout and elevations, sections, and details for fabrication of pipe anchors, hangers, supports for multiple pipes, alignment guides, expansion joints and loops, and attachments of the same to building structure. Detail location of anchors, alignment guides, and expansion joints and loops.

C. Delegated-Design Submittal: For natural-gas piping and equipment indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Detail fabrication and assembly of seismic restraints.
2. Design Calculations: Calculate requirements for selecting seismic restraints.

D. Welding certificates.

E. Field quality-control reports.

F. Operation and maintenance data.

1.5 QUALITY ASSURANCE

A. Steel Support Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

PART 2 - PRODUCTS

2.1 PIPES, TUBES, AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.

1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.
2. Wrought-Steel Welding Fittings: ASTM A 234/A 234M for butt welding and socket welding.
3. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.
4. Protective Coating for Underground Piping: Factory-applied, three-layer coating of epoxy, adhesive, and PE.
    a. Joint Cover Kits: Epoxy paint, adhesive, and heat-shrink PE sleeves.

B. Corrugated, Stainless-Steel Tubing: Comply with ANSI/IAS LC 1.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    a. OmegaFlex, Inc.
    b. Parker Hannifin Corporation; Parflex Division.
    c. Titeflex.
    d. Tru-Flex Metal Hose Corp.
2. Tubing: ASTM A 240/A 240M, corrugated, Series 300 stainless steel.
3. Coating: PE with flame retardant.
    a. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
        (i) Flame-Spread Index: 25 or less.
        (ii) Smoke-Developed Index: 50 or less.
4. Fittings: Copper-alloy mechanical fittings with ends made to fit and listed for use with corrugated stainless-steel tubing and capable of metal-to-metal seal without gaskets. Include brazing socket or threaded ends complying with ASME B1.20.1.
5. Striker Plates: Steel, designed to protect tubing from penetrations.

6. Manifolds: Malleable iron or steel with factory-applied protective coating. Threaded connections shall comply with ASME B1.20.1 for pipe inlet and corrugated tubing outlets.
7. Operating-Pressure Rating: 5 psig.

C. Annealed-Temper Copper Tube: Comply with ASTM B 88, Type K ASTM B 837, Type G.

1. Copper Fittings: ASME B16.22, wrought copper, and streamlined pattern.
2. Flare Fittings: Comply with ASME B16.26 and SAE J513.
   a. Copper fittings with long nuts.
   b. Metal-to-metal compression seal without gasket.
   c. Dryseal threads complying with ASME B1.20.3.
3. Protective Coating for Underground Tubing: Factory-applied, extruded PE a minimum of 0.022 inch thick.

D. PE Pipe: ASTM D 2513, SDR 11.

1. PE Fittings: ASTM D 2683, socket-fusion type or ASTM D 3261, butt-fusion type with dimensions matching PE pipe.
2. PE Transition Fittings: Factory-fabricated fittings with PE pipe complying with ASTM D 2513, SDR 11; and steel pipe complying with ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.
3. Anodeless Service-Line Risers: Factory fabricated and leak tested.
   a. Underground Portion: PE pipe complying with ASTM D 2513, SDR 11 inlet.
   b. Casing: Steel pipe complying with ASTM A 53/A 53M, Schedule 40, black steel, Type E or S, Grade B, with corrosion-protective coating covering. Vent casing aboveground.
   c. Aboveground Portion: PE transition fitting, nail guards, protection throughout, not installed in areas subject to damage.
   d. Outlet shall be threaded or suitable for welded connection.
   e. Tracer wire connection.
   f. Ultraviolet shield.
   g. Stake supports with factory finish to match steel pipe casing or carrier pipe.
4. Transition Service-Line Risers: Factory fabricated and leak tested.
   a. Underground Portion: PE pipe complying with ASTM D 2513, SDR 11 inlet connected to steel pipe complying with ASTM A 53/A 53M, Schedule 40, Type E or S, Grade B, with corrosion-protective coating for aboveground outlet.
   b. Outlet shall be threaded or suitable for welded connection.
   c. Bridging sleeve over mechanical coupling.
   d. Factory-connected anode.
   e. Tracer wire connection.
   f. Ultraviolet shield.
   g. Stake supports with factory finish to match steel pipe casing or carrier pipe.

2.2 PIPING SPECIALTIES

A. Appliance Flexible Connectors:

1. Indoor, Fixed-Appliance Flexible Connectors: Comply with ANSI Z21.24.
2. Indoor, Movable-Appliance Flexible Connectors: Comply with ANSI Z21.69.
3. Outdoor, Appliance Flexible Connectors: Comply with ANSI Z21.75.
4. Corrugated stainless-steel tubing with polymer coating.
5. Operating-Pressure Rating: 0.5 psig.
6. End Fittings: Zinc-coated steel.
7. Threaded Ends: Comply with ASME B1.20.1.

8. Maximum Length: 72 inches

B. Quick-Disconnect Devices: Comply with ANSI Z21.41.

1. Copper-alloy convenience outlet and matching plug connector.
2. Nitrile seals.
3. Hand operated with automatic shutoff when disconnected.
4. For indoor or outdoor applications.
5. Adjustable, retractable restraining cable.

C. Y-Pattern Strainers:

1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 and smaller.
3. Strainer Screen: 40-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.
4. CWP Rating: 125 psig.

D. Weatherproof Vent Cap: Cast- or malleable-iron increaser fitting with corrosion-resistant wire screen, with free area at least equal to cross-sectional area of connecting pipe and threaded-end connection.

2.3 JOINING MATERIALS

A. Joint Compound and Tape: Suitable for natural gas.

B. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

C. Brazing Filler Metals: Alloy with melting point greater than 1000 deg F complying with AWS A5.8/A5.8M. Brazing alloys containing more than 0.05 percent phosphorus are prohibited.

2.4 AUTOMATIC GAS SHUTOFF VALVES

A. As required per code

B. Coordinate automatic sensor device, such as fire alarm, ANSUL, etc. requirements

C. Coordinate emergency shut-off switch requirements

D. Coordinate power requirements

2.5 MANUAL GAS SHUTOFF VALVES

A. See "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles for where each valve type is applied in various services.

B. General Requirements for Metallic Valves, NPS 2 and Smaller: Comply with ASME B16.33.

1. CWP Rating: 125 psig.
2. Threaded Ends: Comply with ASME B1.20.1.
3. Dryseal Threads on Flare Ends: Comply with ASME B1.20.3.

4. Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
5. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction for valves 1 inch and smaller.
6. Service Mark: Valves 1-1/4 inches to NPS 2 shall have initials "WOG" permanently marked on valve body.

C. One-Piece, Bronze Ball Valve with Bronze Trim: MSS SP-110.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. BrassCraft Manufacturing Company; a Masco company.
   b. Conbraco Industries, Inc.; Apollo Div.
   c. Lyall, R. W. & Company, Inc.
2. Body: Bronze, complying with ASTM B 584.
3. Ball: Chrome-plated brass.
4. Stem: Bronze; blowout proof.
5. Seats: Reinforced TFE; blowout proof.
6. Packing: Separate packnut with adjustable-stem packing threaded ends.
7. Ends: Threaded, flared, or socket as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
8. CWP Rating: 600 psig.
9. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

D. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim: MSS SP-110.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. BrassCraft Manufacturing Company; a Masco company.
   b. Conbraco Industries, Inc.; Apollo Div.
   c. Lyall, R. W. & Company, Inc.
2. Body: Bronze, complying with ASTM B 584.
3. Ball: Chrome-plated bronze.
4. Stem: Bronze; blowout proof.
5. Seats: Reinforced TFE; blowout proof.
6. Packing: Threaded-body packnut design with adjustable-stem packing.
7. Ends: Threaded, flared, or socket as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
8. CWP Rating: 600 psig.
9. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

E. Two-Piece, Regular-Port Bronze Ball Valves with Bronze Trim: MSS SP-110.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. BrassCraft Manufacturing Company; a Masco company.
   b. Conbraco Industries, Inc.; Apollo Div.
   c. Lyall, R. W. & Company, Inc.
2. Body: Bronze, complying with ASTM B 584.
3. Ball: Chrome-plated bronze.
4. Stem: Bronze; blowout proof.

5. Seats: Reinforced TFE.
6. Packing: Threaded-body packnut design with adjustable-stem packing.
7. Ends: Threaded, flared, or socket as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
8. CWP Rating: 600 psig.
9. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

F. Bronze Plug Valves: MSS SP-78.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Lee Brass Company.
   b. McDonald, A. Y. Mfg. Co.
2. Body: Bronze, complying with ASTM B 584.
3. Plug: Bronze.
4. Ends: Threaded, socket, as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
5. Operator: Square head or lug type with tamperproof feature where indicated.
6. Pressure Class: 125 psig.
7. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
8. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

G. PE Ball Valves: Comply with ASME B16.40.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Kerotest Manufacturing Corp.
   b. Lyall, R. W. & Company, Inc.
   c. Perfection Corporation; a subsidiary of American Meter Company.
2. Body: PE.
3. Ball: PE.
4. Stem: Acetal.
5. Seats and Seals: Nitrile.
6. Ends: Plain or fusible to match piping.
7. CWP Rating: 80 psig.
8. Operating Temperature: Minus 20 to plus 140 deg F.
9. Operator: Nut or flat head for key operation.
10. Include plastic valve extension.
11. Include tamperproof locking feature for valves where indicated on Drawings.

H. Valve Boxes:

1. Cast-iron, two-section box.
2. Top section with cover with "GAS" lettering.
3. Bottom section with base to fit over valve and barrel a minimum of 5 inches in diameter.
4. Adjustable cast-iron extensions of length required for depth of bury.
5. Include tee-handle, steel operating wrench with socket end fitting valve nut or flat head, and with stem of length required to operate valve.

2.6 PRESSURE REGULATORS

A. General Requirements:

1. Single stage and suitable for natural gas.
2. Steel jacket and corrosion-resistant components.
3. Elevation compensator.
4. End Connections: Threaded for regulators NPS 2 and smaller.

B. Line Pressure Regulators: Comply with ANSI Z21.80.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following, or approved:
   a. Actaris.
   b. American Meter Company.
   c. Eclipse Combustion, Inc.
   d. Fisher Control Valves and Regulators; Division of Emerson Process Management.
   e. Invensys.
   f. Maxitrol Company.
   g. Richards Industries; Jordan Valve Div.
2. Body and Diaphragm Case: Cast iron or die-cast aluminum.
3. Springs: Zinc-plated steel; interchangeable.
4. Diaphragm Plate: Zinc-plated steel.
5. Seat Disc: Nitrile rubber resistant to gas impurities, abrasion, and deformation at the valve port.
6. Orifice: Aluminum; interchangeable.
7. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
8. Single-port, self-contained regulator with orifice no larger than required at maximum pressure inlet, and no pressure sensing piping external to the regulator.
9. Pressure regulator shall maintain discharge pressure setting downstream, and not exceed 150 percent of design discharge pressure at shutoff.
10. Overpressure Protection Device: Factory mounted on pressure regulator.
11. Atmospheric Vent: Factory- or field-installed, stainless-steel screen in opening if not connected to vent piping.
12. Maximum Inlet Pressure: 2 psig.

C. Appliance Pressure Regulators: Comply with ANSI Z21.18.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following, or approved:
   a. Canadian Meter Company Inc.
   b. Eaton Corporation; Controls Div.
   c. Harper Wyman Co.
   d. Maxitrol Company.
   e. SCP, Inc.
2. Body and Diaphragm Case: Die-cast aluminum.
3. Springs: Zinc-plated steel; interchangeable.
4. Diaphragm Plate: Zinc-plated steel.
5. Seat Disc: Nitrile rubber.
6. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
7. Factory-Applied Finish: Minimum three-layer polyester and polyurethane paint finish.
8. Regulator may include vent limiting device, instead of vent connection, if approved by authorities having jurisdiction.
9. Maximum Inlet Pressure: 1 psig.

2.7 DIELECTRIC UNIONS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following, or approved:

1. Capitol Manufacturing Company.
2. Central Plastics Company.
3. Watts Regulator Co.; Division of Watts Water Technologies, Inc.
4. Wilkins; Zurn Plumbing Products Group.

B. Minimum Operating-Pressure Rating: 150 psig.

C. Combination fitting of copper alloy and ferrous materials

D. Insulating materials suitable for natural gas.

E. Combination fitting of copper alloy and ferrous materials with threaded, brazed-joint, plain, or welded end connections that match piping system materials.

2.8 SLEEVES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

2.9 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following, or approved:
   a. Advance Products & Systems, Inc.
   b. Calpico Inc.
   c. Metraflex Company (The).
   d. Pipeline Seal and Insulator, Inc.
2. Sealing Elements: EPDM or NBR interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe and sleeve.
3. Pressure Plates: Carbon steel.
4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one nut and bolt for each sealing element.

2.10 LABELING AND IDENTIFYING

A. Detectable Warning Tape: Acid- and alkali-resistant, PE film warning tape manufactured for marking and identifying underground utilities, integral tracer wire, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of 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 yellow.

PART 3 - EXECUTION

3.1 OUTDOOR PIPING INSTALLATION

A. Comply with NFPA 54 and the International Fuel Gas Code for installation and purging of natural-gas piping.

B. Provide per gas utility requirements. Contractor is responsible for a system that meets, or exceeds utility requirements. Contractor is responsible to determine, correct, and/or provide any requirements of serving utility such that system is deeded, or otherwise provided for the utility to maintain, and/or own such that it meets or exceeds utility requirements.

C. Install underground, natural-gas piping buried at least 36 inches below finished grade. Comply with requirements in Division 31 Section "Earth Moving" for excavating, trenching, and backfilling.

1. If natural-gas piping is installed less than 36 inches below finished grade, install it in containment conduit.

D. Install underground, PE, natural-gas piping according to ASTM D 2774.

E. Steel Piping with Protective Coating:

1. Apply joint cover kits to pipe after joining to cover, seal, and protect joints.
2. Repair damage to PE coating on pipe as recommended in writing by protective coating manufacturer.
3. Replace pipe having damaged PE coating with new pipe.

F. Copper Tubing with Protective Coating:

1. Apply joint cover kits over tubing to cover, seal, and protect joints.
2. Repair damage to PE coating on pipe as recommended in writing by protective coating manufacturer.

G. Install fittings for changes in direction and branch connections.

H. Exterior-Wall Pipe Penetrations: Seal penetrations using steel or cast-iron pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

I. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

J. Install pressure gage downstream from each service regulator. Pressure gages are specified in Division 23 Section "Meters and Gages for HVAC Piping."

3.2 INDOOR PIPING INSTALLATION

A. Comply with NFPA 54 and the International Fuel Gas Code for installation and purging of natural-gas piping.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements are used to size pipe and calculate

friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Arrange for pipe spaces, chases, slots, sleeves, and openings in building structure during progress of construction, to allow for mechanical installations.

D. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

E. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

G. Locate valves for easy access.

H. Install natural-gas piping at uniform grade of 2 percent down toward drip and sediment traps.

I. Install piping free of sags and bends.

J. Install fittings for changes in direction and branch connections.

K. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping."

L. Verify final equipment locations for roughing-in.

M. Comply with requirements in Sections specifying gas-fired appliances and equipment for roughing-in requirements.

N. Drips and Sediment Traps: Install drips at points where condensate may collect, including service-meter outlets. Locate where accessible to permit cleaning and emptying. Do not install where condensate is subject to freezing.

1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use nipple a minimum length of 3 pipe diameters, but not less than 3 inches long and same size as connected pipe. Install with space below bottom of drip to remove plug or cap.

O. Extend relief vent connections for service regulators, line regulators, and overpressure protection devices to outdoors and terminate with weatherproof vent cap.

P. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels unless indicated to be exposed to view.

Q. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.

R. Connect branch piping from top or side of horizontal piping.

S. Install unions in pipes NPS 2 and smaller, adjacent to each valve, at final connection to each piece of equipment.

T. Do not use natural-gas piping as grounding electrode.

U. Install strainer on inlet of each line-pressure regulator and automatic or electrically operated valve.

V. Install pressure gage downstream from each line regulator. Pressure gages are specified in Division 23 Section "Meters and Gages for HVAC Piping."

3.3 VALVE INSTALLATION

A. Install manual gas shutoff valve for each gas appliance ahead of corrugated stainless-steel tubing or copper connector.

B. Install underground valves with valve boxes.

C. Install regulators and overpressure protection devices with maintenance access space adequate for servicing and testing.

D. Install earthquake valves aboveground outside buildings according to listing.

E. Install anode for metallic valves in underground PE piping.

F. Install and electrically connect emergency automatic shut-off valves as required. See requirements per Fire Alarm, Kitchen, ANSUL, and the like.

3.4 PIPING JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Threaded Joints:

1. Thread pipe with tapered pipe threads complying with ASME B1.20.1.
2. Cut threads full and clean using sharp dies.
3. Ream threaded pipe ends to remove burrs and restore full inside diameter of pipe.
4. Apply appropriate tape or thread compound to external pipe threads unless dryseal threading is specified.
5. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

D. Welded Joints:

1. Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators.
2. Bevel plain ends of steel pipe.
3. Patch factory-applied protective coating as recommended by manufacturer at field welds and where damage to coating occurs during construction.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter.

F. Flared Joints: Cut tubing with roll cutting tool. Flare tube end with tool to result in flare dimensions complying with SAE J513. Tighten finger tight, then use wrench. Do not overtighten.

G. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.

1. Plain-End Pipe and Fittings: Use butt fusion.
2. Plain-End Pipe and Socket Fittings: Use socket fusion.

3.5 HANGER AND SUPPORT INSTALLATION

A. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:

1. NPS 1 and Smaller: Maximum span, 96 inches; minimum rod size, 3/8 inch.
2. NPS 1-1/4: Maximum span, 108 inches; minimum rod size, 3/8 inch.
3. NPS 1-1/2 and NPS 2: Maximum span, 108 inches; minimum rod size, 3/8 inch.

B. Install hangers for horizontal, corrugated stainless-steel tubing with the following maximum spacing and minimum rod sizes:

1. NPS 3/8: Maximum span, 48 inches; minimum rod size, 3/8 inch.
2. NPS 1/2: Maximum span, 72 inches; minimum rod size, 3/8 inch.
3. NPS 3/4 and Larger: Maximum span, 96 inches; minimum rod size, 3/8 inch.

C. Additional as required per Structural.

3.6 CONNECTIONS

A. Connect to utility's gas main according to utility's procedures and requirements.

B. Install natural-gas piping electrically continuous, and bonded to gas appliance equipment grounding conductor of the circuit powering the appliance according to NFPA 70.

C. Install piping adjacent to appliances to allow service and maintenance of appliances.

D. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within 72 inches of each gas-fired appliance and equipment. Install union between valve and appliances or equipment.

E. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance.

3.7 LABELING AND IDENTIFYING

A. Comply with requirements in Division 23 Section "Identification for HVAC Piping and Equipment" for piping and valve identification. Install detectable warning tape directly above gas

piping, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.8 FIELD QUALITY CONTROL

A. Test, inspect, and purge natural gas according to NFPA 54 and the International Fuel Gas Code and authorities having jurisdiction.

B. Natural-gas piping will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.9 OUTDOOR PIPING SCHEDULE

A. Underground natural-gas piping shall be one of the following:

1. PE pipe and fittings joined by heat fusion; service-line risers with tracer wire terminated in an accessible location.
2. Steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.
3. Annealed-temper copper tube with wrought-copper fittings and brazed joints. Coat pipe and fittings with protective coating for copper tubing.

B. Aboveground natural-gas piping shall be one of the following:

1. Steel pipe with malleable-iron fittings and threaded joints.
2. Steel pipe with wrought-steel fittings and welded joints.
3. Annealed-temper copper tube with wrought-copper fittings and brazed joints.

C. Branch Piping in Cast-in-Place Concrete to Single Appliance: Annealed-temper copper tube with wrought-copper fittings and brazed or flared joints. Install piping embedded in concrete with no joints in concrete.

D. Containment Conduit: Steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating.

3.10 INDOOR PIPING SCHEDULE

A. Aboveground, branch piping NPS 1 and smaller shall be one of the following:

1. PE pipe, when permitted with PE fittings joined by approved chemical and/or heat fusion means. Protect piping throughout. Provide nail guards throughout where installed within interior walls. Do not install where subject to damage.
2. Corrugated stainless-steel tubing with mechanical fittings having socket or threaded ends to match adjacent piping.
3. Annealed-temper copper tube with wrought-copper fittings and brazed or flared joints.
4. Steel pipe with malleable-iron fittings and threaded joints.

B. Aboveground, distribution piping shall be one of the following:

1. PE pipe, when permitted with PE fittings joined by approved chemical and/or heat fusion means. Protect piping throughout. Provide nail guards throughout where installed within interior walls. Do not install where subject to damage.
2. Steel pipe with malleable-iron fittings and threaded joints.
3. Steel pipe with wrought-steel fittings and welded joints.

C. Underground, below building, piping shall be one of the following:

1. Steel pipe with malleable-iron fittings and threaded joints.
2. Steel pipe with wrought-steel fittings and welded joints.

D. Containment Conduit: Steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.

E. Containment Conduit Vent Piping: Steel pipe with malleable-iron fittings and threaded or wrought-steel fittings with welded joints. Coat underground pipe and fittings with protective coating for steel piping.

3.11 UNDERGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE

A. Connections to Existing Gas Piping: Use valve and fitting assemblies made for tapping utility's gas mains and listed by an NRTL.

B. Underground: PE or Bronze plug valves

3.12 ABOVEGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE

A. Valves for pipe sizes NPS 2 and smaller at service meter shall be one of the following:

1. One-piece, bronze ball valve with bronze trim.
2. Two-piece, full-port, bronze ball valves with bronze trim.
3. Bronze plug valve.

B. Distribution piping valves for pipe sizes NPS 2 and smaller shall be one of the following:

1. One-piece, bronze ball valve with bronze trim.
2. Two-piece, full-port, bronze ball valves with bronze trim.
3. Bronze plug valve.

C. Valves in branch piping for single appliance shall be one of the following:

1. One-piece, bronze ball valve with bronze trim.
2. Two-piece, full-port, bronze ball valves with bronze trim.
3. Bronze plug valve.

END OF SECTION 23 11 23

SECTION 23 30 00 - HVAC AIR DISTRIBUTION

PART 1 - GENERAL

1.1 SUMMARY

A. Materials, installation and testing of HVAC ductwork and accessories, including the following:

1. Heating and air conditioning supply and return systems.
2. Outside air systems.
3. Ductwork hangers.

1.2 QUALITY ASSURANCE

A. Unless otherwise noted, where the Specification refers to SMACNA in reference to sheet metal or flexible ductwork, this refers to HVAC Duct Construction Standards, Metal and Flexible, latest edition, as published by SMACNA.

B. Unless otherwise noted, where the Specification refers to TIMA in reference to fiberglass ductwork, this refers to Fibrous Glass Duct Construction Standards, latest edition, as published by TIMA.

C. Provide duct systems per Oregon Mechanical Specialty Code (OMSC), latest edition, and referenced standards.

D. Have available at the project field office a copy of the referenced standards.

1.3 SUBMITTALS

A. Provide shop drawings for fabricated ducts, fittings, duct materials, flues.

1.4 AIR DISTRIBUTION DUCT SYSTEMS

A. General: Provide ductwork, including collars, register boxes, as well as dampers and any other miscellaneous items not specifically mentioned but necessary for a complete installation. Apply the latest standards of SMACNA and ASHRAE with respect to sheet-metal gauge and general construction for round and rectangular ducts.

1.5 DELIVERY, STORAGE AND HANDLING

A. Comply with manufacturer's rigging and installation instructions for unloading and installing HVAC equipment.

B. Protect accessories from damage during shipping, storage and handling.

1.6 GUARANTEE

A. General: Provide written guaranty on HVAC work, agreeing to replace/repair inadequate and defective materials and quality of work, including leakage, breakage, improper assembly and failure to perform as required for a period of 1 year from date of Owner's acceptance. Include separate product warranties as indicated (if any) for specific parts or products in the work. Provide guaranty signed by both the installer and Contractor.

B. Include manufacturer's standard product warranty, covering HVAC equipment operation under normal conditions and use, where installed, operated and maintained in accordance with manufacturer's instructions. Provide product warranty period terminating 12 months after final acceptance by Owner of the project.

PART 2 - PRODUCTS

2.1 GALVANIZED SHEET-METAL DUCTWORK

A. General: OMSC Duct Construction Standards, latest edition, or latest edition of ASHRAE Guide Table. 1-1/2 ounce galvanizing per square foot, both sides.

2.2 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA’s “HVAC Duct Construction Standards - Metal and Flexible” based on indicated static pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA’s “HVAC Duct Construction Standards - Metal and Flexible,” Figure 2-1,” Rectangular Duct/Transverse Joints,” for static pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA’s “HVAC Duct Construction Standards - Metal and Flexible.”

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA’s “HVAC Duct Construction Standards - Metal and Flexible,” Figure 2-2,” Rectangular Duct/Longitudinal Seams,” for static pressure class, applicable sealing requirements, materials involved, duct support intervals, and other provisions in SMACNA’s “HVAC Duct Construction Standards - Metal and Flexible.”

D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA’s “HVAC Duct Construction Standards - Metal and Flexible,” Chapter 4,” Fittings and Other Construction,” for static pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA’s “HVAC Duct Construction Standards - Metal and Flexible.”

2.3 SINGLE-WALL ROUND DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA’s “HVAC Duct Construction Standards - Metal and Flexible,” Chapter 3, “Round, Oval, and Flexible Duct,” based on indicated static pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA’s “HVAC Duct Construction Standards - Metal and Flexible,” Figure 3-1,” Round Duct Transverse Joints,” for

static pressure class, applicable sealing requirements, materials involved, duct support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Transverse Joints in Ducts Larger Than 48.00inches in Diameter: Flanged.

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2," Round Duct Longitudinal Seams," for static pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Fabricate round ducts larger than 90.00 inches in diameter with butt-welded longitudinal seams.
2. Fabricate flat-oval ducts larger than 72.00 inches in width (major dimension) with butt welded longitudinal seams.

D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.4 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G90.
2. Finishes for Surfaces Exposed to View: Mill phosphatized.

C. Aluminum Sheets: Comply with ASTM B 209 Alloy 3003, H14 temper; with mill finish for concealed ducts, and standard, one-side bright finish for duct surfaces exposed to view.

D. Factory- or Shop-Applied Antimicrobial Coating:

1. Apply to the surface of sheet metal that will form the interior surface of the duct. An untreated clear coating shall be applied to the exterior surface.
2. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.
3. Coating containing the antimicrobial compound shall have a hardness of 2H, minimum, when tested according to ASTM D 3363.
4. Surface-Burning Characteristics: Maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
5. Shop-Applied Coating Color: White.
6. Antimicrobial coating on sheet metal is not required for duct containing liner treated with antimicrobial coating.

E. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

1. Where black and galvanized steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.

F. Tie Rods: Galvanized steel, 0.25-inch minimum diameter for lengths 36.00 inches or less; 0.375-inch minimum diameter for lengths longer than 36.00 inches.

2.5 FLEXIBLE DUCTS

A. General: Comply with OMSC, latest edition, Class 0 or Class 1.

B. Standard factory fabricated product, construct an inner wall of impervious vinyl or chlorinated polyethylene, permanently bonded to a vinyl or zinc-coated spring steel helix. Cover the assembly with fiberglass blanket insulation covered by an outer wall of vinyl or fiberglass-reinforced metalized vapor barrier. UL 181 listed Class 1 flexible air duct material. Overall thermal transmission no more than 0.25 (BTU/in)/(hr/sq.ft./deg. F) at 75F differential, per ASTM C335. Vapor transmission value no more than 0.10 perm, per ASTM E96.

C. Minimum pressure ratings of 4-inch w.g. positive pressure and 1-inch w.g. negative pressure.

D. Air friction correction factor of 1.3 maximum at 1000 FPM. Working air velocity of at least 2000 FPM. Flame spread rating no more than 25. Smoke development rating no more than 50 as tested per ASTM E84. Must have cataloged data on insertion loss characteristics, minimum attenuation of 29 DB for 10-foot straight length at 8-inch diameter and 500 Hz.

E. Manufacturers: J. P. Lamborn Co., Norflex, Clevaflex, Genflex, Atco, Flexmaster, Thermaflex, or approved.

2.6 FACTORY FABRICATED METAL ROUND AND FLAT OVAL DUCTWORK

A. General: Provide per OMSC Duct Construction Standards, latest edition, and ASTM A527 Class 0. Round sheet metal, spiral lock seam type. Fittings: Same construction as the duct. Tap in fittings not allowed. Duct sealer: Specifically formulated for sealing field joints for round spiral lock-seam duct systems.

2.7 DAMPERS

A. Splitter Dampers (SD): Provide where required; constructed of galvanized sheets not lighter than 18 gauge, reinforced to prevent vibration, equipped at both ends with brass bearing mounts and of sufficient length to provide complete shutoff branch duct.

B. Extractors (EX): Provide behind sidewall grilles by same manufacturer as the supply grilles. Each unit to be the same size as the grille face.

C. Register Dampers: Dampers utilized with grilles. Opposed blade dampers utilizing a side operated worm drive which provides external duct operation. Slot the end of the shaft to receive a screwdriver. Factory assembled side operator. Construct of the same material as the grille. Manufacturers: Same as grilles and diffusers. Provide Young Regulator 443 or 443B raised platform for insulated duct.

2.8 MANUAL VOLUME DAMPERS

A. Volume Dampers, up to 10" width:

1. Blade: Minimum 22 ga. galvanized steel.
2. Regulator: Quadrant type, 1/4" diameter shaft, wingnut, indicator dial marked "open" and "shut".
3. Bearings: 1/4" diameter shaft, spring lock on tail bearing.
4. Regulator/Bearing Set Manufacturer: Duro dyne KS 145 or approved.

B. Volume Dampers, 11" to 20" width:

1. Blade: Minimum 18 ga. galvanized steel. Use multiple blades for height over 12".
2. Regulator: Quadrant type, 3/8" diameter shaft, wingnut, indicator dial marked "open" and "shut".
3. Bearings: 3/8" diameter shafts, spring lock on tail bearing.
4. Regulator/Bearing Set Manufacturer: Duro dyne KSR 195 or approved.

C. Volume Dampers, 21" to 30" width:

1. Blade: Minimum 16 ga. galvanized steel. Use multiple blades for height over 12".
2. Regulator: Quadrant type, 1/2" diameter shaft, wingnut, indicator dial marked "open" and "shut".
3. Bearings: 1/2" diameter shafts.
4. Regulator/Bearing Set Manufacturer: Duro dyne KS 12 or approved.

D. Volume Dampers, over 30" width:

1. Blade: Minimum 16 ga. galvanized steel, with stiffeners as required. Use multiple blades for height over 12".
2. Regulator:
   (a) Description: Quadrant type, 1/2" diameter shaft size, wingnut, indicator dial marked "open" and "shut".
   (b) Manufacturer: Duro dyne K 5 or approved.
3. Shaft: 1/2" diameter, continuous across damper width.
4. End Bearing:
   (a) Description: Cast alloy, inside duct type, 1/2" diameter shaft size.
   (b) Manufacturer: Duro dyne SBA 12 or approved.
5. Regulator/Bearing Set Manufacturer: Duro dyne KS 12 or approved.

2.9 CONTROL DAMPERS:

A. Standard Control Dampers:

1. Frame: 16 gage min. galvanized steel.
2. Blades: 16 gage galvanized steel.
3. Opposed action.
4. Blade Seals: TPE
5. Bearings: Synthetic.
6. Electric Actuator: Belimo or approved equal.
7. Control performance: Rated for 2000 - 3000 fpm velocity, and 2.5” – 5.0” wg pressure differential
8. Leakage: Maximum 4 cfm/sf at 1” wg.

9. Manufacturer: Greenheck, Pottorff, Ruskin, Air Balance, Cesco, Prefco, Safe Air, Nailor 1120, or approved. Similar to Greenheck VCD-23.

2.10 TURN VANES

A. Turn Vanes:

1. Type: Non-adjustable, 90 deg. air turn
2. Side Rails: Minimum 24 gauge galvanized steel.
3. Vane Spacing: 2 1/8 inch on center.
4. Manufacturer: Aero/Dyne Co., Durodyne, or approved. Similar to Aero/Dyne Model H E P.

2.11 BACKDRAFT DAMPERS

A. Counter Balanced Backdraft Dampers:
1. Type: Designed for gravity relief at low pressure differentials and low velocity air flow.
2. Frame: Steel or aluminum channel.
3. Blades: 0.070" thick aluminum with felt or vinyl edges.Counterbalance Weights: Adjustable, to operate damper in range of 0.01 to 0.05 w.g.
4. Manufacturer: Nailor, Ruskin, Cesco, Dowco, Greenheck, or approved.Similar to Ruskin Type CBD 4

2.12 FLEXIBLE DUCT CONNECTORS

A. Flexible Duct Connectors:

1. Assembly: Two 3" wide strips of metal connected to 3" wide strip of fabric with continuous crimped seams
2. Metal Strips: 24 gage galvanized steel.
3. Fabric Strip:
   (a) Indoor: Glass fabric with black DuPont Neoprene coating, flame resistant, approximately 30 ounces per yard.
   (b) Outdoor: Glass fabric with white DuPont Hypalon coating, flame resistant, UV resistant, approximately 26 ounces per yard.
4. Manufacturer: Ventfabrics, Durodyne or approved. Similar to Durodyne "Metal Fab".

2.13 TWIST LOCK FITTINGS

A. Twist Lock Fittings:

1. Type: Straight neck "spin in" for round take off from rectangular duct where shown on drawings. No scoop or damper.
2. Damper: None. Volume dampers shall be separate from twist lock fitting. Refer to volume damper specification in this Section.
3. Manufacturer: Genflex, Flexmasterwest, Gensco, Western Stats, or approved. Similar to Flexmaster FL.

2.14 DUCT ACCESS DOORS

A. Duct Access Doors, Rectangular Ducts:

1. Frame: Minimum 24 ga. galv. steel, with gasket and knock over tabs.
2. Door: Galv. steel of thickness equal or greater than that of the duct, double panel with 1" insulation, continuous steel hinge, cam lock, and gasket.
3. Size: As required for easy access to fire damper.
4. Manufacturer: Ruskin, Air Balance, Safe Air, Cesco, or approved. Similar to Air Balance model FSA100.

2.15 TAPE AND ADHESIVE DUCT SEALER, INDOORS

A. U.L. Classification: Flame spread rating not to exceed 25, smoke developed rating not to exceed 50, when applied in a 2 inch wide strip at a thickness of 0.0032 inch.

B. Application Temperature Limits: 30 to 110 deg. F.

C. Manufacturer:

1. Hardcast Inc. DT tape with FTA 20 adhesive
2. United McGill MDT6 300 tape with MTA 20 adhesive

2.16 SHEET-METAL DUCT SEALER

A. Hardcast "Duct-Seal 321" or United McGill. Indoor/outdoor, low VOC (<20 GPL), water based with fiber reinforcement.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The duct layout shown on the Contract Drawings is diagrammatic in nature. Coordinate the ductwork routing and layout, and make alterations to the ductwork routing and layout as required to eliminate physical interferences. Where deviations in the ductwork routing as shown in the Contract Drawings are required, such alterations not to compromise the air flow, pressure drop, and sound characteristics of the duct fitting or run as shown on the Contract Drawings. Make such determination by Project Manager. In the event Project Manager determines that the installed ductwork is inconsistent with the above mentioned criteria, remove and replace at no additional cost to the Owner.

B. Install ductwork in the location and manner shown and detailed. Review deviations required by job conditions with Project Manager prior to any fabrication. Provide fittings construction per SMACNA.

C. Connect duct assemblies such as ductwork, etc., and operating machines or mechanisms such as fans, air conditioners, etc., with flexible connections.

D. Fabricate radius elbows with centerline radius not less than 1-1/2 duct diameters.

E. Do not install duct size transition pitch angles which exceed 30 degrees for reductions in duct size in the direction of airflow, and 15 degrees for expansions in duct size in the direction of airflow.

F. Install single thickness turning vanes in square throat rectangular elbows and in tees. Provide 3/4-inch trailing edge on turning vanes, turned slightly past parallel to the duct.

G. Duct sizes indicated are free inside dimensions including where internal lining is shown.

H. Provide galvanized sheet-metal duct material for ducts unless otherwise indicated or specified.

I. Provide temporary closures of open ducts during construction to prevent dust and debris from entering the system.

J. Flexible Duct:

1. Install flexible duct with bend radius equal to 1.5 times the diameter. Minimum length 2 feet. Maximum length 6 feet, unless noted otherwise.
2. Provide round neck grilles/diffusers or square-to-round transitions. No flex duct connections directly to square neck allowed.
3. Flex duct allowed only for vertical drops to diffusers. Maximum offset angle from vertical: 30 degrees.
4. Approved for use on supply ducts only; not allowed for return or exhaust.
5. Flex duct allowed in concealed spaces above lay-in ceilings only.

K. Fabricate ductwork and sheet metal work of prime grade, lock forming quality steel in accordance with the current issues of the ASHRAE "Guide" and SMACNA standards and installed in strict conformance with SMACNA standards.

L. Submit shop drawings for approval for ductwork. Ductwork to be sheet metal unless specifically authorized as ductboard or other material.

M. Round spiral duct and fittings or where required due to available clearances, use flat oval ductwork and fittings upstream of terminal units manufactured by United Sheet Metal, Rolok or approved in accordance with ASTM A527.

N. Seal joints and seams in supply, exhaust, and return air ductwork and plenums.

O. Fabricate ductwork and plenums with a smooth inside surface and support and brace to prevent sagging and vibration at any time. Provide galvanized steel angles for reinforcing and bracing.

P. Joints:

1. Carefully cut and trim joints and seams in fabricated ducts and fitting to form a closed joint with no portion of the duct or fitting protruding into the air stream.
2. Seal joints in sheet-metal ducts in concealed locations (such as enclosed ceiling spaces) with Hardcast joint sealant system applied in accordance with manufacturer's recommendations, or use Ductmate-type joints.
3. Seal joints in sheet-metal ducts in exposed locations with sealant system applied in accordance with manufacturer's recommendations. Wipe off excess sealer on duct to give a clean finish, or use Ductmate-type joints.
4. To connect sheet-metal ductwork to fiberglass ductboard, use Hardcast only.
5. Standard gray duct tape not allowed.

Q. Fasteners such as sheet-metal screws, machine screws or rivets to be of a corrosion resistant type. Black oxide is not an approved corrosion resistant coating.

R. Crimp flat duct surfaces diagonally or beaded regardless of size, unless acoustically lined.

S. Fabricate duct size transitions with a slope of not more than 1 foot to 5 feet where possible, but in no case more than 1 foot in 3 feet.

T. Fabricate duct turns with the inside (smallest) radius at least equal to the duct width. Where necessary, square elbows may be used, with maximum available inside radius and with fixed single thickness curved vanes, with trailing edge extended 3/4 inch.

U. Provide flexible connectors at connections to equipment, in ducts crossing building expansion joints and may be used at connections of dissimilar metals. Flexible Connections: Minimum 16 ounce airtight "Ventglass" noncombustible fabric with fire retardant neoprene coating on outside, fastened with bolted galvanized steel bands. Maintain a minimum 1-inch space between the connecting surfaces.

V. Duct Hangers and Supports:

1. Hang rectangular sheet-metal ducts with a cross sectional area of less than 7 sq.ft. with galvanized strips of No. 16 USS gauge steel 1 inch wide, and larger ducts with steel angles and adjustable hanger rods similar to piping hangers. Support at 8 feet on center, as detailed.
2. Anchor ducts securely to building in such a manner as to prevent transmission of vibration to structure. Do not connect duct hanger straps to roof deck. Do not support ducts from other ducts or piping.
3. For round sheet-metal ducts, provide duct support in accordance with SMACNA Guidelines. Verify type of building construction.
4. Attach strap hangers installed flush with end of sheet-metal duct run to duct with sheet-metal screws.
5. Do not install duct stiffeners on interior (air side) of unlined ductwork; install on exterior only or on interior of ductwork with duct liner.
6. Seismic Restraint: Brace ductwork against lateral movement as detailed in document "Seismic Restraint Manual Guidelines for Mechanical Systems" as published by SMACNA.

W. Ductwork not to be supported from the roof deck. Hang ducts from beams, joists or supplementary structural members provided by Contractor. Do not hang ductwork from joist bridging or from other ducts.

X. Although not necessarily indicated on the Drawings, provide turning vanes at mitered elbows, opposed blade balancing dampers with locking quadrants at branch ducts, volume extractors and any other applicable devices necessary for minimum duct resistance and proper system air balancing. Sufficiently stiffen dampers to prevent noise or vibration and in no case be lighter than 20 gauge steel. Provide with accessibly located adjuster, manufactured by Young Regulator Co., Parker Kalon Corporation, or approved.

Y. Construct exterior ductwork or ductwork which is otherwise exposed to weather watertight.

Z. Duct sizes indicated are the free inside dimensions. Construct sheet-metal ducts as required to accommodate interior insulation or lining where shown.

AA. Locate access doors in ductwork as required for service of fire dampers, automatic dampers and other items requiring maintenance or inspection.

BB. Paint inside surface of bare ductwork which is visible through face of grilles with flat black paint for ceilings 12 feet and lower.

3.2 GRILLE AND EXPOSED DUCT CLEANING

A. After completion of ductwork installation, operate each fan system (excluding exhaust fans) for a minimum of 30 minutes prior to installation of ceiling grilles and diffusers. After grilles and diffusers are installed, clean out accumulation of particles from grilles and diffusers prior to acceptance.

B. Clean exterior surface of ducts exposed to public view of chalk, pencil and pen marks, labels, sizing tags, dirt, dust, etc., so that upon completion of installation, ducts are left in clean and unblemished manufactured condition.

C. Exposed duct and grilles shall remain free of dust entrained streaks due to leakage at joints and grille connections during warranty period. Clean leaks, seal and refinish to match existing if visible streaks develop.

3.3 CONNECTIONS

A. Flexible Connectors: Make connections to equipment with flexible.

B. SMACNA Requirements: Comply with SMACNA's "HVAC Duct Construction Standards – Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.4 PAINTING

A. Line of Sight: Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized steel primer. Paint materials and application requirements are specified in Section 09 91 13 "Exterior Painting" and Section 09 91 23 "Interior Painting."

3.5 FIELD QUALITY CONTROL

A. General: Perform tests and inspections.

3.6 START UP

A. Air Balance: Comply with requirements in Section 23 05 93 "Testing, Adjusting, and Balancing for HVAC."

3.7 OPTIONAL DUCT JOINT SYSTEM

A. General: Fasten Ductmate angles to duct walls using self-drilling screws, rivets, or spot welding. Fastener spacing shall be as recommended by manufacturer for size of duct and pressure class. Seat raw duct ends in integral mastic seal. A continuous strip of DM440 Butyl Gasket Tape, size 0.25-inch by 0.75-inch, shall be provided between mating flanges of companion angles at each transverse joint, and joint shall be made up using 0.375-inch-diameter by 1.00-inch-long zinc-plated bolts and nuts. Drive-on or snap-on cleats shall be used at spacings as recommended by manufacturer.

3.8 EXPOSED DUCTWORK

A. Requirements: In addition to requirements of SMACNA and ACGIH, seal seams and joints of exposed supply, exhaust, return, and outside air ductwork in finished rooms airtight with caulk. Clean exposed surfaces. Prepare for painting.

B. Ductwork Exposed to Weather: Ductwork exposed to weather (outside building envelope) shall be constructed two gauges heavier than required by SMACNA standards for pressure classification being used. Ductwork shall be constructed (sloped) to prevent ponding of water on top surface of duct. Seal joints and seams watertight.

C. Duct Sealer: Where duct joints have been sealed with a fluid applied sealer (solvent or water based) and ductwork is to remain exposed in occupied area (no ceilings), make joints smooth, ready for painting.

3.9 COMMISSIONING

A. Verify that installation is as indicated and specified

B. Complete manufacture's installation and startup checks and perform the following:

1. Inspect for visible damage to casing or components
2. Verify clearances have been provided for servicing
3. Verify that labels are clearly visible
4. Verify that controls are connected and operable
5. Remove shipping bolts, blocks, and tie-down straps
6. Verify that filters are installed
7. Adjust vibration isolators
8. Lubricate fan bearings
9. Check fan-wheel rotation for correct direction without vibration and binding
10. Adjust fan belts for proper alignment and tension
11. Check dampers for free movement and proper operation

C. Provide cooperation and assistance to the control contractor and engineer for testing of fan speed control, heating, cooling, damper operation, and normal and emergency shutdown.

D. After startup, test and balance, and performance testing; change filters, vacuum coils, lubricate bearings, and adjust belt tension.

END OF SECTION 23 30 00

SECTION 23 74 16 - PACKAGED ROOFTOP AIR-CONDITIONING UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Other Requirements: See Section 23 00 00, “General Mechanical Provisions” for additional requirements for this Section.

1.2 GENERAL DESCRIPTION

A. This section includes the design, controls and installation requirements for packaged rooftop units / outdoor air handling units.

1.3 QUALITY ASSURANCE

A. Unit shall be certified in accordance with UL Standard 1995/CSA C22.2 No. 236, Safety Standard for Heating and Cooling Equipment.

B. Unit and refrigeration system shall comply with ASHRAE 15, Safety Standard for Mechanical Refrigeration.

C. Unit Energy Efficiency Ratio (EER) shall be equal to or greater that prescribed by ASHRAE 90.1, Energy Efficient Design of New Buildings except Low-Rise Residential Buildings.

D. Unit shall meet the requirements of Oregon Energy Efficiency Specialty Code

E. Unit shall be safety certified by ETL and ETL US listed. Unit nameplate shall include the ETL/ETL Canada label.

1.4 SUBMITTALS

A. Product Data: Literature shall be provided that indicates dimensions, operating and shipping weights, capacities, ratings, fan performance, filter information, factory supplied accessories, electrical characteristics and connection requirements. Installation, Operation, and Maintenance manual with startup requirements shall be provided.

B. Shop Drawings: Unit drawings shall be provided that indicate assembly, unit dimensions, construction details, clearances and connection details. Computer generated fan curves for each fan shall be submitted with specific design operation point noted. Wiring diagram shall be provided with details for both power and control systems and differentiate between factory installed and field installed wiring.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Unit shall be shipped with doors screwed shut and outside air hood closed to prevent damage during transport and thereafter while in storage awaiting installation.

B. Follow Installation, Operation, and Maintenance manual instructions for rigging, moving, and unloading the unit at its final location.

C. Unit shall be stored in a clean, dry place protected from construction traffic in accordance with the Installation, Operation, and Maintenance manual.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Products shall be provided by the following manufacturers:

1. AAON or approved.
2. Substitute equipment may be considered for approval that includes at a minimum:
   a) R-410A refrigerant
   b) Variable capacity compressor with 10-100% capacity control
   c) Direct drive supply fans
   d) Double wall cabinet construction
   e) Insulation with a minimum R-value of 13
   f) Stainless steel drain pans

2.2 ROOFTOP UNITS

A. General Description

1. Packaged rooftop unit shall include compressors, evaporator coils, filters, supply fans, dampers, air-cooled condenser coils, condenser fans, reheat coil, electric heaters, exhaust fans, and unit controls.
2. Unit shall be factory assembled and tested including leak testing of the DX coils, pressure testing of the refrigeration circuit, and run testing of the completed unit. Run test report shall be supplied with the unit in the service compartment's literature pocket.
3. Unit shall have decals and tags to indicate lifting and rigging, service areas and caution areas for safety and to assist service personnel.
4. Unit components shall be labeled, including refrigeration system components and electrical and controls components.
5. Estimated sound power levels (dB) shall be shown on the unit ratings sheet.
6. Installation, Operation, and Maintenance manual shall be supplied within the unit.
7. Laminated color-coded wiring diagram shall match factory installed wiring and shall be affixed to the interior of the control compartment's hinged access door.
8. Unit nameplate shall be provided in two locations on the unit, affixed to the exterior of the unit and affixed to the interior of the control compartment's hinged access door.

B. Construction

1. All cabinet walls, access doors, and roof shall be fabricated of double wall, impact resistant, rigid polyurethane foam panels.
2. Unit insulation shall have a minimum thermal resistance R-value of 13. Foam insulation shall have a minimum density of 2 pounds/cubic foot and shall be tested in accordance with ASTM D1929-11 for a minimum flash ignition temperature of 610°F.

3. Unit construction shall be double wall with G90 galvanized steel on both sides and a thermal break. Double wall construction with a thermal break prevents moisture accumulation on the insulation, provides a cleanable interior, prevents heat transfer through the panel, and prevents exterior condensation on the panel.
4. Unit shall be designed to reduce air leakage and infiltration through the cabinet. Cabinet leakage shall not exceed 1% of total airflow when tested at 3 times the minimum external static pressure provided in AHRI Standard 340/360. Panel deflection shall not exceed L/240 ratio at 125% of design static pressure, at a maximum 8 inches of positive or negative static pressure, to reduce air leakage. Deflection shall be measured at the midpoint of the panel height and width. Continuous sealing shall be included between panels and between access doors and openings to reduce air leakage. Piping and electrical conduit through cabinet panels shall include sealing to reduce air leakage.
5. Roof of the air tunnel shall be sloped to provide complete drainage. Cabinet shall have rain break overhangs above access doors.
6. Access to filters, dampers, cooling coils, reheat coil, heaters, compressors, and electrical and controls components shall be through hinged access doors with quarter turn, zinc cast, lockable handles. Full-length stainless steel piano hinges shall be included on the doors.
7. Exterior paint finish shall be capable of withstanding at least 2,500 hours, with no visible corrosive effects, when tested in a salt spray and fog atmosphere in accordance with ASTM B 117-95 test procedure.
8. Units with cooling coils shall include double sloped 304 or 316 stainless steel drain pans.
9. Unit shall be provided with base discharge and return air openings. All openings through the base pan of the unit shall have upturned flanges of at least 1/2 inch in height around the opening.
10. Unit shall include lifting lugs on the top of the unit.
11. Unit base shall be fabricated of 1 inch thick double wall, impact resistant, rigid polyurethane foam panels.

C. Electrical

1. Unit shall have a SCCR per electrical.
2. Unit shall be provided with factory installed and factory wired, non-fused disconnect switch.
3. Unit shall be provided with a factory installed and field wired 115V, 20 amp GFI outlet in the unit control panel.
4. Unit shall be provided with phase and brown out protection that shuts down all motors in the unit if the electrical phases are more than 10% out of balance on voltage, the voltage is more than 10% under design voltage or on phase reversal.

D. Supply Fans

1. Unit shall include direct drive, unhoused, backward curved, plenum supply fans.
2. Blowers and motors shall be dynamically balance and mounted on rubber isolators.
3. Motors shall be premium efficiency ODP with ball bearings rated for 200,000 hours service with external lubrication points.
4. Variable frequency drives shall be factory wired and mounted in the unit. Fan motors shall be premium efficiency.
5. Motor shall include shaft grounding

E. Exhaust Fans

1. Exhaust dampers shall be sized for 100% relief.
2. Fans and motors shall be dynamically balanced.
3. Motors shall be premium efficiency ODP with ball bearings rated for 200,000 hours service with external lubrication points.

4. Access to exhaust fans shall be through double wall, hinged access doors with quarter turn lockable handles.
5. Unit shall include direct drive, axial flow exhaust fans. Blades shall be adjustable pitch.
6. Variable frequency drives shall be factory wired and mounted in the unit. Fan motors shall be premium efficiency.
7. Motor shall include shaft grounding

F. Cooling Coils

1. Evaporator Coils
   a) Coils shall be designed for use with R-410A refrigerant and constructed of copper tubes with copper or aluminum fins mechanically bonded to the tubes and galvanized steel end casings. Fin design shall be sine wave rippled.
   b) Coils shall have interlaced circuitry and shall be standard capacity.
   c) Coils shall be hydrogen or helium leak tested.
   d) Coils shall be furnished with factory installed expansion valves.

G. Refrigeration System

1. Unit shall be factory charged with R-410A refrigerant.
2. Compressors shall be scroll type with thermal overload protection and carry a 5 year non-prorated warranty, from the date of original equipment shipment from the factory.
3. Compressors shall be mounted in an isolated service compartment that can be accessed without affecting unit operation. Lockable hinged compressor access doors shall be fabricated of double wall, rigid polyurethane foam injected panels to prevent the transmission of noise outside the cabinet.
4. Compressors shall be isolated from the base pan with the compressor manufacturer's recommended rubber vibration isolators, to reduce any transmission of noise from the compressors into the building area.
5. Each refrigeration circuit shall be equipped with expansion valve type refrigerant flow control.
6. Each refrigeration circuit shall be equipped with automatic reset low pressure and manual reset high pressure refrigerant safety controls, Schrader type service fittings on both the high pressure and low pressure sides and a factory installed replaceable core liquid line filter driers.
7. Unit shall include a variable capacity scroll compressor on all refrigeration circuits that shall be capable of modulation from 10-100% of its capacity.
8. Lead refrigeration circuits shall be provided with hot gas reheat coil, modulating valves, electronic controller, supply air temperature sensor and a control signal terminal which allow the unit to have a dehumidification mode of operation, which includes supply air temperature control to prevent supply air temperature swings and overcooling of the space.
9. Unit shall be configured as an air-source heat pump. Each refrigeration circuit shall be equipped with a factory installed liquid line filter drier with check valve, reversing valve, accumulator, and expansion valves on both the indoor and outdoor coils. Reversing valve shall energize during the heat pump cooling mode of operation.
10. Lag refrigeration circuits shall be provided with factory installed hot gas bypass to protect against evaporator frosting and to prevent excessive compressor cycling.

H. Condensers

1. Air-Cooled Condenser
   a) Condenser fans shall be a horizontal or vertical discharge, axial flow, direct drive fans.
   b) Heat pump outdoor coil shall be constructed of copper tubes with copper or aluminum fins mechanically bonded to the tubes and aluminum end casings. Fin

design shall be sine wave rippled.

c) Coils shall be designed for a minimum of 10°F of refrigerant sub-cooling.
d) Coils shall be hydrogen or helium leak tested.
e) Condenser fans shall be VFD driven variable speed for condenser head pressure control. Factory provided and factory programmed VFDs shall continuously modulate the fan air flow to maintain head pressure at acceptable levels. Cooling operation shall be allowed down to 35°F with adjustable compressor lockout.

I. Gas Heating

1. Stainless steel heat exchanger furnace shall carry a 25 year non-prorated warranty, from the date of original equipment shipment from the factory.
2. Gas furnace shall consist of stainless steel heat exchangers with multiple concavities, an induced draft blower and an electronic pressure switch to lockout the gas valve until the combustion chamber is purged and combustion airflow is established.
3. Furnace shall include a gas ignition system consisting of an electronic igniter to a pilot system, which will be continuous when the heater is operating, but will shut off the pilot when heating is not required.
4. Unit shall include a single gas connection and have gas supply piping entrances in the unit base for through-the-curb gas piping and in the outside cabinet wall for across the roof gas piping.
5. High Turndown Modulating Natural Gas Furnace shall be equipped with modulating gas valves, adjustable speed combustion blowers, stainless steel tubular heat exchangers, and electronic controller. Combustion blowers and gas valves shall be capable of modulation. Electronic controller includes a factory wired, field installed supply air temperature sensor. Sensor shall be field installed in the supply air ductwork. Supply air temperature setpoint shall be adjustable on the electronic controller within the controls compartment. Gas heater shall be capable of capacity turndown ratio as shown on the unit rating sheet. Heat trace shall be include on the condensate drain

J. Filters

1. Unit shall include 4 inch thick, pleated panel filters with a minimum ASHRAE MERV rating of 8, upstream of the cooling coil.
2. Unit shall include a clogged filter switch.

K. Outside Air/Economizer

1. Unit shall include 0-100% economizer consisting of a motor operated outside air damper and return air damper assembly constructed of extruded aluminum, hollow core, airfoil blades with rubber edge seals and aluminum end seals. Damper blades shall be gear driven and designed to have no more than 20 cfm of leakage per sq ft. at 4 in. w.g. air pressure differential across the damper. Low leakage dampers shall be Class 2 AMCA certified, in accordance with AMCA Standard 511. Damper assembly shall be controlled by spring return enthalpy activated fully modulating actuator. Unit shall include outside air opening bird screen, outside air hood, and barometric relief dampers.

L. Controls

1. Factory Installed and Factory Provided Controller
   a) Unit controller shall be capable of controlling all features and options of the unit. Controller shall be factory installed in the unit controls compartment and factory tested. Controller shall be capable of standalone operation with unit configuration, setpoint adjustment, sensor status viewing, unit alarm viewing, and occupancy scheduling available without dependence on a building management system.
   b) Controller shall have an onboard clock and calendar functions that allow for

occupancy scheduling.

c) Controller shall include non-volatile memory to retain all programmed values without the use of a battery, in the event of a power failure.

d) Single Zone Variable Air Volume Controller

i. Unit shall utilize a variable capacity compressor system and a variable speed fan system to modulate the cooling and airflow as required in meeting the space temperature needs and to save unit operating energy. Unit fan speed shall modulate based on space temperature, not supply air pressure.

ii. With modulating hot gas reheat, unit shall modulate cooling and hot gas reheat as efficiently as possible, to meet space humidity loads and prevents supply air temperature swings and overcooling of the space.

iii. Unit shall be provided with supply air temperature control. Mixing boxes and bypass ducts shall not be required for operation as a single zone VAV system.

e) Unit configuration, setpoint adjustment, sensor status viewing, unit alarm viewing, and occupancy scheduling shall be accomplished with connection to interface module with LCD screen and input keypad, interface module with touch screen, or with connection to PC with free configuration software. Controller shall be capable of connection with other factory installed and factory provided unit controllers with individual unit configuration, setpoint adjustment, sensor status viewing, and occupancy scheduling available from a single unit. Connection between unit controllers shall be with a modular cable. Controller shall be capable of communicating and integrating with a LonWorks or BACnet network.

M. Accessories

1. Unit shall be provided with smoke detectors sensing the return air of the unit, wired to shut off the unit’s control circuit.

2. Unit shall be provided with a safety shutdown terminal block for field installation of a smoke detector that shuts off the unit's control circuit.

PART 3 - EXECUTION

3.1 INSTALLATION, OPERATION, AND MAINTENANCE

A. Installation, Operation, and Maintenance manual shall be supplied with the unit.

B. Install seismic restraints

C. Coordination installation on curb with curb manufacturer.

D. Installing contractor shall install unit, including field-installed components, in accordance with Installation, Operation, and Maintenance manual instructions.

E. Start up and maintenance requirements shall be complied with to ensure safe and correct operation of the unit.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

C. Duct Connections: Duct installation requirements are specified in Division 23. Drawings indicate the general arrangement of ducts. Connect supply and return ducts to self-contained air conditioners with flexible duct connectors.

D.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. Perform tests and inspections.

C. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

D. Tests and Inspections:

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation, and inspect for refrigerant leaks.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Units will be considered defective if they do not pass tests and inspections.

F. Prepare test and inspection reports.

3.4 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

END OF SECTION 23 74 16

SECTION 26 00 01 - GENERAL ELECTRICAL PROVISIONS

PART 1 - GENERAL

1.1 DEFINITIONS

A. Definitions herein are intended as advisory and shall not limit requirements within the Contract Documents. Where a conflict of definitions exists, the more stringent standard shall be used. Where a term is defined on a Drawing, the Drawing definition shall be used for that drawing. Not all definitions are included. Trade standard terms are not defined.

1.2 CONTRACT DOCUMENTS

A. The Contract Documents are inclusive. All requirements of all Contract Documents shall be binding as if repeated herein and within this Division as required by any other Division or Contract Document.

B. This Division does not express or imply separation of the Contract Documents and shall not be considered as separation of the Work.

C. See Advertisement For Bids, Instructions to Bidders, Supplemental Instructions to Bidders, General Conditions, Supplemental General Conditions, Drawings and Specifications, and modifications incorporated in the documents before execution of the Agreement.

D. Conflicts: If any conflicts exist the more stringent is required.

E. Products under this contract must meet minimum specifications requirements in detail without exception unless specifically noted and approved as provided in these Specifications. Equipment submitted for review must clearly state on cover sheet any differences from specified product. Equipment substitution or submittal review does not relieve Contractor from meeting all requirements of specified item.

1.3 SCOPE OF WORK

A. General: Provide complete and functional electrical systems as specified, as shown on Drawings, as required, and as intended. Work generally includes, inspections, electrical distribution, wiring systems, and raceways.

B. Omissions: Contractor shall be responsible for additional labor, or additional material necessary for the proper execution of the Work. Omissions of expressed reference to any item shall not relieve the responsibly to conform to the Contract Documents

C. Scope of Electrical Work

1. All materials and workmanship shall be furnished for complete, tested, and operating electrical systems as shown on the drawings and specified herein.
2. Electrical work is to include the electrical service. Complete to the point of connection with the serving utility. Any changes of or work required by the serving utility, are part of this work and shall be fully included in the bid price.
3. Work is also to include main distribution panel, feeder system and branch circuit panels.

1.4 CONFORMANCE WITH REQUIREMENTS

A. General: All Work shall conform to the reasonable requirements of the project within the scope of the project and authorizations. All work shall conform to the methods and requirements of Code at the location of the Work.

1. Access and inspection: All portions of the Work shall be accessible to inspections and review at all reasonable times during construction. Contractor is responsible for providing access for review and inspection of the Work. Contractor shall secure written inspection reports prior to concealing Work. Contractor is responsible for damages to properly review the Work due to lack of at least 7 Days advance written notification to the Architect, and Engineer that Work is ready for inspection.

B. Accounting: Provide general accounting information as to labor and equipment costs to assist in determination of modifications to the Contract. Provide accounting breakdown when required for securing Owner financing, or for analysis of equipment costs or equipment payback periods, as well as information for Owner incentives.

1.5 COORDINATION OF TRADES

A. Check all other trade drawings to avert potential installation conflicts. Should major changes from the Drawings be required to resolve potential conflicts, notify the Architect and secure written approval and agreement on necessary adjustments prior to start of installation.

B. Check all equipment locations and connections on the site for coordination with other Divisions equipment and connections and structure and the like.

C. Contractor is responsible for scheduling trades to properly execute all the Work as intended.

1.6 STANDARD OF CARE AND QUALIFICATIONS

A. General: Contractor shall be experienced and knowledgeable to Provide Work. Owner is not responsible for improper operation, incompliance, or installation due to Contractor’s lack of knowledge or experience. Upon request, and where requested herein the Contractor shall supply qualifications and experience. Drawings are presented with industry terms, statements, and trade practices and it is the responsibility of the Contractor to be familiar. Provide written notification prior to Bid to the Architect if any representation is not understood, or outside standard practice.

B. Like Materials and Quality Control: All systems provided shall be new and of like materials provided through manufacturer authorized distributors. Provide equipment of same system and type by same manufacturer. Items of the same by different manufacturers will be rejected. Equipment shall conform to all applicable Code and applicable listing criteria as of the date of the Contract Documents. Equipment determined to be manufactured under any other listing or Code prior to the date of the Contract is not acceptable, even if the equipment is new or has not been used. All equipment provided to project shall be listed by an approved listing organization.

1.7 EXAMINATION OF SITE

A. Examine Site of Work prior to making Bid. Ascertain all related physical conditions.

B. Verify at the Site of Work prior to Bid scale dimensions shown due to exact locations, distances, and levels will be governed by actual field conditions.

C. Owner will not be responsible for any loss or costs that may be incurred due to a Bidder's failure to fully inform themselves prior to Bid in regard to conditions pertaining to the Work and nature of the Work.

1.8 MINOR DEVIATIONS

A. Make minor changes in equipment locations and equipment connections as directed or required without extra cost.

1.9 RECORD DRAWINGS

A. Maintain a marked set of prints at job site at all times. Show all changes from the original drawing set whether visible or concealed. Include all addendums, field orders, change orders, clarifications, request for information drawn responses, and deviations. Dimension accurately from building lines, floor, or curb elevations. Show exact location, elevation, and size of conduit/raceway, access panels and doors, equipment, and all other information pertinent to the Work.

B. At project completion, submit marked set to Architect for review.

1.10 TRAINING

A. Provide training of Owner's selected staff for all electrical systems specified herein.

B. Training of all systems shall be videotaped, and two copies shall be distributed to Owner.

C. Notify and Coordinate with Owner for training and attendance not later than 15 Days prior to training.

D. Provide 2.5 hours of general system training.

E. Training shall be conducted by qualified individuals familiar with the Work, and with the equipment.

F. Instructor shall be familiar with programming and operation of equipment and shall provide instruction to do such.

G. Provide contact information to Owner for an additional 1 hours support for all electrical systems.

H. Training shall not occur prior to systems being fully inspected, operational, and complete.

I. Utilize necessary training materials, conduct training at project location including walk-through of equipment on-site.

J. Provide Owner with all required Operation, Maintenance, and Programming manuals provided by equipment manufacturer.

K. Owner shall determine attendee's at training, not the contractor. Contractor shall re-train if attendee's were not selected by the owner

1.11 WARRANTY

A. Warrant Work, materials, and equipment for not less than one year.

B. Provide additional warranty as required herein.

PART 2 - PRODUCTS
THIS PART NOT USED

PART 3 -EXECUTION
THIS PART NOT USED

END OF SECTION 26 00 01

SECTION 26 00 20 - ELECTRICAL DEMOLITION

PART 1 - GENERAL

1.1 INTENT

A. The electrical system shall be adjusted to accommodate installation of the new work and is required to meet Code. Necessary adjustments are shown on Drawings and indicated herein.

1.2 EXISTING CONDITIONS

A. The locations of existing utilities and equipment are shown in an approximate way only and have not been independently verified by the Owner or Owner's Representative. Contractor shall determine the exact location of every existing utility before commencing work, and agrees to be fully responsible for any and all damages which might be occasioned by the Contractor's failure to exactly locate and preserve utilities and equipment. Replace damaged items with new material to match existing. Promptly notify Owner if utilities are found which are not shown.

PART 2 - PRODUCTS

THIS PART NOT USED

PART 3 - EXECUTIONS

3.1 DEMOLITION

A. Locations of items shown on the Drawings as existing are partially based on field inspection of unconcealed equipment and record drawings that may contain errors. The contractor shall verify the accuracy of the information shown prior to bidding and provide such labor and material as is necessary to accomplish the intent of the Contract Documents.

B. Maintain continuity of existing systems that remain. Remove or relocate electrical boxes, conduit, wiring, equipment, fixtures, etc. as may be encountered in removed or remodeled areas in the existing affected by this work. Wiring which serves usable existing equipment shall be removed and restored clear of the construction or demolition. If existing junction boxes will be made inaccessible, or if abandoned outlets serve as feed through boxes for other existing electrical equipment which is being retained, new conduit and wire shall be provided to bypass the abandoned equipment. If existing conduits pass through areas being removed or remodeled, new conduit and wire shall be provided to reroute clear of the construction or demolition and maintain service to the existing load.

C. Remove all abandoned wiring, and leave site clean.

D. Do not disconnect service without approval from the Owner and Utility. Coordinate demolition work with the utility.

E. Verify with the General Contractor a location for storage of materials, supplies, tools, rubbish, etc. prior to start of Work.

F. Include disposal costs in bid unless item is specifically noted as salvage to Owner. Include removal and salvage to Owner costs in bid; including relocating equipment to another location on the Owner's site. Owner has first right of refusal for any other equipment scheduled for demolition not already noted as salvaged to Owner. Owner may elect to salvage any equipment scheduled for disposal. Protect equipment salvaged to Owner. For equipment with disposal/recycle/salvage value, such proceeds shall be passed to Owner through inclusion in total bid.

END OF SECTION 26 00 20

SECTION 26 05 19 - BUILDING WIRE & CABLES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Wires and Cables

1.2 REFERENCE STANDARDS

A. National Fire Protection Association (NFPA).

1. NFPA 70 National Electrical Code.

1.3 DELIVERY, STORAGE AND HANDLING

A. Deliver new wire and new cable to site in new packaging with standard cable coils/reels. Packaging shall clearly show length, wire size, wire/cable type, and manufacturer.

B. Protect products from weather, moisture, and damage.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Building Wiring & Insulation: Copper, 98 percent conductivity, stranded. Solid may be used at contractor's option for wire smaller than #8 AWG. 600 volt insulation, Type THHN for dry interior and damp interior locations. Type THW, THWN or XHHW for wet locations, and exterior locations.

B. Conductor cable with conductors smaller than #12 AWG for branch circuits not permitted.

C. Exterior cables exposed to sunlight shall be listed "sunlight resistant."

D. Control panel wiring no smaller than #14 AWG stranded switchboard Type MTW unless otherwise specified on the Drawings or required by system manufacturer.

E. Motor control wires shall be no smaller than #14 AWG.

F. Wire for other areas as shown on the Drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Parallel feeders shall have identical conductor length.

B. Use UL listed pulling lubricant for greater than equivalent #4 AWG wire diameter.

C. Use UL listed pulling lubricant for pulls greater than 75 feet.

D. Remove moisture from raceway prior to wire pull.

E. Provide copper grounding conductors. Provide a ground wire through conduits. Utilize the ground wire as the equipment grounding conductor no smaller than #12 AWG otherwise sized as shown and per NEC.

F. Do not splice feeders, or services. Splices only permitted in accessible junction or outlet boxes where circuit routes deviate. Do not splice or tap branch circuits terminating in a single outlet.

G. Color code conductors per NEC to designate neutral, phase, and ground as follows:

CONDUCTOR	120/208	277/480
Phase A	Black	Brown
Phase B	Red	Orange
Phase C	Blue	Yellow
Neutral	White	Grey
Ground	Green, Yellow-Green	

H. Wires shall be factory color coded. Coloring shall be integral to the insulation. Plastic tape permitted on #6 AWG and larger where insulation coloring is not available or practical. Apply tape in spiral half-lap over exposed portions of cable at all locations that cable is accessible.

I. All conductors shall be identified with circuit number where conductors are accessible such as at terminals, outlets, switches, circuit breakers, motor control centers, etc. Identify the ends of a given conductor circuit the same.

J. Do not install wires of different voltage systems in same raceway, box, or other enclosure. Control voltage is permitted in same enclosure only where specific equipment is listed for multiple voltage use, and a listed voltage barrier is provided.

K. Radius of cable bends shall not be less than 10 times the outer diameter of the cable.

L. Do not install cable within conduit per NEC.

END OF SECTION 26 05 19

SECTION 26 05 26 - GROUNDING

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Electrical systems grounding.

1.2 APPLICABLE STANDARDS

A. Underwriters Laboratories (UL)

1. UL 467 Standard for Grounding and Bonding Equipment

B. Institute of Electrical and Electronic Engineers (IEEE)

1. IEEE 81 Guide for Measuring Earth Resistively, Ground Impedance, and Earth Surface Potentials of a Ground System Part 1: Normal Measurements
2. IEEE 142 Recommended Practice for Grounding of Industrial and Commercial Power Systems

1.3 APPLICABLE REGULATIONS

A. National Fire Protection Association (NFPA)

1. NFPA 70 National Electrical Code (NEC)

B. NEC references below are based on the 2014 edition. Contractor shall meet current NEC requirements.

PART 2 - PRODUCTS

2.1 GROUNDING CONDUCTORS, AND JUMPERS

A. Size: Per NEC 250.

B. Material: Copper.

C. Protection: Conductors not in raceway or concealed shall be insulated. Provide raceway where shown or required for physical protection.

PART 3 - EXECUTION

3.1 POWER AND SIGNAL SYSTEM GROUNDING

A. All equipment grounding conductors shall be routed through same equipment conductor raceway from beginning to end (distribution source to load).

B. Metallic raceways are not approved as equipment grounds.

C. Circuit Grounding: Install grounding bushings, studs, and jumpers at distribution centers, pullboxes, motor control centers, panelboards, and junction boxes.

D. Ground Connections: Clean surfaces thoroughly before applying ground lugs or clamps. If surface is coated, the coating must be removed down to the conductive material. After the coating has been removed, apply a listed and approved noncorrosive compound to cleaned surface and connections. Where galvanizing is removed from metal, it shall be re-applied or painted.

E. Bonding Jumpers: Provide with green insulation and size not smaller than per NEC and larger where shown. Connection to neutral only at service neutral bar. Bonding jumpers shall be contiguous without break, joint, or splice.

F. Service Panel:

1. Connect the various feeder green grounding conductors to the ground bus in the enclosure with suitable pressure connectors.
2. Connect the grounding electrode conductor to the ground bus.
3. Connect the neutral to the ground bus as the main bonding jumper.
4. Connect metallic conduits, which terminate without mechanical conductive connection to the enclosure, by grounding bushings and ground wire to the ground bus.

G. Feeders and Branch Circuits: Install green grounding conductors with feeders and branch circuits. Additional locations and systems as shown.

H. Raceway Systems:

1. Ground all metallic enclosed raceway systems.
2. All enclosed raceway connecting to equipment shall contain a grounding conductor.
3. Conduit systems shall contain a grounding conductor.
4. Bond grounding conductor at beginning and end of raceway provided for mechanical protection containing only a grounding conductor.

I. Boxes, Cabinets, Enclosures, and Panelboards:

1. Bond the grounding wires to each pullbox, junction box, outlet box, cabinets, and other enclosures through which the ground conductors pass.
2. Provide lugs in each box and enclosure for ground wire termination.
3. Provide ground bars in panelboards, bolted to the housing, with sufficient lugs for terminating the ground wires.

J. Fixed electrical equipment shall have a ground lug installed for termination of the equipment ground conductor.

K. Motors: Install a separate insulated equipment grounding conductor from the equipment ground connection in the motor controller through the raceway and flexible conduit to the ground terminal on the motor housing. Ground motor controller through feeder raceway. No reductions.

3.2 TESTING

A. Test per IEEE 81.

B. Grounding Electrode Conductor:

1. Measure resistance between switchboard ground bus and each grounding electrode, using a Megger and a single length of additional wire.
2. Measure resistance between both ends of the additional wire used.
3. Grounding Electrode Conductor resistance is the difference between 1 and 2.
4. Correct any inadequate connections as indicated.

END OF SECTION 26 05 26

SECTION 26 05 29 - SUPPORTING DEVICES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Raceway Supports.

B. Cable supports.

C. Provide all hardware and materials to support, as required, a complete and congruent raceway system.

1.2 APPLICABLE STANDARDS

A. National Fire Protection Association (NFPA)

1. NFPA 70 National Electrical Code

B. Underwrites Laboratories (UL)

1. UL 2239 Hardware for the Support of Conduit, Tubing, and Cable

C. National Electrical Contractors Association (NECA)

1. ECA 101 Standard for Installing Steel Conduit

PART 2 - PRODUCTS

2.1 RACEWAY SUPPORTS

A. Single Runs: Steel rod hangers, galvanized single hole conduit straps, or ring bolt type hangers with spring clips. Adhesives, tape, staples, or "J-nails" not acceptable.

B. Multiple Runs: Rack with 25 percent spare capacity. Maximum width per manufacturer's recommendations.

C. Vertical Runs: U-channel support with conduit fittings.

D. All hardware such as inserts, straps, bolts, nuts, screws and washers shall be galvanized or plated steel.

E. PVC coated galvanized steel in exterior and wet locations.

F. Channel manufacturers: Kindorf, Unistrut, or approved.

2.2 CABLE SUPPORTS

A. Approved plastic coated wire-ties.

B. Approved PVC coated hangers.

C. Building studs as permitted by Code and specifications.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Supporting devices shall be listed for the location installed. Supports shall be of like material of raceway and be rated for location installed.

B. Layout to maintain headroom, neat mechanical appearance, and to support equipment loads required.

C. Exact location and spacing between supports per manufacturer's recommendations and NEC requirements.

D. Provide adequate spacing to prevent moisture build-up. All runs of conduit shall be arranged so as to be devoid of traps wherever possible.

E. Cable “Sag” greater than 3-Inches from valley to peak of run, not acceptable

END OF SECTION 26 05 29

SECTION 26 05 33 - RACEWAY & FITTINGS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Conduit, Fittings, and Tubing.

B. Flexible Conduit.

1.2 REFERENCE STANDARDS

A. National Fire Protection Association (NFPA).

1. NFPA 70 National Electrical Code--Chapter 3.
2. Underwriters Laboratories (UL) 6,
3. UL797
4. UL1990

PART 2 - PRODUCTS

2.1 MATERIALS AND COMPONENTS

A. General: No smaller than 3/4-inch unless otherwise shown or indicated herein.

B. Conduit and Tubing: Electrical metallic tubing, galvanized rigid steel threaded conduit, Schedule 40 PVC.

C. Flexible Conduit: Flexible plastic jacketed type with liquidtight connectors and steel wrap armor (liquidtight flexible metallic conduit).

D. Fittings:

1. General: Listed and approved for purpose. Water, gas, concrete tight where required.
2. Electrical Metallic Tubing (EMT): Connectors to be steel. All connectors shall have factory insulated throats. Couplers and connectors shall be compression, setscrew type.
3. Galvanized Rigid Steel Conduit (GRC): Threaded. Do not use pressure type. Provide factory insulated throats on bushings.
4. Liquidtight Flexible Metallic Conduit: Continuous copper ground in core; approved watertight.

E. Expansion Joints: Offset or sliding type with bending straps and clamps. Listed for purpose.

F. Entrance Seal: Shall be modular, mechanical type, consisting of inter-locking synthetic rubber links shaped to continuously fill the annular space between the pipe and the

wall opening. The elastomeric element shall be sized and selected per manufacturer's recommendations. Link-Seal or approved.

G. Underground Marking Tape: 6-inches wide, yellow, low density polyethylene 4 mil thickness. Imprinted: "CAUTION: STOP DIGGING - BURIED ELECTRIC LINE BELOW" and current date. Tape for telephone line similar, except green.

2.2 TYPE

A. Utilize GRC in concrete with concrete-tight connectors.

B. Utilize GRC for exterior with watertight connectors.

C. Utilize electrical metallic tubing concealed in finished interior spaces.

D. Utilize electrical metallic tubing exposed in unfinished spaces, where not subject to physical damage.

E. For underground conduit, utilize Schedule 40 PVC or GRC. Provide GRC elbows and GRC risers through penetrations where PVC is used.

F. Connections to motors, vibrating equipment, and movable equipment shall be with flexible metallic conduit or liquidtight flexible metallic conduit. Use liquidtight type in damp locations. No smaller than 1/2-inch for motor connections. Use 3/8-inch only for light fixture wiring where provided by light fixture manufacturer. Provide sufficient length of flexible conduit to stop vibration into connecting support. Sizes not noted on the Drawings shall be as required by the NEC and no smaller then upstream connection conduit size.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install raceway concealed in all areas where required. Concealment not required in mechanical and electrical rooms, connections to motors, above suspended ceilings, and underfloor spaces.

B. Coordinate installation of conduit in masonry, cabinetry, and building slab work.

C. Underground Raceways: Watertight, including fittings, slope 3 inches per 100 feet downward from building. Install underground marking tape. Bury 6 inches to 8 inches below grade directly above raceway. Seal exterior junction boxes or provide with drainage.

D. Galvanized rigid steel conduit installed in contact with earth shall be wrapped with 2-half laps of 10 mil, all weather, corrosion protection tape.

E. Route all conduits parallel or perpendicular to building lines.

F. Vertical Runs: Straight and plumb.

G. Raceways Running in Groups: Run at same elevation, properly spaced and supported.

H. Install conduit in concrete slab with minimum 2-inch cover. Do not install conduit larger than one inch maximum in concrete slabs unless approved.

I. Do not interfere with placement of concrete re-bar. Place raceway between re-bar layers. Space at least 8-inches on center. Space as far as possible where terminating at same area. Secure raceway, boxes, inserts, etc. by mechanical means prior to pour.

J. Install conduit free with no dents or bruises. Cap ends to prevent entry of foreign materials and moisture.

K. Clean raceway before installation of conductor.

L. Alter conduit routing to avoid obstructions, minimizing crossovers. Avoid use of bends and offsets where possible. Only bend raceway with an approved conduit bending machine or approved hand (hickey) bender.

M. Provide listed expansion complete fittings with grounding jumpers where conduits intersect building expansion joints and for longer runs where conduit expansion may be excessive.

N. Allow minimum of 6 inches clearance at flues, steam pipes, and heat sources.

O. Dissimilar Metals: Avoid contact with pipe or duct runs of other systems.

P. Lengths and Bends: Maximum number of bends in any run shall be the equivalent of four quarter bends (360 degrees total). Maximum length of any run shall be 300 feet, less 50 feet for each equivalent quarter bend. Provide Junction and pull boxes to meet these limits.

Q. Provide entrance seal for all exterior wall, underground, and exterior slab raceway penetrations.

R. All empty raceways shall be provided with pull string or #12 conductor. Provide #12 conductor for exterior empty PVC raceways.

END OF SECTION 26 05 33

SECTION 26 05 33.16 - JUNCTION AND PULLBOXES

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Provide electrical boxes and fittings as required for a complete, protected, and operable system.

B. Comply with local Codes and NEC as required for Providing electrical boxes and fittings.

1.2 REFERENCE STANDARDS

A. American National Standards Institute (ANSI).

1. C73 Series Dimensions of Attachment Plugs and Receptacles

B. National Electrical Manufacturers Association (NEMA)

1. OS 1 Sheet-Steel Outlets Boxes, Device Boxes, Covers, and Box Supports
2. FB 1 Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable

1.3 APPLICABLE REGULATIONS

A. American National Standards Institute (ANSI).

1. C2 National Electrical Safety Code (ANSI/IEEE C2)

B. National Fire Protection Association (NFPA).

1. NFPA 70 National Electrical Code.

C. Underwriters' Laboratories (UL).

1. UL50 Cabinets and Boxes (ANSI/UL50).

PART 2 - PRODUCTS

2.1 WEATHERPROOF JUNCTION AND PULL BOXES:

A. Provide galvanized sheet steel junction and pull boxes, with screw-on covers; of the type, shape and size, to suit each respective location and installation; with welded seams and equipped with stainless steel nuts, bolts, screws and washers.

2.2 KNOCKOUT CLOSURES:

A. Provide punched-steel knockout closures for steel boxes.

2.3 PULLBOXES

A. Provide sheet metal in interior dry locations for EMT raceway. Provide cast metal in exterior, or damp locations. Type and material shall conform to National Electrical Code, with screw-on cover.

B. Flush Mounted Pullboxes: Provide overlapping covers with flush head screws, finished in light gray enamel.

C. Box volumes shall meet NEC for size and number of entering conduits and cables.

2.4 UNDERGOUND PULLBOXES

A. Underground Pull Boxes: Cast concrete with suitable concrete cover to withhold loads in location installed. Provide heavy-duty traffic cover where installed with vehicle traffic. Cover and box shall not deform and be rated for location installed. Provide drainage and no less than 4 feet compacted gravel below installation. Size, and configuration to match installation. Provide where required, and shown on Drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide insulation behind box for walls with insulation for sound reduction.

B. Locate pullboxes and junction boxes concealed above suspended ceilings or in electrical rooms, mechanical rooms, or unfinished areas.

C. Support: Provide adequate support of all boxes. Secure boxes independent of raceway, by attaching directly to building structure by approved means.

D. Identify each junction and pullbox with system description including branch circuit numbers of enclosed circuits, and voltage.

E. Secure all raceway to entering boxes with approved bushings, and locknuts.

F. Do not mount boxes back-to-back. Boxes on opposite sides of wall shall be separated by at least 3 inches.

G. Maintain sound transmission and fire properties of surface installed. Provide appropriate fire stop and sound stop materials as required to maintain these properties.

H. Provide separate boxes where two voltage systems have equipment at same location. Provide separate boxes for equipment on emergency power system.

END OF SECTION 26 05 33.16

SECTION 26 05 53 - ELECTRICAL IDENTIFICATION

PART 1 GENERAL

1.1 WORK INCLUDED

A. Permanent Identification of system components.

1.2 APPLICABLE REGULATIONS

A. National Fire Protection Association (NFPA)

1. NFPA 70: National Electrical Code.

PART 2 PRODUCTS

2.1 MATERIALS

A. Phenolic Nameplate:

1. Three layer, white front and back with black core.
2. Neatly engraved through outer layer to show white characters on black background.
3. Beveled edges, print lettering.
4. Other colors as specified or shown. Use red for fire alarm, or fire sprinkler only.

B. Stenciling and Silk Screening: Printed lettering with enamel or lacquer paints. Legends contrasting with the background on which applied

C. Panelboard Directory Card: Fiberboard typed. Laminate or place in protective cover.

D. Concealed Box Labels: Permanent black ink such as “Sharpie” pen with neat and legible writing. Red permanent ink for fire alarm.

E. Concealed Conductor Labels: Listed white tape wrapped around individual conductor or cable, with permanent black ink with printed lettering

PART 3 EXECUTION

3.1 EQUIPMENT TO BE IDENTIFIED

A. Motor starters, panels, and the disconnecting devices contained therein.

B. Disconnects.

C. Transformers.

D. Other items as specified, required by NEC, or noted on Drawings

E. Devices in panels shall be identified on the panelboard directory card.

3.2 PHENOLIC NAMEPLATES

A. Panels shall be labeled on the door of the interior with a nameplate. Letters for panels shall be printed and no less than 1/2 inch high.

B. Provide nameplate on switchboard

C. Provide nameplates where specified and as shown.

3.3 APPLYING IDENTIFICATION

A. Stenciled letters shall be applied by brush or by spraying.

B. Nameplates shall be attached with either adhesive or screws. If adhesive is used, it shall adequately adhere to the surface installed.

3.4 IDENTIFICATION REQUIREMENTS

A. Indicate Voltage for all concealed labels, and for Disconnects, panelboard and switchboard identification.

B. Identification for disconnecting devices contained in panels and motor control centers shall show the equipment name and location by floor, area, and direction to adequately indicate location of load. Do not include Voltage when the Voltage is the same as for the panel or motor control center.

C. Nameplates on disconnect devices located in the area but not part of a panel or motor control center shall have the equipment name, power source identification, and voltage designation. Nameplates for disconnect devices located remotely from the equipment shall also show the equipment location by floor, area, and direction to adequately indicate location of load.

D. Panelboard directory cards shall list the circuit numbers and show the equipment name and location supplied by the circuits. Equipment locations shall be shown by floor, area and direction, or by room numbers.

END OF SECTION 26 05 53

SECTION 26 05 60 - OVERCURRENT PROTECTIVE DEVICES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Circuit Breakers.

B. Fuses.

1.2 REFERENCE STANDARDS

A. American National Standards Institute (ANSI).

1. C37.16 Preferred Ratings, Related Requirements, and Application Recommendations for Low Voltage Power Circuit Breakers and AC Power Circuit Protectors.
2. C37.17 Trip Devices for AC and General-Purpose DC Low-Voltage Power Circuit Breakers.
3. C37.50 Test Procedure for Low-Voltage AC Power Circuit Breakers Used in Enclosures - Test Procedures.
4. C97.1 Low Voltage Cartridge Fuses 600 Volts or Less.

B. Institute of Electrical and Electronic Engineers, Inc. (IEEE).

1. 20-73 Low Voltage AC Power Circuit Breakers Used in Enclosures: ANSI C37.13.

C. National Electrical Manufacturer's Association (NEMA).

1. FU-1 Low Voltage Cartridge Fuses.

1.3 APPLICABLE REGULATIONS

A. Underwriters' Laboratories (UL).

1. UL 489-72 Molded Case Circuit Breakers and Circuit Breaker Enclosures.
2. UL 198 E Class R Fuses.
3. UL 869 Service Disconnects
4. UL 1066 Standard for Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures

B. National Fire Protection Association (NFPA).

1. NFPA 70 National Electrical Code.

1.4 QUALITY CONTROL

A. Breakers shall be selectively coordinated with feeder breakers.

B. Breakers shall be of the same manufacturer as the switchboard and the panelboards.

PART 2 - PRODUCTS

2.1 CIRCUIT BREAKERS

A. Construction

1. Bolt-on connection to bus.
2. Thermal-magnetic, molded case, with inverse time current overload and instantaneous magnetic tripping.
3. Quick-make, quick-break, with tripped indication clearly shown by breaker handle taking a position between ON and OFF.
4. Multiple phase breakers shall have a common internal trip. Do not use handle ties between single pole breakers.
5. Breaker shall be switch (T) rated.
6. Where used as service disconnects, breakers shall be listed for use as service entrance equipment and include locking handle.
7. Building normal power service main breaker shall include power monitoring with LCD display on breaker.
    a. Voltage- each phase L-L, L-N
    b. Amps- each phase
    c. kW/KVA
8. Breakers, 400 amps and larger, shall include externally operable mechanical means to trip the circuit breaker, enabling maintenance personnel to verify the ability of the breaker trip mechanism to operate as well as exercising the breaker latch and operating mechanisms.
9. Fully rated at fault current of panel or switchboard.
10. Selectively coordinated by manufacturer with upstream protection device.

2.2 TESTING

A. By Manufacturer at factory. Timed thermal trip test and timed magnetic trip test.

B. As required by local authority.

C. Submit test results to Engineer upon request.

2.3 FUSES

A. Feeder, Branch Circuit and Service Entrance Fuses: 600 amperes and below, UL Class J or RK1 current limiting type, 600 volt 200,000 ampere interrupting capacity.

B. Motor and Inductive Circuit Fuses: UL class RK5 time delay current limiting type, 600 volt, 200,000 ampere interrupting capacity.

C. Control Circuit Fuses: UL Class J or R current, limiting type, 600V.

D. Manufacturer: Bussmann, or approved

PART 3 - EXECUTION

3.1 CIRCUIT BREAKER INSTALLATION

A. Label each breaker located in switchboard or separate enclosure to indicate load served.

B. Adjust settings on breakers to operate properly under actual field conditions and to provide selective system coordination.

C. Torque breakers to bus per manufacturer’s requirements and installation procedures.

3.2 FUSE INSTALLATION

A. Label each switch to indicate type and rating of fuse installed.

B. All fuses shall be selected to provide selective system coordination.

C. Provide the greater of 10%, or not less than 3 spare fuses of each size, and rating used.

END OF SECTION 26 05 60

SECTION 26 05 83 - WIRE CONNECTIONS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Wires Connectors

1.2 REFERENCE STANDARDS

A. National Fire Protection Association (NFPA).

1. NFPA 70 National Electrical Code.

B. Underwriters' Laboratories, Inc (UL

1. UL 486A through UL 486E

C. American National Standards Institute (ANSI)

1. ANSI/UL 467

PART 2 - PRODUCTS

2.1 TWIST-ON CONNECTOR

A. Pressure-type wound spring twist on connector.

B. Solderless pressure connectors.

C. Shell rating of 105 degrees C.

D. "Push-On" or "punch" type connectors not permitted.

2.2 COMPRESSION ADAPTER

A. Dual rated for use with both aluminum and copper cable conductors.

B. Diameter and ampacity as current carrying equivalent copper wire.

C. Pre-filled with approved joint compound

D. Connectors shall be clearly marked with Catalog Number, wire size and color-coded die index number.

E. Burndy "Hyplug" type AYP or equal by T&B, or approved.

2.3 TERMINAL, CRIMP TYPE

A. Flat; fork tongue, or flat circular matched to terminal size.

B. Color coded to wire size.

C. T&B “Sta-Kon”, or approved.

2.4 WP COATING

A. Liquid

B. For use as an outer seal on vinyl tape splice, fast- drying, suitable for use for direct burial and moisture protection.

C. 3M Scotchkote Electrical Coating FD, or approved

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide Twist-On Connectors at taps and splices for conductors no larger than #10 AWG. Provide only in approved junction and outlet boxes.

B. Provide Compression Adapters for terminating a single conductor into mechanical connectors such as a circuit breaker or set screw lugs. Provide only where required for AL/CU transitions or where lugs require adapters.

C. Provide Crimp terminal at all Control voltage terminal blocks, unless otherwise recommended by manufacturer.

D. Do not nick conductor when stripping insulation. No “ringing”

E. Conductor and cable shall not be reduced at the terminal for connections.

F. Connectors shall be approved and listed for the purpose used.

G. Wrap all twist-on connectors with listed tape to maintain equivalent insulation of wire.

1. Exterior, Underground, and WP connections shall include 2-coats of WP Coating.

H. Remove any obstructions on connection to maintain continuity prior to installation of connectors, such as paint, dirt, and construction materials.

I. Copper conductors can be terminated in approved compression or mechanical connector, including set screws.

J. Provide slack at equipment to allow for a neat termination, access to conductors, and ability to repair or replace equipment.

END OF SECTION 26 05 83

SECTION 26 29 12 - DISCONNECTS & MANUAL STARTERS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide motor disconnects as shown, and as required by Codes.

B. Provide circuit disconnects as shown, and as required by Codes.

C. Provide manual motor starters for single phase motors below one horsepower where disconnect is shown as required by Codes.

D. Disconnects to include adequate support, required hardware, and accessories for com-plete functional installation.

1.2 APPLICABLE REGULATION

A. Conform to National Electrical Code and inspection authority.

B. Provide disconnects rated for the location installed, as required by National Electrical Code, as shown, and as indicated herein.

1.3 REFERENCE STANDARDS

A. Underwriters' Laboratory (UL).

1. UL-98 Enclosed Switches.

B. National Electrical Manufacturer's Association (NEMA).

1. NEMA KS-1 Enclosed Switches.

PART 2 - PRODUCTS

2.1 MANUAL MOTOR STARTER

A. Toggle horsepower rated, switch with thermal overload and pilot light.

B. Switch tab for locking switch in “OFF” Position.

2.2 DISCONNECT

A. Motor and circuit disconnects shall have a UL label.

B. Construction: Dry, Indoor Locations shall be not less than NEMA 1. Enclosures for outdoor, or wet locations shall be not less then NEMA 3R. Rated at 600 Volt. Heavy duty, quick make,

quick break. Number of poles and ampacity as noted or required by Code. Fusible with dual element fuses where shown. Short circuit rating sufficient to withstand the available fault current. Solid ground, solid neutral.

C. Compression lugs or set-screw lugs approved for use with copper wire.

D. ON/OFF Positions clearly marked.

E. Lockable in "OFF" position.

F. Interlock:

1. Prevents switch from being opened when "ON."
2. Prevents closing switch when cover is open.
3. Provide defeater to permit authorized personnel to open door and inspect switch when "ON," or operate with cover open.

2.3 COMBINATION MOTOR STARTER AND DISCONNECT

A. Include features of Disconnect above.

B. Provide molded case magnetic only circuit breakers with operating handle and lock-off facility.

C. Provide contactors with three overload relays.

D. Holding coil at 120 Volts.

E. Provide pilot lights in cover, red & green neon or LED type.

F. Provide reset button, and Hand-Off-Automatic switch in cover, field convertible to Off/Auto or Start/Stop momentary pushbutton.

G. Provide starters with a sufficient number of auxiliary contacts (N.O. and N.C.) to afford the control and interlocking required in addition to standard auxiliary holding contacts supplied with each contactor.

H. Provide control transformer with 120 volt secondary voltage of sufficient capacity to handle operating coil and associated controls. Protect transformers with fuses on primary and secondary sides of transformers as required by Code.

I. Minimum size NEMA 1.

J. Enclosure for dry, indoor locations: NEMA 1, drip-proof. Others as required by location.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install motor and circuit disconnects as recommended by manufacturer, required by Code, required by UL, and where shown.

B. Maintain Code clearances and access.

C. Provide Manual Motor Starter where shown for single phase motors rated less than one horsepower. Manual Motor Starter is not required for motors with integral thermal overload protection. Provide Switch with locking tab for motors with integral thermal overload protection. Provide Manual Motor Starters as required for single phase motors without integral or other protection, otherwise provide Disconnect.

D. Provide a phenolic nameplate on each disconnect identifying the equipment item served.

E. Independently support disconnects. Do not mount disconnects on vibrating, HVAC, or Plumbing equipment.

F. Install heaters correlated with full load current of motors provided.

G. Set overload devices according to measured current of motors provided.

END OF SECTION 26 29 12

SECTION 26 51 13.20 - LIGHTING FIXTURES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide complete, supported, trimmed and finished lighting system operational for the use intended.

1.2 REFERENCE STANDARDS

A. National Electrical Manufacturer's Association (NEMA).

1. NEMA LE1: Fluorescent Luminaires.

B. American National Standards Association (ANSI)

1. ANSI C62.41 IEEE Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits

C. Underwriters Laboratories (UL)

1. UL 1598 Luminaires
2. UL 1029 Standard for High-Intensity-Discharge Lamp Ballasts
3. UL 935 Standard for Fluorescent-Lamp Ballasts’

D. National Fire Protection Association (NFPA)

1. NFPA 70 National Electrical Code

E. Oregon Energy Code

1.3 COORDINATION

A. Verify compatibility and coordination of other materials with luminaire and ceiling system, and mounting system. Inform discrepancies to the Architect, and do not order until clarified.

B. Coordinate with Division 15 to avoid conflicts with mechanical equipment.

1.4 QUALITY CONTROL

A. Acceptable Manufacturers- Refer to Fixture Schedule.

PART 2 - PRODUCTS

2.1 GENERAL

A. Provide support and trim hardware required for adequate support and approved appearance of mounted equipment.

B. Factory balanced. Provide concealed weighted material to offset ballast and other component weight. Fixtures that do not hang or mount level are not acceptable.

C. Provide A12 lens, semi-diffuse, not less than 0.125 thick acrylic or per lighting fixture schedule.

D. Fixtures installed in insulated cavities shall be IC rated.

E. Provide fire rated enclosures for all fixtures installed in fire rated structures and fire rated ceilings. Enclosure shall be of the same rating as to not compromise the full rating of the structure where installed. Fixtures used in fire rated enclosures shall be UL listed for such installation and shall have 3-inches clear from enclosure on all sides.

F. Equipment shall be certified, and approved per Oregon Energy Code.

2.2 FLUORESCENT LED LUMINAIRES

A. Painted finish, no exposed materials with potential to oxidize. Additional or other requirements per Lighting Fixture Schedule.

B. Not less than 20-guage steel housing and reflectors unless otherwise indicated and per light fixture schedule.

C. Provide Hinged Frames with Catches; removable for cleaning without tools. Support lay-in lenses on four sides with flip ends on short dimension. Include captive removable and reusable hardware to secure lens to frame.

D. Design Luminaire to adequately dissipate heat from LEDs/lamp, driver/ballast, and battery pack.

E. Provide formed endplates and trim.

F. Suitable for mounting where shown.

2.3 RECESSED LUMINAIRES

A. Incandescent type shall be prewired with J-box integral to fixtures. Conductors rated for area and for conductor connections.

B. Flush and plumb with exposed surface, no gaps, include required trim rings and materials of adequate type for flush appearance.

2.4 PENDANTS/CABLE HANGERS

A. Pendant: Shall be contiguous, and color matched to fixture. Pendant type shall include swivel sockets permitting normal fixture motion and self-adjustment. Include color matched canopy at structural attachment. Provide safety cables secured to structure, wrapped around or through pendant where recommended by fixture manufacturer to independently support fixture. Route conductors through pendant as per manufacturer requirements.

B. Visible Cable: Field adjustable length, with extra coiled and concealed. Equal lengths, with 18-inches. Additional cable and for future adjustments. Locking ring to adequately hold fixture at desired mounting height. Cable stop to prevent fixture from sliding off end of cable.

2.5 CABLE HUNG FIXTURE CORDS

A. Visible Cords: Straight (not pigtail type) along length of cable, black, by fixture manufacturer. Shall not provide supporting function.

2.6 BALLASTS

A. Fluorescent Electronic Ballast

1. Program start, or program rapid start
2. THD < 10%
3. Ballast Power Factor > 98% for primary lamp
4. Operating input frequency 50/60 Hz
5. Provide 0-10V dc Dimming where shown
6. 0 degree F minimum lamp starting temperature
7. Operating input voltage +/- 10%
8. Audible noise rating “A” or better
9. Output frequency > 40 KHz with no visible flicker or striation
10. Continued operation if one lamp fails on multiple lamp ballasts
11. Constant light output for line voltage variation of +/- 10%
12. Ballast factor 0.90 to 0.85
13. No PCBs
14. 5 year warranty + labor allowance.
15. Class A sound rating
16. Qualified CEE (Consortium for Energy Efficiency) listed
17. FCC Class A: EMF/RFI
18. ANSI C62.41 Cat A for transient protection
19. UL listed
20. Acceptable product: Sylvania Quicktronic Professional, or approved.

B. Compact Fluorescent Electronic Ballast

1. Program start, or program rapid start.
2. THD < 10%
3. Ballast Power Factor > 99%
4. Provide 0-10V dc dimming where shown
5. 0 degree F minimum lamp starting temperature
6. Operating input voltage +/- 10%
7. Operating input frequency 50/60 Hz
8. Audible noise rating “A” or better
9. Output frequency > 40 KHz with no visible flicker or striation
10. Continued operation if one lamp fails on multiple lamp ballasts
11. Lamp current crest factor < 1.5
12. Constant light output for line voltage variation of +/- 10%
13. Ballast factor > 0.95
14. No PCBs
15. 5 year warranty + labor allowance
16. Qualified CEE (Consortium for Energy Efficiency) listed
17. Meets ANSI C62.41 Cat A for transient protection

18. UL listed
19. Acceptable product: Sylvania Quicktronic Professional or approved

PART 3 - EXECUTION

3.1 GENERAL

A. Replace any damage to fixture, lamps, lens, or other lighting components with new fixture. Damage includes paint spray, and other construction materials adhering to fixtures. Damage or altering fixture as a result of mounting or placing fixture into applicable space is not acceptable.

B. Install per requirements of Oregon Energy Code.

3.2 COORDINATION

A. See Reflected Ceiling plan for exact location of equipment and ceiling construction.

B. See Finish Schedule for additional finish requirements.

C. Coordinate fixture mounting system prior to ordering fixtures.

D. Provide price breakdown accounting as required and requested by Oregon Energy Trust, or Engineer.

3.3 ACCESS

A. All fixtures shall have Code accessible supplies. Use reach-through type where recessed in non-accessible spaces.

3.4 SUPPORT

A. Suspended ceiling:

1. Attach light fixtures to the suspended ceiling system where installed. Attachment shall have capacity of 5 times fixture weight in all directions.
2. Support fixtures with not smaller than number 12 AWG hangers attached to the grid members within 3 inches of the corner of each fixture, attached to building structure.
3. Attach two not smaller than number 12 AWG hangers from the fixture housing to the building structure.
4. Support pendent-hung lighting fixtures directly from the structure above with not smaller than number 9 AWG wire or approved alternate support.

B. Support all fixtures from structure rated at least five times support weight.

3.5 SURFACE MOUNTING

A. Attach with mechanical means to secure fixture flush with structure. Attach at each corner of fixture not less than four places to building structure. Round fixtures shall be attached by forming a tripod configuration. Single center connection is not acceptable.

B. Seal around fixture so no light trespass can be observed.

3.6 ACCEPTANCE

A. Remove all debris, bugs, and other foreign materials from lamps and fixture housings. Clean all lamps, shades, reflectors, and lens removing all temporary labels, debris, dirt, and dust per manufacturer guidelines.

END OF SECTION 26 51 13.20

SECTION 28 10 00

ACCESS CONTROL

PART 1 GENERAL

1.1 SECTION INCLUDES:

A. Physical Access Control System (PACS).

B. PACS Appliance.

C. PACS Software.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate with Owner or Owner's representative regarding camera network configuration and estimated bandwidth utilization prior to performing network connections.

B. Sequencing / Scheduling: Provide to Owner or Owner's representative a schedule and list of participants required to attend coordination and progress update meetings.
   1. Owner representative(s) for Facilities Management, Information Technology (IT) Services, and Security Management.
   2. General Contractor.
   3. Project Manager.
   4. Manufacturer's Representative.
   5. Project Architect.
   6. Security Consultant.

1.3 INFORMATIONAL SUBMITTALS

A. Submit under provisions of Section 01 30 00.

B. Product Data: Manufacturer's product information and data sheets for each product specified in this section, including:
   1. Substrate preparation instructions and recommendations
   2. Installation means and methods.
   3. Recommendations and requirements for proper storage and handling.

C. Shop Drawings:
   1. Submit Manufacturer's approved shop drawings detailing the section and elevation views of each product to be installed.
   2. Coordinate with locations listed on Contract Drawings.

D. Warranty Information:
   1. Submit confirmation and details of manufacturer's warranty, extended warranty, and replacement policies.

E. System Support Resources:
   1. Submit a list of available manufacturers providing fee based professional services available to the Contractor or Owner, including but not limited to the following:
      a. Training.
      b. Installation.

c. Commissioning.
d. Remote diagnostics and integration with 3rd party software and hardware systems.

1.4 CLOSEOUT SUBMITTALS

A. Supply licensing and registration information for all software, hardware, firmware, operational, and administrative licenses.

B. Supply network configuration backup files, restoration application and instructions.

1.5 MAINTENANCE SUBMITTALS

A. Spare Parts: All Spare Parts must be delivered to the owner in their original sealed packaging. Clearly label with “SPARE: DO NOT REMOVE”, and include manufacturer part numbers, and date of delivery to Owner. Store all spare parts in an environment and condition recommended by the manufacturer.
   1. One spare for each 15 devices.
   2. Provide spare components as noted in the coordinating schedule for work listed in this section.

1.6 QUALITY ASSURANCE

A. Qualifications - Manufacturers: Manufacturer(s) suppling products noted in this section must have a minimum of 5 years in business.

B. Qualifications - Installers:
   1. Installer must be licensed to install video surveillance and security equipment as required by authority having jurisdiction.
   2. Installer must be capable of providing references that will attest to successful completion of projects of similar scope as the work noted in this section.
   3. Installer must be certified by the manufacturer and be up to date with all training required to maintain good standing.

C. Mock-Ups: Provide a mock-up for evaluation of installer’s workmanship.
   1. Do not proceed with remaining Work until workmanship is approved by Architect.
   2. Refinish mock-up area as required to produce acceptable work.

1.7 WARRANTY

A. Manufacturer Warranty: Provide manufacturer’s warranty covering parts and labor costs to repair or replace part that fail to perform.
   1. Warranty Period: Parts and labor warranty for 24 months from date of Substantial Completion or date of purchase, whichever comes first.
   2. Service During Warranty: Provide direct support to Owner via phone and email, including access to training and education in the form of documents, videos and other materials via the internet.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design Manufacturer: Avigilon.
   1. Address: 555 Robson St., Vancouver, BC, V6B 1A6, Canada.
   2. Phone: (888) 281-5182.
   3. Website: www.avigilon.com.

B. Substitutions:
   1. Submit substitution requests in accordance with provisions of Section 01 60 00.
   2. Single manufacturer will provide, from a single source, a fully integrated surveillance system consisting of network cameras and the following components:
      a. Video Management System.
      b. Video Management System Interfaces.
      c. Storage Appliances for Electronic Safety and Security.
      d. Video Surveillance Positioning Equipment.
      e. Video Surveillance Sensors.
      f. Access Control Software and Database Management.

2.2 ACCESS CONTROL MANAGER (ACM) SYSTEM DESCRIPTION

A. Description: Access Control Manager (ACM) software provides an expandable, role-based system that has the following features:
   1. Compatibility with existing IT systems.
   2. Manages permissions centrally, from a single location.
   3. Integrates with Active Directory, HR databases, and other IT and logical security systems.
   4. Provides browser-based solutions allow full access from other devices, enabling security personnel to respond to an incident immediately.
   5. Integrates with Avigilon Control Center, to manage video alarm events with system and display them through an intuitive interface.
   6. Does not require installation on multiple workstations.
   7. Supports open field hardware from other manufacturers.
   8. Provides hot-standby or auto-failover through cloud-based server architecture, switching to backup system automatically in the event of a fatal failure.

B. Server Appliance: Linux based server pre-loaded with Avigilon Access Manager Software and optimized to manage an IP-based access control system.
   1. Form Factor: As selected by owner.

C. Virtual Appliance: Bundled as either an on-site, or private cloud solution within the Owner's virtualized environment.

D. Products Supported: Provide ACM which supports the following third-party products with the compatible drivers, firmware, and software as required to provide a fully functional system:
   1. Access Hardware:
      a. Mercury Security: Products bearing the "Authentic Mercury" mark.
      b. HID Global: VertX Evo controllers and VerteX Sub Panel.
   2. Reader Hardware:
      a. HID Global: iClass Series, iClass SE, MultiClass SE and iClass Seos.
      b. Allegion: aptiQ, XceedID Series, MIFARE DESFire and EV1.
      c. Farpointe Data: Pyramid, Delta, Ranger Series.
      d. OSDP (Mercury hardware only).
   3. Intrusion Detection Control Panels:
      a. Bosch B series and D9412GV4 (Version 2).
   4. Biometrics:
      a. VIRDI Biometrics.
   5. Wireless Locksets:
      a. Allegion AD, LE, NDE, and CT series devices
      b. Assa Abloy: Aperio Series.
      c. SimonsVoss: Smartintego Series.
   6. Visitor Management:
      a. HID Global: Easy Lobby.
   7. Power Supplies: Provide one of the following power supplies that are manufacturer prepared to support Mercury Security hardware.

a. Life Safety Power: Enclosure Kits and Power Supplies.
b. Elmdene: Power Supplies.

2.3 APPLICATION SUPPORT

A. Supported Browsers: Provide PACS appliance with browser-based access to system applications, without mandated requirement of a dedicated client workstation that supports the following industry standard web browsers:
1. Mozilla Firefox.
2. Google Chrome.
3. Safari.
4. Microsoft Edge.

B. Supported Third Party Databases: Provide ACM which supports the following third-party data bases:
1. Lightweight Directory Access Protocol (LDAP).
2. Microsoft Active Directory.
3. Structured Query Language (SQL) Server.
4. Oracle Relational Database Management System (RDBMS).
5. Comma Separated Value (CSV).
6. Extensible Markup Language (XML) Event Push).

C. Supported Updates: Provide ACM which automatically updates the following:
1. Software maintenance of operating system service packs.
2. Software Licensing.
3. Operating System Security Vulnerabilities.
4. Physical Access Control System (PACS) Appliance: Provide a PACS with the following capabilities:
5. Serves as central repository for entire system configuration and activities and is only accessible through a web browser.
   a. A database server and separate database server with a unique operating system are not allowed.
6. Compliant with Owner's IT Standard with fully featured physical access control system solution.
7. Utilizes industry standard TCP/IP network infrastructures to communicate including the following:
   a. PACS appliances.
   b. Intelligent field hardware controllers.
   c. Browser based workstation.
8. Secure Data: PACS data secured as follows:
   a. Secure Data communicated over the network to/from the PACS appliances and the web browser workstations via SSL 128-bit encryption.
   b. Encrypt PACS appliance backups using AES Encryption.
   c. Back up PACS appliance to the following:
      1) USB storage device.
      2) Windows shared directory and network shared folder.
      3) Secured SCP servers.
   d. Encrypted passwords required to log in to PACS appliance within Open LDAP directory structure.

D. Basis of Design Product: Access Control Enterprise Appliance, by Avigilon.
1. Model: AC-APP-16R-PRO, with a maximum of 16, upgradable to 400 card readers.

E. Description: Linux based server pre-loaded with Avigilon Access Control Manager software and optimized to manage an IP-based physical access control. Hardened Linux network appliance using LDAP compliant directory structure with a small desktop tower form factor. Factory licensed from the manufacturer.

2.4 ACCESS CONTROL MANAGER (ACM) VIRTUAL APPLIANCE

A. Basis of Design Product: Access Control Enterprise Appliance, by Avigilon.
   1. Model: AC-APP-32R-VM, with a maximum of 32 readers.

B. Description: Self-contained virtual appliance is distributed as a digital virtual machine to run within a virtualized computing environment.
   1. VMware® vSphere ESX 4.x, 5.x, 6.x.

C. Owner Provided Minimum Hardware Requirements
   1. Processor: Two, with two cores per processor.
   2. Memory: 4 GB Minimum.
   3. Hard Drive: 1TB Minimum
   4. Network: 1 GB Ethernet Port

D. Capacities:
   1. Maximum Controllers: 512.
   2. Maximum Simultaneous Operators: 50.
   3. Maximum Identities: 500,000.
   4. Maximum Stored Events: 150,000,000.
   5. Maximum Card Readers: 16.

2.5 PACS SOFTWARE ALARM CONTROL FUNCTIONALITY

A. Alarm and Event Attributes: Administrator configures and determines how each alarm and event is communicated in Alarm Monitors.
   1. Event Listing Window: Lists alarms and events with their associated event type and source object that is responsible for generating alarm or event.
   2. Upon logging in and accessing Alarm Monitor, queued alarms and events reported into Alarm Monitor for Operator action.

B. Provide Administrators with the following options for each alarm and event in system:
   1. Rename the alarm or event from its factory default.
   2. Rename, where applicable, the Return to Normal state name for the alarm or event.
   3. Assign an event type that sets the default configuration for alarm or event.
   4. Display alarm or event in Alarm Monitor.
   5. Mask alarm or event from displaying in Alarm Monitor.
   6. Display text instructions that guides Operator in responding to alarm.
   7. Automatically send an email message to a recipient.
   8. Have alarm display in priority order based on priority of alarm.
      a. Minimum Number of Priorities Supported: 99.
   9. Set priority of alarm or event, as well as its associated Return to Normal event priority.
   10. For video related alarms or events, automatically launch Video Player to display a live video feed from camera associated with device that generated alarm or event.
   11. Store alarm or event information for later retrieval.
   12. Create distinct schedules that can be assigned to different alarm types.
   13. Create schedule to enable/disable global events, which include the following:
      a. Shunt/un-shunt doors.
      b. Mass denial of credentials (lock down).

C. Alarm and Event Logging: As a default, log alarms and events in PACS to the PACS appliance internal data storage logging structure.

D. Off-Line Alarm/Event Queue: Queue alarms and events that occur:
   1. While Alarm Monitor is off-line with the rest of the system.
   2. When an Operator is not logged in to the Alarm Monitor.

E. Alarm and Event Types: Supports creation of alarm and event types as follows:
   1. Creates alarm and event templates as part of the installation.
   2. Events contain configuration of parameters including the following:
      a. Priority.
      b. Text instructions.
      c. Masking and masking schedule.
      d. Logging.
      e. Reporting.
      f. Email notifications.3
   3. Each alarm and event type support multiple alarm and event assignments.

F. Alarm/Event Synchronization: Supports alarm synchronization for alarm and events that report into multiple Alarm Monitors.
   1. Clears alarms and events from other Alarm Monitors when alarms or events are acknowledged or cleared by an Alarm Monitor Operator.

G. Alarm Reporting: Supports reporting of alarms to alarm monitors based on schedules.
   1. Each alarm in the system to have its own associated schedule.

H. Alarm/Event Instructions: Each alarm and event in the system to have associated text instructions.
   1. Maximum instruction character per event: 255.

2.6 PACS SOFTWARE, ACCESS CONTROL FUNCTIONALITY

A. Access Groups: An access group consists of card reader and schedule combinations.
   1. Access groups consists of the total number of card readers in the system that are assigned to a single schedule.
   2. Any card reader has the ability to belong to any access group.
   3. Individual card readers be able to belong to multiple access groups.
   4. Credential holder are allowed access to secure areas based on:
      a. Card reader.
      b. Time.
      c. Day.
   5. Access Group Support: Provide support of the following minimums:
      a. 255 access groups per intelligent enterprise controller.
      b. Access groups can be assigned to an individual credential holder per intelligent enterprise controller, and optionally be selectable up to a total of 16.
   6. Access groups support conventional names up to 50 alphanumeric characters.

B. Schedules: Provide support for creation of schedules as follows:
   1. Schedules serve as templates for application parameters including the following:
      a. Access groups.
      b. Masking devices.
      c. Device modes.
   2. Number of Schedules: Minimum of 255 schedules per panel.
      a. Each schedule set to one of following 3 operating modes:
         1) On: Schedule is active 24 hours per day / seven days per week.
         2) Off: Schedule is never active.
         3) Scan: Schedule is active during the assigned intervals.
   3. Schedule Intervals: Provide ability to assign individual schedules to a predetermined interval as follows:
      a. Day(s) of the week.
      b. Assigned to function a minimum of 8 holiday types.

c. Supports a minimum of 10 intervals.

4. Download schedules to related intelligent enterprise controllers for local processing and decision making.
5. Schedules support conventional names up to 50 alphanumeric characters.

C. Holidays: Define specific dates and ranges to be defined as a holiday as follows:
1. Number of Holidays: Minimum of 255.
2. Assign a minimum of 8 holiday types.
3. Ability to temporarily alter, adjust or suspend parameters, including the following:
   a. Card reader modes.
   b. An Identity's access rights.
   c. Masking Schedules.
4. Supports an embedded calendar to assist in configuration of holidays.
5. Holidays support conventional names up to 50 alphanumeric characters.

D. Card Reader Options: Defines options for card readers in the system as follows:
1. Specify the card reader is an active card reader.
2. Specify the off-line mode operations should the card reader lose communications with the enterprise intelligent controller or Intelligent Field Controller.
3. Specify Door Forced Filter: Reduces false alarms for doors that "bounced."
   a. No report of Door Forced Open Alarm for door opening within 3 seconds of the door closing.
4. Extended Cardholder Door Held Open Time: Allows a card reader's door held open time to be extended beyond the normal configured time.
   a. Maximum Extended Door Held Open Time: Definable up to 32,767 seconds.
   b. Defines application of this functionality by the following:
      1) Card reader.

      2) Credential holder.

5. Duress Access to a Card Reader: Supports a Duress Mode for a credential holder's entry through a card reader as follows:
   a. When a credential holder is gaining entry under duress, the credential holder must append the number "5" to the end of their PIN code.
      1) Thus, a credential holder with PIN of 9999 would enter 99995 when entering an area under duress.

   b. Make duress access for card readers in the following mode:
      1) As requested by Owner from products standard modes.

   c. Upon entrance to a card reader under duress, send alarm to Alarm Monitor and logged to the audit database.
   d. Deny if Duress: Able to deny a credential holder access to the card reader during duress, even if that credential holder entered the proper duress code.
   e. Generates an alarm at the Alarm Monitor noting duress access was requested and denied.
6. Specify "Strike Mode" / strike operations allowing Administrators to define, upon a valid access:
   a. Door strike remains active for the entire strike time.
   b. Door strike turns off after the door has closed.
   c. Door strike deactivates as soon as the door is open.
   d. Do Not Pulse Door Strike on REX: Door strike disabled during a valid request to exit.
   e. Allows card reader's strike to be extended beyond the normal strike time for specific individual credential holders as follows:
      1) Definable up to 255 seconds.

2) Definable by card reader.

3) Definable by credential holder.

7. Log All Access As Used: In an instance where there is not a door contact at the door to monitor door position, the PACS assumes entry and report an event into the Alarm Monitor.
8. Do not log REX Transactions: Does not log request to exit transactions to the directory structure.
9. Two-Card Control: Requires two valid access requests occur prior to granting access to the door as follows:
   a. Both requests must occur within a 10 second period.
   b. In the event a second valid access has not occurred within 10 seconds of the first valid access request, the card reader will reset and the first credential will have to be presented again.
10. Use Shunt Relay that has ability to shunt a door contact of separate intrusion detection systems:
    a. When the PACS provides an access grant, a dedicated auxiliary output will first trigger and bypass the door contact of the separate intrusion detection system, and then the door locking mechanism will unlock.
    b. Once the door returns to a secure state, the door contact of the separate intrusion detection system will return to its normal state.

E. Pre-Alarm: Supports a Door Held Open pre-alarm capability as follows:
1. When a door has been held open for a pre-determined amount of time after a valid access grant, a local audible annunciation alerts credential holder to close door.
2. Failure to close the door between the pre-alarm annunciation and the configured door held open time generates an alarm at the Alarm Monitor.
3. Pre-Alarm parameters apply to the following:
   a. Door Held Open time.
   b. Pre-alarm time.
   c. Configurable up to 65,534 seconds.
   d. Provide distinct pre-alarm setting for each door.

F. Card Reader Scheduled Mode Overrides: Supports ability for card reader modes to be overridden from standard mode on a scheduled basis.
1. Based on the card reader type, custom modes include the following:
   a. Card only.
   b. Card and PIN.
   c. Card or PIN.
   d. PIN only.
   e. Locked.
   f. Unlocked.
   g. Facility code.
   h. At end of scheduled override, card reader returns to its default standard mode.
2. Cipher Mode: Supports Cipher Mode, which emulates presentation of a credential to a card reader with a keypad.
   a. In Cipher Mode, an authorized credential holder attempts access by entering their Credential ID/Card Format at keypad.
      1) The card reader treats the information as a magnetic card format read.

      2) The number sequence must match an existing magnetic card format configured in the system, including facility code.

      3) Correct entry of code will allow access.

      4) Incorrect entry of code will be ignored and deny access to card reader.

5) Will not send a transaction to Alarm Monitor.

b. A card reader in Card and PIN Mode and Cipher Mode also requires the credential holder's PIN be entered after original sequence is entered.
c. Changes in card reader mode will not remove a card reader from Cipher Recent Door Transactions. The PACS will provide a form listing the most recent transaction activity associated with a door, without having to run a report including the following:
1) Transaction activity.
2) Time/date.
3) Identity.
4) Token related details.

3. Invalid PIN Attempts Counter: Supports an Invalid PIN Attempts Count on a per card reader basis. Invalid PIN Attempts parameters include, but not be limited to, the following:
a. Unknown PIN entry at a card reader configured as Card or PIN Mode.
b. Invalid cipher entry at a card reader in Cipher Mode.
c. Invalid PIN entered for a given card at a card reader configured as Card and PIN Mode.
d. The Denied PIN Attempts value will be configurable from 0 to 255.
e. The counter rests to zero if the following events occur:
1) A specific user defined number of minutes pass without one of the above denial types.
2) An access grant at the given card reader.
f. When the current Deny Count reaches the threshold configured for the card reader, a Deny Count Exceeded transaction is reported.
1) This transaction will only be reported when the limit is initially reached.
2) It will not report on subsequent denials.
g. Define the number of Invalid PIN Attempts may be presented before generating an alarm to the Alarm Monitor.
4. Supports Macro/Trigger functionality when the Deny Count Exceeded transaction occurs.
a. Actions include, but not be limited to, the following:
1) Lock down the card reader.
2) Annunciating a local siren.
3) Configured to execute for a given card reader.
5. Multiple complementary modes can be assigned per reader.

G. Provide buttons in Graphical User Interface (GUI) that are available to control operational state of the door including the following:
1. Door access.
2. Door mode.
3. Forced and Held status.
4. Door installed status.

H. Door Summary and Status Page: Supports a Door Summary and Status Page that displays a list of doors defined in the system.

1. For each door in the system, the Door Summary and Status Page will display the following:
    a. Door Name.
    b. Current Door Mode.
    c. Door Status including forced and held states, masking states, including communications and tamper states.
    d. Results displayed are able to be filtered by Door Group or by other searchable criteria.

I. Mask Alarm Filters: Displayed on the workstation GUI.
1. Filter operator views to remove Door Forced Open and Door Held Open alarms to the following:
    a. Mask permanently.
    b. Mask during a schedule.
2. Distinct Schedules will be able to be assigned to different Alarm Types.

J. Multiple Card Formats: The PACS, enterprise intelligent field controller, and card readers will support a minimum of 8 card formats; including the following:
1. Wiegand.
2. Magnetic Stripe.
3. The PACS will support any industry standard format that uses the following:
    a. A card number.
    b. A facility code.
    c. An issue code combination.
4. The PACS will support the following:
    a. A maximum 19 digit card number.
    b. Two digit issue codes.

K. Wireless Lock Integration: The PACS will support the following wireless lock integration solutions:
1. Allegion Solution Panel Interface Module (PIM): Schlage wireless locks to communicate with a PIM.
    a. Each PIM will allow wireless connection to up to 32 wireless locks.
    b. There will be RS-485 connection from Mercury controllers to the PIM.
    c. There will be automatic linking to remote wireless access points with 10 channel frequencies.
    d. The solution will support 125 kHz proximity and 13.56 MHz smart cards.

L. End of Line Resistance Configuration: Allows Administrators to define configurations to be assigned to alarm inputs.
1. Standard End of Line Resistance configurations will include:
    a. Independently define Request to Exit and Door Contacts as Normally Open or Normally Closed.
    b. Independently define Request to Exit and Door Contacts as Supervised or Unsupervised.
2. A minimum of 4 custom End of Line Resistance configurations will be available.
3. Configurations will be given a priority of low, medium or high.
4. Configurations include options for low range and high range resistance thresholds.
5. Configuration options include the following input line statuses:
    a. Inactive.
    b. Active.
    c. Ground Fault.
    d. Open.
    e. Short.
    f. Foreign.
    g. Non-Setting.

M. Elevator Control: Provide elevator control as follows:
1. Using standard access control field hardware.
2. Permits restriction of access to certain floors.
3. Does not restrict access to general admittance floors.
4. Card readers located in elevator cab has the capability to do the following:
   a. Control access for a minimum of one floor.
   b. Integrate to Input and Output Control Modules.
   c. Restrict which floor select buttons are accessible when a credential is swiped based on the Identity's access level.
   d. Permit only one authorized floor to be selected per single card swipe.
   e. Not require a swipe by any passenger to access floors programmed as public access.
5. Independently configure individual floors to allow visitor/general access to different floors during different times of the day.
6. Track which floor was selected by an individual cardholder for auditing and reporting purposes.

N. Anti-Passback (APB):
1. Provide area control features including the following:
   a. Hard Anti-Passback.
   b. Soft Anti-Passback.
   c. Timed Anti-Passback.
   d. Two-Person Control.
   e. Occupancy Count:
      1) Minimum Number of Areas Created: 127 areas per PACS appliance.

2. Hard and Soft APB Common Function: In addition to functions specific to Hard or Soft APB, either function will include the following:
   a. Initially (Time 0), credential holders are reset to Area 0.
   b. Credential holders will be allowed to enter a controlled area any time after Time 0 by presenting a Token to an entry card reader.
   c. Credential holders will not be allowed to exit the controlled area unless they have entered the area presenting a Token to the area entry card reader.
   d. Credential holders will not be allowed to enter the controlled area a second time unless the credential holder has exited that area previously.
   e. Credential holders will be able to enter through any entry card reader and exit through any exit card reader of a single controlled area.
   f. A Forgiveness feature that allows the Administrator to give credential holders One Free Pass to allow the PACS to move them into the next area they enter, regardless of their current APB status.
      1) Provide one Free Pass to an individual credential holder, to credential holders in a single enterprise intelligent field controller, and to credential holders in the PACS.

   g. Provide an APB exempt option for privileged and VIP credential holders.
      1) Credential holders with this option will not have APB rules applied to them.

   h. Provide the ability to disabled/closed areas and not allow access into disabled/closed area.
      1) Exception: Those Tokens with APB privileged status.

3. Hard APB:
   a. Requires a Token be used to enter and exit an area.
      1) Provide entry and exit card readers at controlled area portals.

2) Confine entry and exist card readers to a single enterprise intelligent field controller.

3) Logically define areas.

4) Every card reader in the system is not required to be included within the Area Control.

b. Operations:
1) Once in an area, a credential holder must present their Token at an exit card reader of the area they are currently in and wish to leave.

2) Once access has been granted to leave the area and enter a new area, the credential holder must present their Token at an exit card reader of the new area.

3) Should a credential holder present their Token at any other card reader involved in Area APB, the credential holder will be denied access and an alarm will be reported.

c. Nesting: Provide definable, nested control areas (areas inside areas) that include a minimum of 64 entry and exit card readers.
1) Apply Hard APB rules to individual areas within an area and multiple areas that are independent of each other.

4. Soft APB:
a. Requires a Token be used to enter and exit an area.
1) Provide entry and exit card readers at controlled area portals.

2) Confine entry and exist card readers to a single enterprise intelligent field controller.

3) Logically define areas.

4) Every card reader in the system is not required to be included within the Area Control.

b. Operations:
1) Once in an area, a credential holder must present their Token at an exit card reader of the area they are currently in and wish to leave.

2) Once access has been granted to leave the area and enter a new area, the credential holder must present their Token at an exit card reader of the new area.

3) Should a credential holder attempt this, the credential holder will be allowed access (provided the credential holder has appropriate access level to access the new area), and an alarm will be reported.

c. Nesting: Provide definable, nested control areas (areas inside areas) that include a minimum of 64 entry and exit card readers.
1) Apply Hard APB rules to individual area within an area and multiple areas that are independent of each other.

5. Timed APB: Allows an Administrator to decide how long after a credential holder has swiped their Token before the same Token will be accepted again at the same card reader.

a. If a credential holder swipes their Token a second time after initial entry and after the delay time has expired, access will be granted and an APB alarm will be reported into the Alarm Monitor.
b. Administrators will be able to set the delay time up to a minimum of 65,535 seconds.

6. Provide Two-Person Control to restrict access to certain areas unless there are 2 credential holders present.
   a. When an area is configured for Two-Person Control, apply the following criteria:
      1) Card reader will grant access only if 2 valid credential holders (with authorized access privileges) swipe their badges one after the other.
      2) In the event that a second authorized badge is not presented within 10 seconds of the first authorized badge, the card reader will reset and the first card will need to be re-swiped.
      3) Once 2 people occupy an area, individual access will be granted to other credential holders.
      4) Individual exit will be allowed until an area is occupied by only 2 credential holders.
      5) For the last 2 credential holders to exit, both must present their cards at exit reader within 10 second of each other and exit together.

O. Mustering: Allow creation of a dashboard and a map view to quickly monitor who as arrived at a predetermined mustering station.
   1. Mustering area will be defined by administrator to add/ delete identities to each mustering area.
   2. Mustering feature will allow a report of people in each area and have ability to filter the report to display specific identities.
   3. The dashboard will contain dynamic text areas that can be customized by size, shape, color and transparency.
   4. Administrator will be able to place dynamic text areas over a map view.
   5. Import maps with the following formats:
      a. BMP.
      b. GIF.
      c. JPG.
      d. PDF.
      e. PNG.
   6. Provide map view with a real time update of the number of people in each area.

P. Occupancy Count / Control: Restricts number of credential holders that are present in an area at any given time.
   1. Administrator will define Occupancy Controlled area.
      a. Occupancy Limit: Maximum 250,000 credential holders in area at any given time.
   2. Once the occupancy limit has been reached, a credential holder must swipe out of the exit card reader before the next credential holder may enter.
   3. Each area where Occupancy Control is enabled will be definable with up to 64 entry/exit card readers.
   4. Able to define Multiple Occupancy Controlled areas.

Q. Custom Device Mappings / Local Alarms: Administrators may assign a unique group of alarm attributes to specific device-alarm combinations to override global settings of generic attributes.

R. Entry / Exit Delay: Administrators may set entry/exit delays for inputs attached to Input Control Modules, Single Reader Interface Modules, and Dual Reader Interface Module using the following settings:
   1. Non-Latched Entry: Administrators may set an input to non-latched entry.
      a. When non-latched entry mode is selected and an entry delay is specified, the following procedure ensues:
         1) When an input activates, the alarm will not be reported until the entry delay expires.
         2) If the input is active when the entry delay expires, the alarm will be reported.
         3) If the input is not active when the entry delay expires, then the alarm will not report.
   2. Latched Entry: Administrators may set an input to latched entry.
      a. When latched mode is selected and an entry delay is specified, the following procedure ensues:
         1) When an input activates, the alarm will not be reported until the entry delay expires.
         2) If the alarm has not been masked by the time the entry delay expires, the alarm will be reported.
         3) If the input has been masked when the entry delay expires, then the alarm will not report.
   3. Exit Delay: Administrators may set an input to exit delay that activates directly after an input has been unmasked.
      a. When an exit delay is specified, the following procedure ensues:
         1) When an input activates, the alarm will not be reported (operates as if masked) until the exit delay expires.
         2) If the input is still active when the exit delay expires, the alarm will be reported.
         3) If the input is not active when the exit delay expires, the alarm will not be reported.
         4) Administrators will be able to set the entry and exit delay times up to a minimum of 65,535 seconds.

S. Input Control Module Options: Allows the following options to be defined for inputs or outputs in the Input Control Module:
   1. Debounce Time: Allows Administrators to control time that an input state change must remain consistent in order for it to be considered a real change of state.
   2. End of Line Resistance: Administrators may define an Input as Normally Open or Normally Closed and define an input as Supervised or Unsupervised.
   3. Hold Time: Allows Administrators to set the amount of time in seconds to wait to report an input activation as restored when an input goes active and then is restored.
      a. Hold Time Range: From 0 to 15 seconds.
   4. Alarm Masking: Allows input to be masked either all the time or during a defined schedule.
   5. Activate Output: Allows Administrators to configure an output to activate all the time or during a defined schedule.
   6. Installed: Defines whether the PACS will consider the input an active component of the on-line system.

7. Logging: Allows Administrators to determine whether to log change of state events or only when the event is not masked.

T. Relay Output Options: Allows the following options to be defined for outputs in the Output Control Module:
   1. Installed: Defines whether the PACS will consider the output an active component of the on-line system.
   2. Relay Output Mode: Sets default mode of relay output.
   3. Pulse Time: Defines how long output will pulse when command is given.
   4. Schedule: Defines time the relay output is active.

U. Input / Output / Event Linkages: The PACS will support input/output/event linkage whereby an input/output/event in an enterprise Intelligent field controller can trigger an action within the same enterprise intelligent field controller.
   1. Linkage decisions will be made local to the intelligent enterprise controller.
   2. Administrators will be able to create macros.
      a. Each macro to consist of a sequence of actions to be performed.
         1) Example: Changing card reader modes and activating outputs.

      b. Maximum Number of Actions: 30 actions per macro.
   3. Administrators will then be able to link events to macros so that a defined action will trigger a macro to execute.

V. Global Actions: Allows Operators to define an action to be performed.
   1. Action may be scheduled and run manually.
   2. Available action types include the following:
      a. Access group install/uninstall.
      b. Action group.
      c. Door grant.
      d. Door install/uninstall.
      e. Door mask.
      f. Door mode.
      g. E-mail.
      h. Exacq soft trigger.
      i. Input.
      j. Intrusion area.
      k. Intrusion output.
      l. Intrusion point.
      m. Output.
      n. Panel install/uninstall.
      o. Panel micro.
      p. Policy install/uninstall.
      q. Schedule set mode.

W. Global Linkages: Allows Operators to define linkages relating to the following:
   1. Devices, including the following:
      a. Doors.
      b. Inputs.
      c. Intrusion areas.
      d. Intrusion outputs.
      e. Intrusion panels.
      f. Intrusion points.
      g. Output.
      h. Panel.
      i. Sub-panel.
      j. Video camera.
      k. Video server

2. Events.
3. Tokens.
4. Actions.

X. Inputs include any enterprise intelligent field controller level event, including the following:
1. Enterprise Intelligent Field Controller Events:
   a. Cabinet tamper.
   b. Power failure.
2. Input Control Module Events:
   a. Communication loss.
   b. Cabinet tamper.
   c. Power failure.
   d. Input points.
3. Card Reader Events:
   a. Cabinet tamper.
   b. Communication loss.
   c. Door contact tamper.
   d. Door forced open.
   e. Door held open.
   f. Power failure.
   g. Card reader tamper.

Y. Macro actions include, but not be limited to, the following:
1. Activating an Output Control Module Output.
2. Masking/Unmasking an alarm Input.
3. Setting the active mode of a card reader.
4. Activating/deactivating a schedule.

Z. Macros will link to devices and types of inputs will include, but not be limited to, the following:
1. Enterprise Intelligent Field Controller Events.
   a. Cabinet Tamper, Power Failure:
      1) Secure.

      2) Fault.

      3) Alarm.

2. Card Reader Events:
   a. Communication Status.
   b. Cabinet tamper, Power failure, Reader Tamper, Forced Open, Held Open, Door Contact tamper, Aux Input #1, Aux Input #2:
      1) Secure.

      2) Fault.

      3) Alarm.

   c. Access Activity:
      1) Access granted.

      2) Access denied.

      3) Duress.

3. Input Control Module Events:
   a. Communications Status.
   b. Alarms: Cabinet Tamper, Power Failure, Alarm Inputs:
      1) Secure.

2) Fault.

3) Alarm.

4. Intrusion Events:
   a. Points.
   b. Areas.
   c. Panels.
   d. Outputs.
   e. SDI devices.
5. An input/event may trigger multiple Macros and a Macro will be able to be triggered by multiple inputs/events.
6. Supports a minimum of 100 Macros per enterprise intelligent field controller.
   a. Maximum Number of Actions: 30 actions per macro.

2.7 PACS SOFTWARE, IDENTITY MANAGEMENT FUNCTIONALITY

A. Identity Management Integration: Offers an integrated Identity Management and Enrollment functionality as part of the core system functionality.
   1. Data Import: Will import Identity records and their associated image in JPEG, BMP and PNG formats.
   2. Identity records will be able to be pre-loaded prior to implementation or added at any time after deployment.

B. Provide a pre-configured one-time import utility, using standard Comma Separated Value (.csv) files that allows import of Identity information based on the factory shipped data fields.

C. Identity Enrollment: Allows individual enrollment of identities.
   1. Each Identity allows entry of required and optional fields.
   2. Required fields included the following:
      a. User account.
      b. Account password.
      c. Non-activity timeout.

D. Role Base Permissions:
   1. Assign roles during enrollment.
   2. An identity's role will determine their access groups.
      a. Access groups define the following:
         1) Which card readers they have access to.

         2) Which times access to those card readers is allowed.

E. PACS software allows an identity to have access to specific doors or access groups for a specified time range without requiring a role to be assigned.

F. Create and assign Tokens during enrollment.
   1. For each Token, credentials include, but not be limited to, the following:
      a. A Badge ID.
         1) Support a minimum of a 19 digit Badge IDs.

      b. Embossed number.
      c. Assigned PIN codes
      d. Activation and deactivation date.
      e. Associated settings for Anti-Passback (APB).
   2. Optional credential parameters include, but not be limited to, the following:
      a. Adding a Token to a group during enrollment to create predefined Role and Policy Settings that will drive the configuration of the Identity information.
      b. Expiration of the credential due to non-use within a certain timeframe.

1) System wide for every credential.

2) Variable parameters per individual or access level.

3) Individual or access levels can be exempt from expiration.

4) Scheduled time for expiration do to non-use will be at least one year from date of activation.

G. During Enrollment, the Identity's image will be captured or loaded in JPEG format and a Badge template will be assigned.

H. Federal Information Processing Standard Publication 201 (FIPS-201) Support: Enables FIPS 201 compliant validation and registration of Identities through the following:
1. Integration with HID pivCLASS devices.
2. HID pivCLASS Certificate Manager and updating an existing cardholder record or inserting one, if one did not already exist.
3. Supports importing photographs and fingerprint biometrics from government issued smart card that is compliant with FIPS- 201.

I. Allows credential suspension if card certificate serial number is on a designated list, including the following:
1. Certificate Revocation List (CRL).
2. If the FASC-N is on TSA Canceled Card List (CCL).

J. Supports PIV, TWIC, CAC, and FRAC credentials.

K. Credential Re-Issuance:
1. Operator will be able to deactivate existing credentials by marking them as lost or stolen.
2. The PACS will be able to use existing Identity information and photos for new credentials.
   a. The process will not require re-enrollment of credential holders.
3. The re-issuance process will automatically perform the following actions:
   a. Remove access rights from the deactivated Token.
   b. Enable those same rights in the new Token.
   c. Automatically send the appropriate changes to the intelligent enterprise controllers.

L. Identity Database: Each Identity will have a unique record in the Open LDAP directory structure.
1. LDAP Directory Structure will include the use and definition of User Defined Fields and Forms.

M. Deleting Identities: Highest level administrators will be given the ability to perform the following actions:
1. Delete individual Identities.
2. Bulk Delete Identities: The ability to delete a group of identities based on user defined search criteria.

N. Assign Access Groups: Allow Administrators to assign access groups to Roles.
1. A Role will then be assigned to an Identity during enrollment.
2. Each Identity may have up to 8 access groups assigned to their record per intelligent enterprise controller through assignment of one or more roles to their record.

O. Access group modifications or assignments will be automatically downloaded to the appropriate intelligent enterprise controllers:
1. Without Operator intervention.

2. Completed as a push communication immediately after an Identity record is saved. Scheduled, batch updates are not allowed.

P. Supports an Access Group View form that allows Operators to view the following:
   1. Roles that have been assigned to an Identity.
   2. Which access groups are associated with the Role.
   3. What doors an Identity has access to.

Q. Roles: Support a Role Based Permission methodology to be used in conjunction with Identities.
   1. Roles will be assigned to Identities to determine door access as well as access into the system application.
   2. Multiple Roles will be able to be assigned to an Identity.
      a. A Parent/Child relationship can be defined, per Role.
      b. Duplicating Role information for multiple roles will not be required.
   3. Identities will aggregate all Role assigned permissions.
   4. Each Role will have a defined start and stop date.
      a. To allow assignment of Roles on a temporary basis.
      b. Roles can be manually activated or deactivated through the use of a checkbox.
   5. Each Role will consist of any combination of the following components that will determine which Roles an Operator will be able to assign to other Identities during enrollment:
      a. Access groups.
      b. Delegation assignments.
      c. Role assignments.

R. Image Capture Device: Support IP-based cameras for Photo Capture.
   1. The Operator will be able to view a live image on screen of the Identity to move them into a proper pose or position prior to freezing the image.
   2. If the Operator is not satisfied with the captured image, they will be able to revert to a live view and freeze a new image.
   3. Configuration settings for IP cameras, as well as viewing a live and still image of a person will be user-configurable.

S. Photo Capture: The PACS will support Photo Capture through use of an IP-based camera.
   1. The Operator will be able to view a live image on screen of the Identity to move them into a proper pose or position and then be able to freeze the image.
   2. If the Operator is not satisfied with the captured image, they will be able to revert to a live view and freeze a new image.

T. Support the ability to import photos in standard JPEG format from digital cameras or other image capture sources.

U. Allow the captured photo to be cropped via use of the mouse to define the crop window.
   1. Only information inside the crop window will be saved and stored in directory structure.
   2. Images will be associated with the Identity and will be stored in the Open LDAP directory.

V. Token Activation and Deactivation Dates: Supports activation and deactivation dates for Tokens created.
   1. A Token will be able to be configured to activate at a future date from time of creation.
   2. When a Token reaches its deactivation date/time, the PACS will automatically deactivate the access rights associated with the Token.
   3. Access rights of a Token will be eliminated after deactivation date.
   4. Should Identity become authorized for access again, new access rights will be applicable to the same Token.

a. Re-issue will not be required.

5. Expiration of Credential Due to Non-Use: Credentials can be set to expire if not used within a timeframe determined by Operator.
   a. Parameters include the following:
      1) System wide for every credential.
      2) Variable parameters per individual or access level.
      3) Individual or access levels can be exempt from expiration.
      4) Scheduled time for expiration do to non-use will be at least one year from date of activation.

W. Token Audit Trail: Keep an on-line record of Tokens issued to an Identity.
   1. For each record, details will be recorded including activation and deactivation dates, Token status, and Token ID.

X. Token Issue Codes: Support a minimum of a 2-digit issue code.

Y. PIN Codes: Support up to 8-digit PIN codes.
   1. Each credential holder in the PACS will be able to choose a PIN to be associated with their record.
   2. A credential holder's PIN will be able to be changed should the original PIN code be compromised.
   3. An Identity will be able to be exempted from PIN requirements within the system.

Z. Credential Options: Support industry standard pre-encoded physical credential options including:
   1. Composite Credentials.
      a. Example: PVC cards, mobile credentials.
   2. Proximity Credentials including dual PVC technology that includes both proximity and magnetic stripe technology.
   3. Contact Smart Credentials.
   4. MiFare Credentials.
   5. DESFIRE Credentials.
   6. HID iClass Credentials.

AA. Last Access Information: A credential holder's last entry point will be indicated as follows:
   1. Displays on the main Identity form.
   2. Include date/time stamp for when entry occurred.
   3. If a credential holder has multiple Tokens, the Tokens' form will also show the last entry point with date/time stamp for each Token in a credential holder's possession.

BB. Last Identity Record Modification: Display date and time of last modification to that Identity record from main Identity form.

CC. Multiple Active Tokens: Allow Identities to have multiple active Tokens associated with their record.
   1. Number of Active Tokens: Minimum of 25 active Tokens may be assigned to an Identity.

DD. Dual Sided Credential Printing: Allow for printing on both sides of a credential.

EE. Revoke Credential Access: Allow Operators to revoke access privileges from a credential holder by updating that credential holder's Token status.
   1. A Token with Revoked access will immediately stop functioning at card readers.

FF. Search Capabilities: Support search for Identities according to the following parameters:

1. First Name.
2. Last Name.
3. Identity.
4. Token field in the system.

GG. Allow multiple field-based Identity / Token searches using AND / OR logic.
1. Filters include, but not be limited to, the following:
    a. Equals.
    b. Starts with.
    c. Ends with.
    d. Contains.

HH. Pick List Builder: Include a pick list builder that allows Administrators to define Operator selection options that appear in Identity form pick lists.
1. Each pick list will have an unlimited number of pre-defined selections.

II. Support the following standard Identity and Token fields:
1. Last Name.
2. First Name.
3. Middle Name.
4. External System ID.
5. Address.
6. City.
7. State.
8. Zip.
9. Phone.
10. Work Phone.
11. Email Address.
12. Title.
13. Department.
14. Division.
15. Site Location.
16. Building.
17. Last Record Modification.
18. Status.
19. Type.
20. Issue Date.
21. Login.
22. Password.
23. Password Confirmation.
24. Inactivity Timer.
25. Last Door Accessed.
26. Last Time Accessing Last Door.
27. Photo.
28. Embossed Number.
29. Internal Number.
30. PIN.
31. Token Status.
32. Issue Level.
33. Activate Date.
34. Deactivate Date.

JJ. Transaction Activity: Provide a form listing the most recent transaction activity associated with an Identity, without having to run a report.
1. Information provided will include the following:
    a. Transaction activity.

b. Time/date.
c. Related Token.

KK. User-defined Fields: Support the ability to add additional Identity-based forms to support user-defined fields.
1. Up to 10 user-defined forms will be able to be added.
2. Each user-defined field will be given a field name/label and be defined as one of the following field types:
a. String.
b. Integer.
c. Boolean.
d. Date.
e. Text box.
3. Up to 300 user-defined fields will be available.

LL. Badge Layout Tool: Support a tool to allow for the custom creation of Identity/Token Badge Layouts.

MM. Support Badge sizes required by Owner and supported by printer used for to create Badges.

NN. Allow multiple objects to be configured for a badge layout including:
1. Alphanumeric text fields.
2. Database fields.
3. Photos.
4. Identity photos.
5. Graphics.

OO. Each text and database field added to the layout will be able to employ the following properties:
1. Location of the object.
2. Height and width.
3. Background color.
4. Rotation.
5. Typeface of text.
6. Size of text.
7. Color of text.
8. Horizontal and vertical alignment of text.

PP. Each photo and graphic field added to the layout will be able to employ the following properties:
1. Location of object.
2. Height and width.
3. Maintain aspect ratio.
4. The PACS Badge Layout tool will support a color palette that supports a minimum of 16.7 million colors that can be applied to applicable objects.

2.8 PACS SOFTWARE, ALARM AND EVENT MONITORING

A. System Level Events: Events configured at the system level; for example: Door Forced Event, if configured at System Level will affect all doors in the system.

B. Field Level Events: Events configured at the field controller level and only affect that particular controller. For example: Door Forced Event configured as local event (Field Event), will only affect the door it is configured on, all other doors will follow the System Level Event.

C. Tabbed User Interface: Supports a tabbed view for Monitor User Interface of the following tabs:
   1. Event Monitor: Used to monitor system level events.
      a. Example: Operator activity and field level events.
   2. Alarm Monitor: Used to monitor field level events.
      a. Example: Identity access activity, input alarms, and door alarms as well as system level events configured as alarms.
   3. Swipe and Show Verification: Used to view Identity information in real-time as credential holders access specific doors.
   4. Search: Used to search for alarm and event transactions currently stored in the PACS.
   5. Hardware Status: Used to view the real-time status of field hardware devices configured in the system, as well as to manipulate/override those devices.

D. Alarm Annunciation: Allows Administrators to configure how alarms and events annunciate into the Alarm Monitor.
   1. Support audible notification at workstation when alarms arrive in the system.
      a. Allows Users to adjust the configuration and parameters.
      b. Allows Administrators to choose a specific sound to pair with each type of alarm.

E. Provide the following configuration options for alarms and events:
   1. Display in Alarm Monitor.
   2. Masking from displaying in Alarm Monitor.
   3. Allows higher alarms to be displayed on top of Alarm Monitor when an Operator sorts based on alarm priority.
   4. Display text instructions that guide Operator in alarm response.
   5. Automatically sends an email message to one or more recipients.
   6. For video related alarms and events, automatically launches Video Player to display live video feed from camera associated with generating alarm or event.

F. Alarm Management and Handling: Provides a real-time count of alarms and events in Alarm Monitor awaiting Operator action.

G. Supports the following options for handling / responding to alarms and events upon selection:
   1. Acknowledge the alarm.
   2. Review text instructions on pre-defined alarm response.
   3. Enter unlimited notes on reason for alarm and action taken in alarm response.
   4. Review the history of the alarm.
   5. For alarms and events that include a credential holder, call up the Identity Record of that credential holder.
   6. Clear the Alarm: Provide 3 types of alarm clearing as follows:
      a. Single Operator Enabled Clearing: Only one Operator is required to clear the alarm from the Monitor.
      b. Two-Person Control Clearing: Requires the following sequence of actions:
         1) First: One Operator is required to acknowledge the alarm.
         2) Second: After alarm has been acknowledged, a different Operator is required to clear the alarm from the Monitor.
      c. Role-Based Clearing: Allows System Administrators to assign a Role or Roles to the alarm.
         1) Only the Operator assigned one of the Roles assigned to an alarm is allowed to clear the alarm from the Monitor.

H. Bulk Alarm Management and Handling: Supports the ability to manage and handle multiple alarms.
   1. Operators may clear or acknowledge all selected alarms in a single action.

I. Alarm Routing: Allows Identity-based alarm routing to specific Identities monitoring the application based on the following:
   1. Schedule.
   2. Event type.
   3. Device.

J. Alarm Masking: Allows masking of specific alarms or alarm types based on pre-defined schedules or via manual overrides.
   1. Masked alarms will not report into the Alarm Monitors.
   2. Logging the transaction database for reporting and audit trail will not be affected by Masked status.
   3. An Operator will be able to mask or unmask any alarm point in the system based on permissions.

K. Alarm Sorting: Allows alarms and events to be sorted in Alarm Monitor by currently configured viewable columns.

L. Alarm Prioritization Color Bars: Provides capability to emphasize alarm priority through use of colored bars within alarm monitor screen.
   1. Each alarm priority has its own unique user-defined color assigned to it.
   2. Color bars may be assigned to individual alarm priorities or to a range of alarm priorities.

M. Column Configuration: Allows Administrators to define which columns are displayed in Alarm Monitor.
   1. Administrators may set column order of the Alarm Monitor and includes the following columns:
      a. Time.
      b. Last Access.
      c. Token Expire Date.
      d. Token Issue Date.
      e. Panel Date.
      f. Priority.
      g. Operator.
      h. Identity First Name.
      i. Identity Middle Initial.
      j. Identity Last Name.
      k. Card Number.
      l. Embossed Number.
      m. Message.
      n. Event Name / Description.
      o. Event Type.
      p. Panel.
      q. Source.
      r. Location.
      s. Alternate Source.
      t. Input Address.
      u. Event Address.
      v. Source Type.
      w. Flags.
      x. Status.
      y. Issue Level.
      z. Role.

N. Email Capabilities: Supports integrated email capabilities.
   1. Generates an email message to send to one or more recipients upon a generated alarm or event.
   2. Email function interfaces with email servers that uses SMTP protocol.

O. Events Monitoring: Supports an Event Monitoring tab that monitors system level events.
   1. An Operator may choose which field columns to display and may place those columns in their order of preference.
   2. The Operator may sort events by currently displayed columns in the Event Monitor.
   3. Administrators may configure the number of recent events to display in the Event Monitor upon accessing Events tab.

P. Field Hardware Device Status Summary Counter: Supports a real-time Field Hardware Device Status Counter displaying a summary of the total number of doors, input points, intelligent enterprise controllers, and sub panels that are active, masked, and off-line.

Q. Field Hardware Device Status Tab: Supports real-time system status that depicts configured field hardware devices.
   1. List the following information in the real-time system status tab:
      a. Intelligent enterprise controllers.
      b. Input Control Modules.
      c. Alarm inputs.
      d. Relay outputs.
      e. Card readers.
      f. Hardware status shows the following real-time status of the devices listed immediately above:
         1) On-line versus off-line.
         2) Alarms activated.
         3) Masking status.

R. System status includes the following 3 counters:
   1. Active Counter: Counts number of active points.
   2. Offline Counter: Counts number of offline devices.
   3. Masked Counter: Counts number of masked points.

S. Hardware Status tab displays hardware devices separately in their own row including the following information:
   1. Device Name.
   2. Intelligent Enterprise Controller / Input Control Module / Output Control Module Name.
   3. Current Device Status.

T. Allows Operators to change the access mode of card readers, open doors, mask/unmask alarm inputs, and activate/deactivate/pulse and output from the tab.
   1. Allows Operators to change the access mode of multiple devices with a single action by selecting multiple devices and then performing the command.

U. Supports integration with Life Safety Power's (LSP) N1 network module.
   1. When configured, LSP power supply link appears in Field Hardware Device Status tab.
   2. When link is clicked, the N1 diagnostic and configuration window will appear.

V. History Record Call-Up: Supports the ability to call up the history of an alarm.
   1. History call up window displays associated alarm information including the following:
      a. Time/date stamp.
      b. Acknowledgment actions by Operators.

c. Entered notes.

2. Operator will not be required to exit Alarm Monitor to access this information.
   a. This functionality will not prevent additional alarm activity from reporting to Alarm Monitor.

W. Identity Record Call-up: Supports ability to call up Identity form to display Identity Record associated with alarm.
1. Identity call up window displays Identity's information and photo.
2. Operator will not be required to exit Alarm Monitor to access this information.
   a. This functionality will not prevent additional alarm activity from reporting to Alarm Monitor.

X. Operator Control of Field Hardware Devices: Allows Operators to manually control the state of field hardware devices and their input/output points from the Alarm Monitor.
1. Card Readers:
   a. Manually control reader state or based on current schedule:
      1) Unlocked.
      2) Locked.
      3) Facility code.
      4) Card Only.
      5) PIN Only.
      6) Card and PIN.
      7) Card or PIN.
      8) Pulse the Door Open.
      9) Mask/Unmask.
      10) Door Forced Open/Door Held Open.
      11) Disable the Door.
      12) Restore the Door to its Correct State.
      13) Inputs: mask and unmask input.
2. Outputs:
   a. Manually control reader state or based on current schedule:
      1) Turn on.
      2) Turn off.
      3) Pulse outputs.

Y. Operator will control field hardware devices from Hardware Status tab.

Z. Uses a Last Command Wins methodology.
1. Example: If an output is set to off due to a schedule and an Operator manually turns it on, then the output will remain on until it is manually turned off or until the next scheduled interval occurs.

AA. Manual controls will be recorded in Operator Audit log, including the following information:
1. Time of the change.
2. Operator performing function.

3. Description of activity performed.

BB. Maps: Supports the import of graphic map backgrounds in the following formats:
1. Bitmap (.bmp, .dib).
2. JPEG (.jpg).
3. Portable Network Graphics (.png).
4. TIFF (.tif).
5. Windows Metafile (.wmf, .emf).
6. Encapsulated Post Script (.eps).

CC. Administrator may place system icons for the following hardware devices to indicate their location in facility:
1. Card readers.
2. Input & output points.
3. Video cameras.
4. Other access control field hardware.

DD. Zoom Capabilities: From the Map, operators may zoom in or zoom out on a camera's view and be able to:
1. Acknowledge an alarm.
2. Change the Access Mode of Readers.
3. Mask/Unmask Inputs.
4. Pulse, Set ON/OFF of Relay outputs.
5. Launch a Video "Window".

EE. System Status Indicators: The Alarm Monitor will provide status indicators to display current status of multiple elements of The PACS including the following:
1. Total number of pending Unacknowledged Alarms and Events.
2. Status (including off-line, active, and masked) of the following field hardware devices:
   a. Intelligent System Controllers.
   b. Subpanels.
   c. Card readers.
   d. Inputs.
   e. Outputs.
3. Hardware status tab will show devices that are in alarm, as well as on-line /off-line status, for field hardware devices.

FF. Swipe and Show: Supports Swipe and Show functionality that allows display of credential holder's photo as they swipe their badge through a specified card reader.
1. Up to 4 card readers will be active for swipe and show in each browser window.
2. Swipe and Show: Allows Operators to verify the credential holder to their photo as they enter a portal.

GG. Intrusion Panels: Allows Operators to monitor intrusion panel statuses as well as monitoring and controlling related points, areas and outputs.
1. Intrusion Panel Statuses:
   a. Operators may sort and search/filter the listed statuses.
   b. For each panel indicate the status of the following:
      1) Battery.
      2) Power.
      3) Tamper.
      4) Phone Line.
2. Intrusion Areas:
   a. Areas will be able to be armed using the following options:

1) Instant Arm.

2) Delay Arm.

3) Force Instant Arm.

4) Force Delay Arm.

5) Perimeter Instant Arm.

6) Perimeter Delay Arm.

7) Perimeter Force Instant Arm.

8) Perimeter Force Delay Arm.

b. Operators may easily disarm areas.
c. Operators may silence alarms.
d. Area details will display the following intrusion area statuses:
1) Armed.

2) Ready to Arm.

3) Not Ready to Arm.

4) Partial Arm.

5) Trouble.

6) Alarm.

e. Operators may sort and search/filter the listed statuses.

3. Intrusion Points:
a. Operators may bypass and unbypass points.
b. Point, area and panel details will display the following intrusion point statuses:
1) Normal.

2) Faulted.

3) Bypassed.

4) Trouble.

c. Operators may sort and search/filter the listed statuses.

4. Intrusion Outputs:
a. Operators will be able to activate and deactivate outputs.
b. Output and panel details will display with the following output statuses available:
1) Inactive.

2) Active.

3) Trouble.

c. Operators will be able to sort and search/filter the listed statuses.

2.9 PACS SOFTWARE, SYSTEM CONFIGURATION AND ADMINISTRATION

A. Provide Administrators with a “localization” function that has the ability to utilize separate languages per identity.
1. Languages supported:

a. English.
b. German.
c. Spanish.
d. French.
e. Italian.
f. Brazilian Portuguese.
g. Russian.
h. Simplified Chinese.

2. Up to 50 operators can be assigned a predefined language.
3. Languages can be changed from the following locations:
   a. Account View.
   b. Identity profile.

B. Alarm and Event Logging: Track and keep a comprehensive log of alarm and event activity, including the following information:
   1. Alarm Name.
   2. Time and Date Stamp.
   3. Where the alarm occurred.
   4. Acknowledgment information.
   5. Operator actions associated with alarms or events.

C. Administrators may suppress certain alarms from logging during pre-defined scheduled times of the day.

D. Alarm and Event information can be viewed through the PACS reporting engine that lists total number of alarms and events logged in PACS appliance.
   1. The number of stored alarms and events will be limited only by the amount of disk space available in The PACS appliance.

E. Operator Session Timeout / Logout: Supports an Auto Logout feature that allows the system to automatically log an Operator out of the system after a period of inactivity.
   1. Provide the following auto logout timeout options:
      a. 10 minutes.
      b. 15 minutes.
      c. 30 minutes.
      d. 60 minutes.
      e. One hour.
      f. Indefinite: A selection available to not log out an Operator regardless of inactivity length.

F. Delegations: Protect permission of Major PACS features and functions through use of delegations.
   1. Each Operator Account will be assigned a Role, which includes a list of delegations assigned to that Role.
   2. Operator access to PACS screens will be controlled though delegations.
      a. Access includes the Operator’s ability to view, add, edit, or delete PACS objects.

G. Software Based Licensing: Supports software-based License Enforcement model.
   1. A hardware key or dongle for controlling licensed features and functionality is not allowed.

H. Appliance Diagnostic Information: Supports the ability to analyze real-time diagnostic information for each PACS appliance by viewing the About Page for the appliance.
   1. Diagnostic data includes the following:
      a. Number of days online.
      b. Current load.

c. Memory.
d. Disk space usage.
e. Network communications data.

I. On-Line, Context Sensitive Help: Supports on-line, context sensitive help to assist system users in the operation of the system.
1. Once inside the help program, users may navigate the help files, moving to other areas of the documentation without having to go back into the application software.
2. Help files will have links to the table of contents and will have search capability.

J. Operator Accounts: Supports Operator Accounts.
1. Operator Accounts will require a unique user name password to access the system.
2. Operator Accounts will be assigned a Role, which determines the permission level for that account.
3. Modifications to an Operator Account will be reported to the Event Monitor and logged to the LDAP directory structure for audit and reporting processes.
4. The PACS supports as many Operator Accounts as configured identities.

K. Password Protection: Operator Accounts will require a unique user name and password that would tie that identity to delegation rights to access the PACS.
1. This denotes Operator access to the following:
a. Screens the Operator can access.
b. Tasks the Operator can perform.
2. An Operator will be able to change their PACS password at any time.
3. Strong Password parameters will be supported.
a. Requiring system users to enter at least eight characters.
b. Include at least one upper case letter, one lower case letter and one numeral.

L. Duplicate PINs: Support the use of duplicate PINs.
1. When enabled, this feature restricts available door modes to the following:
a. Card and PIN.
b. Card only.

M. Policies: Support Policies that will act as templates to be applied to field hardware devices in the system to ease in configuration of similar devices.
1. Each Policy will consist of a template for card readers, inputs, or outputs.
2. The PACS will support an unlimited number of policies.

N. Groups: Support Grouping of parameters for ease of configuration, including, but not be limited to, the following Grouping concepts:
1. Roles.
2. Field Hardware Devices.
3. Policies.

O. System Partitioning: Provide the capability for advanced system partitioning.
1. Each partition will be allowed its own group of identities, field hardware, and parameters.
a. Example: Schedules and access groups.
2. Identities will be allowed to belong to one or multiple partitions.
3. Partitioning will provide a flexible “tenant/landlord” architecture whereby partition users can only view, add, modify, and delete identities, system parameters, and field hardware that belong to their respective partitions.
4. PACS Operators may be assigned to more than one partition.
a. A partition may be assigned to more than one Operator.

P. Operator Activity Logging: Track and keep a comprehensive log of Operator Account activities.

1. Changes that occur in directory structure will be logged including the following:
   a. Operator Account Login / Logout Activity.
   b. Adding, Deleting, or Changing Identity Records.
   c. Change to system configurations including the following:
      1) Field hardware.
      2) Access Groups.
      3) Schedules.
   d. Activity performed inside the Alarm and Event Monitor including the following:
      1) Acknowledging alarms.
      2) Opening doors.
      3) Clearing events.

Q. Logged activities include, but not be limited to, the following:
   1. Operator Account.
   2. Date and time of the activity.
   3. Activity that was performed.
   4. Original data prior to change, if applicable.
   5. New data that was updated.

R. Operator Account activity information can be viewed through PACS reporting engine that lists total number of Operator events that are logged in the PACS appliance.
   1. The number of stored Operator Account events will be limited only by the amount of disk space available in the PACS appliance.

S. System Scheduler Utility: Allow System Administrators to schedule actions the following:
   1. On-demand or single-use.
   2. Recurring basis.
   3. Types of actions include the following:
      a. Running reports.
      b. Updating identity profiles.
      c. Apply door modes.
      d. Running global actions.
   4. Scheduling Utility will satisfy a wide range of scheduling needs, including the following:
      a. Hourly: For example, “Every day on the hour”.
      b. Specific Day, specific time: For example, “every Monday at 8:00 am”.
      c. Monthly: For example, “the first Sunday of every month”.
      d. Specific Recurring Date: For example, “Every February 29th @ noon”.
      e. Specific Date in the future: For example, “December 7, 2017 @ 5pm”.
      f. Recurring activities can be set to the following:
         1) A master start and stop date.
         2) Run indefinitely.

T. The Scheduling Utility will provide a job monitor allowing the System Administrator to observe the following:
   1. Status of currently running tasks.
   2. A chronological list of future scheduled tasks.
   3. A history log of completed tasks.

U. Reports: Support a minimum of 28 standard reports as follows:
   1. Administrators may create Reports in the following formats:
      a. PDF document.

b. Spreadsheet document.

2. Once a Report is created, the Administrators may take the following actions with the report:
   a. Save Report to a file.
   b. Print Report to a local or networked printer.
3. Each report will be able to be customized / filtered on relevant data for that particular report.
4. Standard PACS reports will include the following:
   a. Access Grant via Operator Report: The Access Grant via Operator Report will present information on access grant activity that was manually generated by an Operator and will include the door that was opened, time, and Operator executing the door grant.
   b. Access Group Report: Presents information on defined PACS Access Groups, including the following:
      1) Roles that are assigned to group.
      2) Schedule assigned to group.
      3) Number of doors assigned to group.
      4) List of doors assigned to group.
   c. Action Audit Report: Presents information on system events and includes the following information:
      1) Panel date (and UTC date).
      2) Event name and type.
      3) Panel and source names.
      4) Source location and alternative name.
      5) Name of related Operator.
   d. Alarm Report: Presents information on alarms that occurred in the system including the following information:
      1) Panel Name.
      2) Operator action taken.
      3) Operator responding to alarm.
      4) Operator Notes pertaining to alarm.
   e. Appliance Report: The Gateway Report presents information on each defined PACS appliance, including the following:
      1) PACS appliance type.
      2) DNS name and domain.
      3) Local time zone and Daylight Savings Time settings.
      4) List of field hardware manufacturers are enabled.
      5) List of Intelligent Enterprise Controllers are configured to report to the panel.
   f. Area Identity Report: Presents information on Areas. Each area entry will include the following information:
      1) Area name.

2) Last and first names of the Identity.

3) Last accessed door and time.

4) Identity type.

5) Token internal number.

g. Area Report: Presents information on defined Areas. Each area entry will include the following information:
   1) Area name.

   2) PACS appliance where the area exists.

   3) Doors assigned to the area.

h. Audit Log Report: Presents information about each change made to The PACS by an Operator. Each Audit log entry will include the following information:
   1) A date/time stamp.

   2) Description.

   3) Operator who made the change.

   4) Type of change.

   5) Details of the change.

   6) Original information prior to the change.

i. Camera Report: Presents information on each camera configured in the system including Camera Name and its attributes.

j. Collaboration Report: Presents information on defined PACS collaboration scripts, including collaboration type and if the collaboration is active.

k. Delegation Comparison Report: Presents information comparing the delegations assigned to each identified role.

l. Delegation Report: Presents information on defined PACS delegation groups, including which identities have been assigned to the delegation and what permission have been configured for that delegation.

m. Door Configuration Report: Presents information on the complete configuration / settings of each door configured in the PACS.

n. Door/Identities with Access Report: Presents information on credential holder access to each door in the PACS, including the schedule that credential holder can access door.

o. Event Report: Presents information on defined events in the system along with their attributes including the following:
   1) Event Name.

   2) Assigned Event Type.

   3) Priority.

   4) Masking Schedule.

   5) If the event is configured to always mask and log the event.

p. Event Type Report: Presents information on each defined PACS Event Type, including the following:
   1) Suppression Schedule.

2) Priority.

3) Retransmission Time.

4) Retransmission Procedure.

5) Procedure.

6) If the Event Type is set to be masked, logged, and sent to the Alarm Monitor.

q. Group Report: Presents information on defined Groups, including the following information:
   1) Group Name.

   2) Type.

   3) Members' information.

r. Holiday Report: Presents information on each defined holiday, including the following information:
   1) Date of the holiday.

   2) Number of days the holiday is in effect.

   3) Holiday type(s) assigned to the holiday.

s. Identity Photo Gallery Report: Presents information on each defined Identity, including first and last names, role and photo.

t. Identity Summary Report: Presents information on each defined Identity with respect to Identity Status and Type, Token(s) issue and expiration date, and which Roles and Access Groups have been assigned to the Identity.

u. Identity/Doors with Access Report: Presents information on each defined Identity with respect to which doors they have access.
   1) Reports include the schedule in which access has been granted to each reader as well as the Access Group and Role assignments that allow access to each reader.

v. Panel Report: Presents information on complete configuration/settings of each Intelligent Enterprise Controller configured in the PACS.

w. Policy Report: Presents information on defined policies in the PACS, including the following information:
   1) Policy Name.

   2) Active Status.

   3) Which hardware components the policy encompasses.

x. Role Report: Presents information on each defined Role, including the following information:
   1) Parent information.

   2) Activation/deactivation dates.

   3) Child Roles.

   4) Identities assigned to that Role.

   5) Access Groups assigned to that Role.

6) Doors assigned to that Role.

y. Schedule Report: Presents information on each defined Schedule, including its mode and each interval configured, and including the following information:
1) Days of the week.

2) Holiday types.

3) Start and end times of the interval.

z. Token Report: Presents information on tokens in the system including the following information:
1) Token number.

2) Identity to whom the token is assigned.

3) Active / de-active status.

aa. Tokens Pending Expiration Report: Presents information on tokens that expire within a defined period, including the following information:
1) Internal number.

2) First and last name of the cardholder.

3) Embossed number.

4) Expiration date.

5) Days until expiration.

bb. Transaction Report: Presents information on each transaction generated at the field hardware level, including the following transaction log event information:
1) Date/time stamp.

2) Event source.

3) Event name and type.

4) Identity and Token information.

cc. Quick Reports: The PACS will support Quick Reports.
1) Each of the standard reports defined in the “Reports” paragraph of this Section will be able to have relevant data filters applied to them, prior to running, in order to provide a report with more specific information than the generic report. Quick Report settings are designed to run once and will not be saved.

2) Administrators may create Quick reports as delimited spreadsheet data or PDF.

dd. Custom Reports: The PACS will support Custom Reports.
1) Each of the standard reports defined in the Reports section will be able to have relevant data filters applied to them, prior to running, in order to provide a report with more specific information than the generic report.

2) Custom Reports will be designed to run multiple times and will be saved in the Custom Reports form for fast future execution.

3) Administrators may create Custom reports as delimited spreadsheet data or PDF. Each Custom Report will be given a unique name to identify it in the Custom Reports list.

V. Remote Support: The PACS will have remote support capability to allow Value Added Reseller or Manufacturer to access customer's appliance for the following:
1. Troubleshooting.
2. Diagnostics.
3. Load review.
4. Assistance with configuration.

W. The PACS will offer the ability to obtain software log data out of the system appliance Logs for further application support.

X. Grid Based Replication: The PACS will support automated grid based replication architecture of the appliance directory structure for customers that deploy multiple appliances.
1. Replication architecture will be peer-to-peer and not require a dedicated database server to enable replication of identities and configuration data across appliances.
2. The PACS will support encrypted communications between appliances using SSL Encryption.
3. Replication will allow the LDAP data of appliances to be synchronized with each of the others in the system, allowing for the PACS appliance to rebuild itself from replicated data found on another appliance found in the system.

Y. Hot Standby Functionality: The PACS will support a hot standby, auto-failover architecture.
1. For each appliance, a Hot Standby appliance will be configured to monitor the status of its primary partner device.
2. Should an appliance fail to function, the hot standby appliance will be able to automatically detect a problem and assume control of the system.

Z. Software Updates: The PACS will support updates by download from software manufacturer's web site, or by receiving emailed update files.
1. No physical interaction with PACS appliance will be required to perform a successful update and upgrade to system software.

AA. System Backups: The PACS will be able to backup and restore the LDAP directory structure.
1. Backups will run concurrently with the rest of the system and will not require Operators to log out of the PACS.
2. Backups will include transaction data and system configuration data.
3. Appliance backups be encrypted using AES Encryption.
4. Appliance backups to the following:
    a. USB Storage Device.
    b. Windows shared Directory or network shared folder.
    c. Secured SCP servers.
5. Backups will be performed as follows:
    a. Automatically on a predefined daily schedule.
    b. Manually via the user interface.

BB. Elegant Restart and Shutdown of Appliance: The PACS will support Elegant Restart and Shutdown capabilities of the Appliance.
1. The PACS User Interface will support both re-start and shutdown of the Appliance.
2. Rights and access to re-start and shutdown of the Appliance will be denoted by login.

CC. Global Time Display: The PACS will support localized date and time display.

DD. System Data Logs: The PACS will support system data logs to assist with diagnostics and troubleshooting.
1. Standard logs will include the following:
   a. Web server logs.
   b. Field hardware communication logs.
   c. System software logs.
   d. System transaction logs.
2. Logs will be viewable in a plain text format.

2.10 PACS SOFTWARE, VIDEO MANAGEMENT SYSTEM (VMS) INTEGRATION

A. Integration with Digital Video Servers: The PACS will support digital video integration with digital video servers including the following:
1. Avigilon.
2. NVR (network video recorder).
3. NVMS (network video management server).
4. VMS (video management system).
5. DVR (digital video recorder).

B. Digital video servers will be integrated with Alarm Monitors and perform as follows:
1. Alarms generated by the system will link to live and recorded video on the video management system (VMS).
2. Alarms and events in the PACS will be able to be associated with a digital video clip in real-time.
3. Each alarm and event in the PACS will trigger the VMS to store:
   a. A pre-defined number of seconds of video before the event occurred.
   b. A pre-defined number of seconds of video after the event occurred.

C. LAN/WAN Connectivity: The PACS will support connectivity for streaming live video of a camera or for reviewing stored recorded video of alarm and event activity in the Alarm Monitor across datacom networks including the following:
1. LAN/VLAN/WLAN (Local Area Network/Virtual LAN/Wireless LAN).
2. WAN (Wide Area Network).
3. MAN (Managed Area Network).
4. VPN (Virtual Private Network).

D. Device Association: Each access control field hardware device configured in the PACS will be associated with a camera from the VMS.
1. An unlimited number of device associations will be possible.
2. A camera will be associated with multiple access control hardware devices.
3. An access control hardware device will be associated with multiple cameras.
4. Where multiple cameras are associated to a single access control hardware event or alarm, associated cameras will appear in video player in the appropriate matrix view.

E. Pre-Roll and Post-Roll Marking of Event Based Video: When an alarm triggers, the PACS will notify the VMS to mark a pre and post roll time for the associated recorded video clip.
1. Pre-Roll will be the number of seconds of video that the VMS will store previous to the event time.
2. Post-Roll will be the number of seconds of video that the VMS will store after an associated event is generated.
3. The pre and post roll times will be configurable up to 100 seconds.

F. Stored Video Events: Each alarm / event condition will mark the start of a video event or the end of a video event in real-time.
1. Example: When a door held open is activated, the VMS will mark the start of the video event.
   a. When the alarm restores, the VMS can mark the end of the video event.

G. VMS Event Reporting: The PACS will support following incoming VMS events:
   1. Panel Offline/NORMAL Panel Offline: This event reports connection losses and restores of the digital video servers.
   2. Motion Detection / No More Motion Detected: This event reports motion events from cameras on the VMS.
   3. Video Loss / Video Restored: This event reports connection losses and restores of analog cameras connected to the VMS.
   4. Connection Loss / Connection Restored: The event reports connection losses and restores of IP Cameras connected to the VMS server.

H. Video Recall: Upon generation of an alarm that has associated video, the Operator will be able to recall the video segment associated with the alarm.
   1. Once launched, the Operator will be able to adjust the start and end time of the video segment.

I. Video Player: The Video Player will support a Matrix View for On-line cameras.
   1. The number of video windows in matrix will be dependent on frame rate and resolution of cameras / number of video clips viewing.
   2. The Matrix view will allow sizing the matrix windows.
   3. The PACS will provide the ability to launch more than one camera on a generated alarm.
      a. When an alarm with multiple cameras is generated, a matrix window will launch displaying associated cameras.
      b. The Operator will also be able to switch between other cameras if the device that generated the event has more than one camera associated with it.
   4. Operators will be able to concurrently playback recorded video from any clip, even as that video clip is being recorded.
   5. The Operator will have the option to switch to Live Mode from a camera at any time during the operation.
   6. The digital video player will show the date and time of the video clip frame, as well as the current mode of the player (play or live).
   7. Playback Control: The PACS will provide the following playback controls for viewing recorded video by the Operator:
      a. Start and Stop Playback: Starts and stops playback.
      b. Pause and Resume: Pauses and resumes current playback.
      c. Play in Reverse: Reverses video in normal speed.
      d. Skip Backward: Uses Skip Backward button to rewind playback.
      e. Frame Advance: Uses Frame Advance button to advance video clip one frame at a time.
   8. Auto-Launch of Video Player: Alarms and events generated will be configurable to automatically launch the Video Player in the PACS Alarm Monitor.

J. Pan/Tilt/Zoom (PTZ) Command Functionality: The PACS will support PTZ controls from Alarm Monitor using the following command settings:
   1. Pan Left.
   2. Pan Right.
   3. Tilt Up.
   4. Tilt Down.
   5. Zoom In.
   6. Zoom Out.
   7. Focus Near.
   8. Focus Far.
   9. Iris Open.
   10. Iris Close.
   11. Go to Preset.
   12. Stop PTZ Movement.

K. Go-To PTZ Presets on Alarm: The PACS will support pre-defined PTZ presets that are executed based on alarm generation.
   1. Each event/alarm in the PACS will be able to be assigned to a PTZ preset on the associated camera.
   2. Upon alarm generation, the associated camera will automatically pan, tilt, and zoom to its pre-configured location.

L. Video Motion Detection Alarms: The PACS will report video motion detections alarms as follows:
   1. When a monitored camera senses motion in its range of site, it will report a “Motion Detection” alarm to the PACS Alarm Monitor.
   2. When the camera no longer senses motion, it will report a “Motion Detection Restored” alarm to the PACS Alarm Monitor.

M. Video Motion Detection Event Smoothing: The PACS will allow Video Motion Detection Event smoothing that will assist in eliminating the generation of multiple motion detection alarms due to an object repeatedly and quickly entering and exiting a camera’s field of view.
   1. Administrators will be able to set a time period from when an initial motion event is restored, that no other video motion is detected before reporting the alarm.
   2. If motion is detected during the smoothing time, the PACS will wait for the motion to subside, then again wait for the configured smoothing time to expire without new motion before reporting the alarm.

N. Video Motion Detection Event Masking: The PACS will be able to mask video motion detection events on a per camera basis.
   1. Each camera will be able to be assigned a schedule; during which video motion detection events generated by that camera will be masked.

O. Off-line Alarms: Should a VMS Server or any associated cameras go off-line, a specific alarm will be sent to the PACS Alarm Monitor.

P. Still Image View: During playback of recorded of video, the Operator will be able to create a still picture.
   1. This operation will not affect any other operation and will not alter the recorded video.

Q. Video Icons: The PACS will support video icons.
   1. Alarms that enter the Alarm Monitor generated by a device that has an associated camera will display an icon next to the alarm to alert the Operator that video is associated with the alarm.

R. Video Server / Video Camera Status Listing: The PACS will support a status listing page that will list the connection status of configured video servers and cameras.

S. Video Delegations: User defined delegations will restrict each Operator’s security access to specific system operations.
   1. Examples: Video monitoring and associating cameras to devices.

2.11 PACS SOFTWARE, THIRD PARTY COLLABORATION UTILITY

A. The PACS will support a Collaboration utility that will allow for real-time or scheduled transfer of information, including images and events, between the PACS and third-party IT, Security, and other systems.

B. A user interface will allow for the generation of import and export collaborations.
   1. A Start and Stop date will be applied to run the Collaboration during the scheduled intervals only between certain dates.

C. The PACS will support a minimum of 32 Collaborations per PACS appliance.

D. The PACS will support the following Collaboration Types:
   1. Events:
      a. Arcsight CEF.
      b. Generic XML.
      c. Splunk.
   2. Identity:
      a. CSV Export.
      b. CSV One-time Long format.
      c. CSV One-time Short format.
      d. CSV Recurring.
      e. LDAP pull.
      f. Oracle RDBMS pull.
      g. SQL Server pull.

E. Identity Pulls: Identity Pull Collaborations will allow Identity, Token, and Role related data to be imported into the system directory structure.
   1. Importing information will occur in the following method:
      a. Add/Modify: If a record in the file exists in the directory structure, it will be replaced according to the layout configuration specified.
      b. Records that don't already exist will be added to the directory structure.

F. Identity Pull Collaborations will support BLOB image file formats to be imported into the Open LDAP directory structure.

G. Ability to encrypt exported Identity information will be available using SSL encryption.

H. Each collaboration will utilize an error log that will report errors that occur during a file import.
   1. Errors can then be viewed from this log and once corrected the import may be run a second time to download the corrected records.

I. As a Collaboration Pull completes, imported changes will be automatically downloaded to Intelligent Enterprise Controllers on a real-time basis as information is being imported into the directory structure.

J. Event Pushes: Event Push Collaborations will allow alarm and events to be exported from the PACS to other third party reporting engines.

K. Each Event Push Collaboration will be defined with specific Event Types to be exported along with the schedule in which they are to be exported.

L. Events will have the option to be exported with detailed alarm response information including Acknowledgments, Clears, and Operator Notes.

M. Data Filters: Collaborations will allow Administrators to select a subset of data for export or import operations.
   1. Filters will be used do define which records would be selected for the import or export.

PART 3 EXECUTION

3.1 PREPARATION

A. Prior to installation, configure and test Network Video Management System according to manufacturer's instructions.

3.2 INSTALLATION

A. Install system according to manufacturer's written instructions.

B. Systems Integration:
   1. Develop, install, and test software and databases for complete and proper operation of systems involved.
   2. Setup and program entire system so that no additional programming is required after Substantial Completion, including setup of available software features.
   3. Perform a full system back-up at completion of initial programming and deliver configuration to Owner.
   4. Perform field software changes after the initial programming session to "fine tune" operating parameters and sequence of operations based on revisions to the Owner's operating requirements.

C. Test equipment and configure system in accordance with instructions provided by manufacturer prior to installation.

D. Provide products with latest and most up-to-date firmware by manufacturer, or provide firmware of a version as specified by provider of Video Management Application (VMA) or Network Video Recorder (NVR).

E. Review configurable features of device with Owner's Representative and establish a punch list for standard, device specific, location specific and VMA/NVR specific configuration of device(s).
   1. Program and configure devices in accordance with this punch list so no additional programming is required for operation by user.

F. Configure equipment requiring users to log on using a password with user/site-specific password/passwords.
   1. No system/product default passwords allowed.

3.3 CLOSEOUT ACTIVITIES

A. Demonstration:
   1. Demonstrate administration and operation of devices described by this section.
   2. Demonstrate how to authorize users and applications to operate and configure installed devices.
   3. Demonstrate how an authorized user can gain access to and make changes to configuration.
   4. Demonstrate how to operate functionality configured for this project as defined by configuration punch list.

B. Fine Tuning:
   1. Perform field software changes after initial programming session to "fine tune" operating parameters and sequence of operations based on any revisions to Owner's operating requirements.

C. License Assignment:
   1. Register software, hardware, firmware, operational or administrative licenses necessary for to operate or administer devices to Owner.
   2. Deliver to Owner's Representative proof of license registration from product manufacturer.

D. Device Configuration Backup:
   1. Using ACM backup functionality, perform a full system backup at the completion of the initial programming to a USB drive or customer local network shared folder (preferred

option). Backup function could also be scheduled to execute system backup periodically.

2. Deliver configuration backup files, restoration application and instructions detailing for restoration of back-up configuration.

END OF SECTION

SECTION 31 05 13 - EARTHWORK

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
1. Removing surface debris, designated paving, curbs, topsoil, etc.
2. Removing designated trees, shrubs, and other plant life.
3. Removing abandoned utilities.
4. Excavation and rough grading, cutting, grading, filling, contouring and, compacting for building foundations, site structures, roads, parking areas, slabs-on-grade and landscaping.
5. Excavating trenches for utilities from 2 feet outside building to connection with public utility service. Compacting backfilling and compacting from top of utility bedding to subgrade elevations.
6. Removing identified and discovered rock during excavation.
7. Backfilling site structures perimeter to subgrade elevations, fill under slabs-on-grade, fill under paving, fill for over-excavation.

B. Related Sections:
1. Section 01 33 00 - Submittal Procedures
2. Section 32 91 19 – Landscape Grading, Topsoil, and Soil Preparation
3. Section 33 11 16 - Site Water Utility Distribution Piping
4. Section 31 25 13 - Erosion Controls
5. Section 33 31 00 – Sanitary Utility Sewerage Piping
6. Section 33 41 00 – Storm Utility Drainage Piping
7. Contract Documents - Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division I Specification Sections.
8. Document [1200C]: Oregon DEQ Construction Stormwater General Permit.
9. Document: Geotechnical report.

1.02 REFERENCES

A. ASTM International:
1. ASTM C117 - Standard Test Method for Materials Finer than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing
2. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
3. ASTM D1157 - Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort 56,000 ft-lbf/ft^3.
4. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
5. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

B. National Fire Protection Association: NFPA 495 - Explosive Materials Code.

C. OSSC refers to the current edition of the State of Oregon/ APWA, Standard Specifications for Construction.

D. Regulatory Requirements: All materials and construction work within the public rights of way or for public facilities within easements shall be provided and constructed in accordance with the requirements and specifications of the Governing Authority having Jurisdiction.

1.03 DEFINITIONS

A. Utility: Any buried pipe, duct, conduit, or cable.

B. Rock: Solid mineral material of size that cannot be removed as defined in the geotechnical report.

1.04 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Samples: Submit, in air-tight containers, 10 lb sample of each type of fill to testing laboratory.

C. Materials Source: for materials used as imported fill material and pipe bedding and backfill. Submit name and location of imported fill materials source.

D. For information, submit description of vibratory compactors proposed for use when requesting placement of backfill and fill materials greater than requirement established herein.

E. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

F. Product Data: Submit data for herbicide. Indicate compliance with applicable codes for environmental protection. Submit data for geotextile fabric indicating fabric and construction.

G. Excavation Protection Plan: Describe sheeting, shoring, and bracing materials and installation required to protect excavations and adjacent structures and property; include structural calculations to support plan.

H. Shop Drawings: Rock Removal: Indicate proposed method of blasting, delay pattern, explosive types, type of blasting mat or cover, and intended rock removal method. Survey Report: Submit survey report on conditions of buildings near locations of rock removal.

1.05 QUALITY ASSURANCE

A. Codes and Standards: Perform Work in accordance with applicable requirements of governing authorities having jurisdiction and the recommendations of the geotechnical report.

B. Conform to all applicable codes for environmental requirements, disposal of debris, use of herbicides, and installation of protection and erosion control devices.

C. Soil Testing Service:
1. The OWNER will engage a soil testing service, to include testing soil materials proposed for use in the work and for quality control testing during excavation and fill operations.
2. Samples of materials shall be furnished to the testing service by the CONTRACTOR.

3. Under this Contract, the CONTRACTOR shall smooth out areas for density tests and otherwise facilitate testing work as directed.

D. Rock Removal: Seismic Survey Firm: Licensed company specializing in seismic surveys with a minimum of five years documented experience. Explosives Firm: Company specializing in explosives for disintegration of rock, with a minimum of five years documented experience.

E. Maintain one copy of each document on site.

F. Furnish each imported soil and aggregate material from single source throughout the Work.

1.06 CLOSEOUT SUBMITTALS

A. Project Record Documents: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

1.07 QUALIFICATIONS

A. Prepare excavation protection plan under direct supervision of Professional Engineer experienced in design of this Work and licensed in State of work being performed.

1.08 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.09 COORDINATION

A. Verify Work associated with lower elevation utilities is complete before placing higher elevation utilities.

B. ROCK REMOVAL: Schedule Work to avoid working hours of and disruption to occupied buildings nearby. Conduct blasting operations between hours as required by Jurisdiction having authority only.

1.10 PROJECT CONDITIONS

A. Site information: Subsurface conditions were investigated by GeoDesign. Samples, logs and other data may be inspected by contacting them.
1. The data on subsurface conditions are not intended as representations or warranties or accuracy or continuity of such conditions between soil borings. It is expressly understood the Owner will not be responsible for interpretations or conclusions drawn there from by the CONTRACTOR. The data is made available for the convenience of the CONTRACTOR
2. Additional test borings and other exploratory operations may be made by the CONTRACTOR at no additional cost to the Owner.

B. Disposal of Waste Material:
1. Disposal sites for earth waste materials are not available on Owner's property. Materials that are not suitable for use as topsoil or cannot be used in embankments or construction shall be disposed off-site.
2. CONTRACTOR shall restrict temporary storage of waste materials and materials to be reused to the designated work areas.

3. CONTRACTOR shall arrange and pay for removal and disposal of all waste materials encountered in the work.

C. Existing Utilities:

1. Locate existing underground utilities in the areas of work. If utilities are to remain in place, provide adequate means of protection during excavation operations.
2. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult utility owner immediately for directions. Cooperate with the Owner and public and private utility companies in keeping their respective services and facilities in operation. Repair damaged utilities to the satisfaction of the utility owner.
3. Do not interrupt existing utilities serving facilities occupied and used by the Owner or others, except when permitted in writing by Engineer and then only after acceptable temporary utility services have been provided.
4. Demolish and completely remove from the site existing underground utilities which are not to remain in service and are located within an excavation area. Coordinate with local utility companies for shut-off services in lines that are active.

D. Rock Removal:

1. Conduct survey and document conditions of buildings near locations of rock removal, prior to blasting, photograph existing conditions identifying existing irregularities. Advise owners of adjacent buildings or structures in writing, prior to executing seismographic survey. Explain planned blasting and seismic operations. Obtain seismic survey prior to rock excavation to determine maximum charges that can be used at different locations in area of excavation without damaging adjacent properties or other work.

PART 2 PRODUCTS

2.01 Herbicide

A. Type, approved by authority having jurisdiction

2.02 SUBSOIL MATERIALS

A. Subsoil Type:

1. Excavated and re-used material or imported clean structural borrow as approved by the project Geotechnical Engineer.
2. Any on-site materials free of organic matter, non-plastic (dried), containing no particles larger than recommended, capable of compaction as specified, and approved by the Geotechnical Engineer and Governing Authorities having jurisdiction prior to use in the Work.
3. Imported Fine-Grained Structural Fill Material: Material approved by the Geotechnical Engineer and Governing Authorities having jurisdiction for use as embankment material from an off-site source other than imported granular material. The source shall be approved by the Geotechnical Engineer and Governing Authorities having jurisdiction prior to use in the Work.

2.03 TOPSOIL MATERIALS

A. Stripping:

1. Grass, sod, roots and other types of vegetation as well as concrete, wood and other deleterious materials to be removed.

B. Topsoil:
   1. Unclassified excavated and reused or imported material, free of roots, rocks larger than ½ inch, subsoil, debris, large weeds and foreign matter meeting the requirements of the Geotechnical Report or landscape specifications for topsoil characteristics.

2.04 CRUSHED AGGREGATE MATERIALS

A. Pipe Bedding and Backfill Material: Crushed rock with a maximum particle size of ¾"-0". The aggregate shall be well-graded capable of compaction meeting OSSC as specified in trench zone. Material shall be approved by the Geotechnical Engineer and Governing Authorities having jurisdiction prior to use in the Work.

B. Trench Stabilization Material: Trench stabilization material shall consist of quarry run rock, crushed rock, or crushed gravel and sand and shall meet the requirements set forth by ODOT SS 00330.14 and 00330.15, with a minimum particle size of 6 inches and less than 5 percent passing the U.S. Standard No. 4 Sieve. The material shall be free of organic matter and other deleterious material. Trench stabilization material shall be placed in lifts between 12 -18 inches and compacted to a firm condition. Material shall be approved by the Geotechnical Engineer and Governing Authorities having jurisdiction prior to use in the Work

C. Coarse Aggregate: Angular crushed aggregate, Pit run as approved by the Geotechnical Engineer, the Governing Authorities having jurisdiction or OSSC standards prior to use in the Work.

D. Floor Slab Base Rock: Capillary break aggregate should be crushed rock with a maximum particle size of 1 ½" for under floor slabs. The aggregate shall be well-graded capable of compaction meeting OSSC as specified, with not more than 5% passing the #200 sieve. Material shall be approved by the Geotechnical Engineer and Governing Authorities having jurisdiction prior to use in the Work.

E. Free Draining Fill: Free-draining material for blanket or wall drains for the subdrainage system shall be crushed rock with a maximum size of 2" with not more than 2% passing the #200 sieve (washed analysis) meeting OSSC 00430-11.

2.05 ACCESSORIES

A. Geotextile Fabric: As recommended in the geotechnical report

2.06 SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Testing and Inspection Services, Testing and analysis of soil material.

B. Testing and Analysis of Material: Perform in accordance with ASTM D1157, AASHTO T180, ASTM D4318 and/or ASTM C136 as recommended in the geotechnical report.

C. When tests indicate materials do not meet specified requirements, change material and retest.

D. Furnish materials of each type from same source throughout the Work.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify site conditions and note subsurface irregularities affecting Work of this section.

B. Verify existing plant life designated to remain is tagged or identified.

C. Identify temporary waste area for placing removed materials until materials can be re-used on site or hauled offsite and disposed of properly.

D. Verify locations of survey benchmarks, property corners and intended elevations for the Work and protect from damage.

3.02 PREPARATION

A. "Call Before You Dig" - Call Utility Notification Center at (800) 424-5555 or 811 not less than two nor more than 10 business days before performing Work.
   1. Request underground utilities to be located and marked within and surrounding construction areas.
   2. Cost(s) for locating utilities will be the responsibility of the CONTRACTOR.

B. Identify required lines, levels, contours, and datum.

C. Notify utility company(ies) to remove and/or relocate utilities as required.

D. Locate, identify, and protect utilities to remain, from damage. If utilities are to remain in place, provide adequate means of protection during Site Clearing operations.
   1. Should uncharted or incorrectly charted piping or other utilities be encountered during Work in this section, immediately consult utility owner for directions and notify Owner's representative. Cooperate with the Owner's representative and public and private utility companies in keeping their respective services and facilities in operation. Repair damaged utilities to the satisfaction of the utility owner.
   2. Do not interrupt existing utilities serving facilities occupied and used by the Owner or others, except when permitted in writing by Owner's representative and then only after acceptable temporary utility services have been provided.

E. Establish approved temporary traffic control and detours when trenching is performed in public rights-of-way. Relocate controls and reroute traffic as required during progress of Work.

3.03 PROTECTION

A. Locate, identify, and protect utilities indicated to remain, protect from damage.

B. Protect trees, other vegetation, and features remaining as a portion of the final landscaping, as indicated on the drawings and or as directed by the Owner's representative.

C. Protect benchmarks, survey control points, and existing structures from damage or displacement.

D. Prevent displacement or loose soil from falling into excavation; maintain soil stability.

E. Cold Weather Protection: Protect excavation bottoms against freezing when atmospheric temperature is less than 35 degrees F.

F. Reshape and re-compact fills subjected to vehicular traffic during construction.

G. Barricade: Open excavations in compliance with code requirements. Protect structures, utilities, sidewalks, pavement, and other facilities immediately adjacent to excavations, from damages caused by settlement, lateral movement, undermining, washout and other hazards. Do not leave more than 15 feet of trench open at end of working day.

H. Excavation Safety: The CONTRACTOR shall be solely responsible for making all excavations in a safe manner. Provide appropriate measures to retain excavation side slopes and prevent rock falls to ensure that persons working in or near the excavation are protected. CONTRACTOR shall follow all OHSA rules and regulations.

I. Protect excavation cuts or open trenches to prevent danger to the public.

J. Protect sidewalks, paving and curbs from equipment, vehicular traffic and general construction activities

K. Protect newly graded areas from traffic and erosion. Keep free of trash and debris.

L. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.

M. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, compact to required density and provide other corrective work as specified, prior to further construction.

N. Protection of Subgrade: Do not allow equipment to disturb subgrade, stripped areas, or other areas prepared for project. Prevent water from collecting on surface. Repair disturbed subgrade as specified below for unauthorized excavation.

O. Excavation Safety: The CONTRACTOR shall be solely responsible for making all excavations in a safe manner. Provide appropriate measures to retain excavation side slopes and prevent rock falls to ensure that persons working in or near the excavation are protected.

P. Notify Engineer of unexpected subsurface conditions and discontinue affected work in the area until notified to resume operations.

3.04 CLEARING

A. Clear areas required for access to site and execution of Work to minimum depth are recommended and approved by the project Geotechnical Engineer.

B. **CONTRACTOR shall stake construction / clearing limit for approval by Owner's representative prior to Work. Identify special considerations for protecting existing Trees and vegetation within the drainage channels. Protection measure must be in place prior to commencing Work and must be maintained throughout the construction period. No Work shall be performed beyond designated construction limit. CONTRACTOR is responsible for damage to significant resources and buffers as a result of careless Work, including all costs required to remedy the damage**

C. Remove vegetation, pavement, curbs, other materials and miscellaneous debris, or obstructions interfering with installation of new construction unless otherwise indicated on drawings or by the Owner's representative as protected. Remove such items off-site unless indicated differently by the Owner's representative. Removal includes stumps and roots.

D. Strip all organic matter under areas to receive pavement, sidewalks, building pads and other structural features. Remove off-site unless being used as topsoil or as directed by the Owner's representative.

E. Clear undergrowth and deadwood, without disturbing subsoil.

F. Strip grass and weeds from planting areas to be planted (seed and plants) to a depth approved by the Geotechnical Engineer and the landscape specifications. Leave remaining topsoil in place unless as directed by Owner's representative.
   1. Strip only areas that are accessible to equipment without causing damage to existing trees and vegetation to be preserved. Manual stripping by method of grubbing and hand removal, per these specifications, will be approved in sensitive areas. CONTRACTOR shall identify and review sensitive areas with Owner's representative prior to Work.

G. Apply herbicide to remaining stumps to inhibit growth.

3.05 CLEARING REMOVAL

A. Demolish and completely remove from the site existing underground utilities which are not to remain in service and are located within the Work area. Coordinate with local utility companies for shut-off services in lines that are active.
   1. Remove abandoned utilities as indicated on the drawings. Indicate removal termination point for underground utilities on Record Documents.

B. Remove debris, rock, and extracted plant life from site.

C. Remove demolished paving, curbs, sidewalks and other incidental materials for a complete project. Neatly saw cut edges at right angle to surface.

D. Remove abandoned utilities. Indicated removal termination point for underground utilities on Record Documents.

E. Continuously clean-up and remove waste materials from site. Do not allow materials to accumulate on site. CONTRACTOR shall restrict temporary storage of waste materials and materials to be reused to approved, designated areas.

F. Do not burn or bury materials on site. Fill excavations and pits created by Work to adjacent grades. Leave site in clean condition.

3.06 TOPSOIL EXCAVATION

A. Excavate topsoil from areas to be further excavated, re-landscaped or regraded without mixing with foreign materials for reuse in finish grading.

B. Stockpile material to be reused in area designated on site to depth not exceeding 8 feet and protect from erosion.

C. Remove excess topsoil not intended for reuse, from site.

3.07 EXCAVATION

A. Excavation consists of removal and disposal of all material encountered when establishing required grade elevations. All excavation is unclassified. The contours or spot elevations indicated on the drawings indicate finish grade unless otherwise indicated.

B. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of the OWNER'S REPRESENTATIVE. Unauthorized excavation, as well as remedial work directed by the OWNER'S REPRESENTATIVE, shall be at no change in Contract amount.

C. Additional Excavation: When excavation has reached required subgrade or trench invert elevations, notify the Geotechnical Engineer who will observe conditions.
   1. Proof roll ground surface. Proof rolling will be observed by the Geotechnical Engineer. Remove soft areas detected by the proof rolling and replace with compacted structural fill material as directed.
   2. If unsuitable bearing materials are encountered at the required subgrade elevations, carry excavations deeper and replace the excavated material as directed by the Geotechnical Engineer.

D. Stability of Excavations: The stability of excavation slopes will be the responsibility of the CONTRACTOR in conformance with the recommendations of the geotechnical investigation.

E. Shoring and Bracing: Provide shoring and bracing to comply with local codes and authorities having jurisdiction. Provide materials for shoring and bracing, such as sheet piling, uprights, stringers and cross braces, in good serviceable condition. Maintain shoring and bracing in excavations regardless of the time period excavations will be open. Carry down shoring and bracing as the excavation progresses.

F. Underpin adjacent structures which may be damaged by excavation work.

G. Dewatering: Prevent surface water and subsurface or ground water from flowing into excavations and from flooding the project site and surrounding area.
   1. Do not allow water to accumulate in excavations. Remove water to prevent detrimental soil changes to stability of subgrades and foundations. Provide and maintain pumps, well points, sumps, suction and discharge lines and other dewatering system components necessary to convey water away from excavations.
   2. Convey water removed from excavations and rainwater to collection or run-off areas. Establish and maintain temporary drainage ditches and other diversions outside excavation limits for each structure. Do not use trench excavations or public utility lines as temporary drainage facilities.

H. Excavation for Building Pads:
   1. Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10' and extend a sufficient distance from footings and foundations to permit placing and removal of concrete form work, installation of services, other construction and for inspection (5 feet minimum).
   2. In excavating for footings and foundations, take care not to disturb bottom of excavation. Excavate by hand to final grade just before concrete reinforcement is to be placed. Trim bottoms to required lines and grades to leave solid base to receive concrete.

I. Excavation for Pavements: Cut surface under pavements to comply with cross-sections, elevations and grades as shown.

J. Excavate subsoil to accommodate building foundations, slabs-on-grade, paving sections, site structures and construction operations.

K. Compact disturbed load bearing soil in direct contact with foundations to original bearing capacity or greater as required by the Geotechnical Engineer.

L. Slope banks with machine to angle of repose or less until shored. Do not interfere with 45 degree bearing splay of foundations.

M. Grade top perimeter of excavation to prevent surface water from draining into excavation. Trim excavation. Remove loose matter. Remove lumped subsoil, boulders, and rock.

N. Notify Architect/Engineer of unexpected subsurface conditions. Correct areas over excavated with structural fill as directed by the Geotechnical Engineer. Repair or replace items indicated to remain damaged by excavation.

O. Excavate and process wet material to obtain optimum moisture content.

P. When excavating through roots on trees to remain, perform Work in accordance with the Arborist's report.

Q. Remove excess subsoil not intended for reuse, from site.

R. Benching Slopes: Horizontally bench existing slopes as recommended by the Geotechnical Engineer to provide firm bearing.

S. Stability: Replace damaged or displaced subsoil as specified for fill.

T. Remove excavated materials not meeting requirements for subsoil materials or structural fill from site.

U. Dust: CONTRACTOR shall assume full responsibility for all alleviation or prevention of dust nuisance on or about the site in compliance with regulatory requirements.

3.08 TRENCHING

A. Excavations for Trenches: Performed as part of work installed.
   1. Dig trenches to the uniform width required for the particular item to be installed, sufficient minimum width as shown on the Drawings and to provide ample working room.
   2. Excavate trenches to the depth indicated or required. Carry the depth of trenches for piping to establish the indicated flow lines and invert elevations. Beyond the building perimeter, keep bottoms of trenches sufficiently below grade to avoid freeze-up and outside of the 1:1 slope beyond the bottom of the footings.
   3. When unstable pipe foundation is encountered, place a minimum of 12 inches of imported granular trench stabilization material under the pipe bedding material to stabilize the trench or as directed by the Geotechnical Engineer.
   4. Grade bottoms of trenches as indicated, notching under pipe bells to provide solid bearing for the entire body of the pipe.
   5. Backfill trenches prior to tests and inspections. Use care in backfilling to avoid damage or displacement of pipe systems.

B. Trench for pipes to lines and grades indicated on Drawings.
   1. Engineer reserves right to make changes in lines, grades, and depths of utilities when changes are required for Project conditions.

2. Use laser-beam instrument with qualified operator to establish lines and grades.

C. Excavate subsoil required for utilities to utility service point of connection.

D. Perform excavation of existing utility service in accordance with utility's requirements.

E. Do not advance open trench more than 100 feet ahead of installed pipe.

F. Cut trenches to width indicated on Drawings or sufficiently wide to enable installation and allow inspection. Remove water or materials that interfere with Work.

G. Excavate bottom of trenches maximum 2 feet wider than outside diameter of pipe.

H. Excavate trenches to depth indicated on Drawings. Provide uniform and continuous bearing and support for bedding material and pipe utilities.

I. Do not interfere with 45 degree bearing splay of foundations.

J. When Project conditions permit, slope side walls of excavation starting 2 feet above top of pipe. When side walls cannot be sloped, provide sheeting and shoring to protect excavation as specified in this section.

K. When subsurface materials at bottom of trench are loose or soft, excavate to greater depth as directed by Geotechnical Engineer until suitable material is encountered. Notify Geotechnical Engineer, and request instructions.

L. Trim excavation. Hand trim for bell and spigot pipe joints and remove loose matter.

M. Sheet, shore, and brace excavations to prevent danger to persons, structures and adjacent properties and to prevent caving, erosion, and loss of surrounding subsoil.

3.09 ROCK REMOVAL BY MECHANICAL METHOD

A. Excavate and remove rock by mechanical method.
1. Drill holes and use expansive tools, wedges or mechanical means to fracture rock.

B. Cut away rock at bottom of excavation to form level bearing.

C. Remove shaled layers to provide sound and unshattered base for footings and foundations.

D. In utility trenches, excavate to 6 inches below invert elevation of pipe and 24 inches wider than pipe diameter.

E. Remove excavated materials from site or crush and reuse as fill if needed.

3.10 ROCK REMOVAL BY EXPLOSIVE METHODS

A. When rock is uncovered requiring explosives method for rock disintegration, notify Engineer.

B. Provide seismographic monitoring during progress of blasting operations.

C. Prepare a drilling and blasting plan and submit to Jurisdiction having authority for review and approval.

D. Disintegrate rock and remove from excavation.

E. Remove rock at excavation bottom to form level bearing.

F. Remove shaled layers to provide sound and unshattered base for footings and foundations.

G. In utility trenches, excavate to 6 inches below invert elevation of pipe and 24 inches wider than pipe diameter.

H. Remove excavated materials from site or crush and reuse as fill if needed.

3.11 BACKFILL, FILLING AND GRADING

A. In all excavations, unless otherwise specified, use satisfactory excavated or imported material for backfill which has been sampled and tested by the Geotechnical Engineer. Onsite fine-grained soils may be used in structural fills only during dry conditions when optimum moisture content can be maintained. Use optimum moisture conditioned imported fill material as structural fill during wet conditions, when onsite soils cannot be utilized.

B. Compact subgrade to density requirements for subsequent backfill materials.

C. Proof roll to identify soft spots. Cut out soft areas of subgrade not capable of compaction in place. Backfill with structural fill and compact to density equal to or greater than requirements for subsequent fill material.

D. Scarify subgrade surface to depth as recommended by the Geotechnical Engineer.

E. Proof roll to identify subsequent soft spots, fill and compact to density equal to or greater than requirements for subsequent fill material.

F. Fill areas to contours and elevations with unfrozen materials.

G. Place fill material in continuous layers and compact in accordance with the recommendations of the Geotechnical engineer.

H. Backfill simultaneously on each side of unsupported foundation walls until supports are in place. Do not backfill against unsupported foundation walls.

I. Backfill excavations as promptly as work permits, but not until completion of the following:
   1. Acceptance by OWNER'S REPRESENTATIVE of construction below finish grade including, where applicable, waterproofing, damp proofing, drainage pipe and perimeter insulation.
   2. Inspection, testing, approval and recording of locations of underground utilities.
   3. Removal of shoring and bracing and backfilling of voids with satisfactory materials.
   4. Removal of trash and debris.

J. Slope grade away from building minimum 2 percent slope for minimum distance of 5 ft, unless noted otherwise.

K. Backfill trenches to contours and elevations with unfrozen fill materials.

L. Systematically backfill trenches to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.

M. General: Uniformly grade areas of work including adjacent transition areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are shown, or between such points and existing grades.

N. Grading Outside Building Lines: Grade areas adjacent to building lines to drain away from structures and to prevent ponding. Finish surfaces free from irregular surface changes. Grading CONTRACTOR to provide for placement of topsoil, as required, to the finish grades indicated on the drawings

O. Make grade changes gradual. Blend slope into level areas by rounding so as to avoid sharp grade changes.

P. Repair or replace items indicated to remain damaged by excavation or filling.

Q. Placement and Compaction: Place native onsite and imported fine grained backfill and fill materials in layers not more than 8 inches in loose depth and imported granular material in layers not more than 12 inches in loose depth or as recommended by the Geotechnical Engineer for the specific application.
   1. Before compaction, moisten or aerate each layer as necessary to provide the optimum moisture content.
   2. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification.
   3. Do not place backfill or fill material on surfaces muddy, frozen, or containing frost or ice.
   4. Place backfill and fill materials evenly adjacent to structures, to required elevations. Take care to prevent wedging action of backfill against structures by carrying the material uniformly around structure to approximately same elevation in each lift. Contractor shall follow the Geotechnical Engineer's recommendations when backfilling immediately adjacent to walls

3.12 COMPACTION

A. General: Control soil compaction during construction providing minimum percentage of density specified for each area.

B. Prior to fill placement or aggregate base course placement, the subgrade shall be proofrolled with a fully loaded 10 to 12 yard dump truck. Any areas that pump, heave or appear soft shall be over excavated and backfilled a minimum of 12 inches (or as recommended by the Geotechnical Engineer) with approved fine grained structural or select imported granular fill material.

C. Percentage of Maximum Density Requirements: Compact soil, fill and backfill to not less than that recommended in the Geotechnical Report. In the absence of a Geotechnical Report, compact to the following percentages of maximum dry density for soils which exhibit a well-defined moisture density relationship determined in accordance with ASTM D1557.
   1. On site Native Fine-Grained Structural Fill: Compact exposed subgrade where disturbed, and each layer of backfill or fill material to 92 percent of maximum dry density (MDD).
   2. Base Course (Pavements and Floor Slabs): compact top 12 inches of the subgrade below the pavement and the granular base course material to 92 percent of maximum dry density MDD.

3. Non-Structural Landscape Fill: Compact each layer of fill material to 90 percent of MDD.
4. Trench Backfill: Compact the pipe base and pipe zone as recommended by the geotechnical report and per manufacturer recommendations. Contractor shall take precautions so as to not over compact the pipe zone causing damage to the utility pipe.

D. Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade, or layer of soil material. Prevent free water appearing on surface during or subsequent to compaction operations.
1. Remove and replace, or scarify and air dry, soil material too wet to permit compaction to specified density.
2. Soil material removed because it is too wet to permit compaction may be stockpiled or spread and allowed to dry. Assist drying by discing, harrowing or pulverizing until moisture content is reduced to satisfactory value.

3.13 STOCKPILING

A. Stockpile materials on site at locations designated by OWNER.

B. Stockpile in sufficient quantities to meet Project schedule and requirements.

C. Separate differing materials with dividers or stockpile apart to prevent mixing.

D. Stockpile to 10 feet high maximum.

E. Prevent intermixing of soil types or contamination.

F. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.

3.14 STOCKPILE CLEANUP

A. Remove stockpile, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

B. Leave unused materials in neat, compact stockpile.

C. When borrow area is indicated, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

3.15 QUALITY CONTROL/TOLERANCES

A. General: The CONTRACTOR is responsible for preparing and scheduling all required testing activities.

B. Quality Control Testing During Construction: Allow Geotechnical Engineer and soil testing service retained by the OWNER to observe, test and approve subgrades and fill layers before further construction work is performed.

C. If in the opinion of the OWNER'S REPRESENTATIVE, based on Geotechnical Engineer reports and observations of subgrades and fills which have been placed are below specified density, provide corrective work as required to reach specified density at no additional expense.

D. Grading Surface of Fill Under Building Slabs and Pavement: Grading smooth and even, free from voids, compacted as specified, and to required elevation. Provide final grades within a tolerance of ½ inch from design elevation and variations to within ½ inch when tested with a 10-foot straight edge

E. Top Surface of Subgrade: Plus or minus 1 inch from required elevation.

F. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.

G. Perform laboratory material tests in accordance with ASTM D1557.

H. Perform in place compaction tests in accordance with the following:
1. Density Tests: ASTM D1557, and ASTM D2922.
2. Moisture Tests: ASTM D3017.

I. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

J. Frequency of Tests:
1. Trench Backfill – As required by the geotechnical engineer or 1 test every 50 feet and every 3 feet of vertical backfill at a minimum.
2. Structural Fill – as required by the geotechnical engineer or 1 test every 2 vertical feet or 500 yd^3 which ever requires more testing.

K. Proof roll compacted fill surfaces under slabs-on-grade, paving, and overall site grading. Request visual inspection of bearing surfaces by Geotechnical Engineer before installing subsequent work.

END OF SECTION

SECTION 31 25 13 - EROSION CONTROLS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Furnishing, placing and maintaining all erosion control and protective materials including but not limited to the following:
   1. Construction Entrance.
   2. Filter Fabric.
   3. Sediment Fencing.
   4. Bio-Bags.
   5. Straw Wattles
   6. Inlet Protection.
   7. Mulch.
   8. Plant Materials.
   9. Maintenance

B. Related Sections:
   1. Section 01 33 00 - Submittal Procedures
   2. Section 31 05 13 - Earthwork.
   3. Section 32 91 19 – Landscape Grading, Topsoil, and Soil Preparation
   4. Section 32 93 00 – Planting
   5. Section 33 41 00 – Storm Utility Drainage Piping.
   6. Contract Documents - Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division I Specification Sections.
   7. Document: 1200C Oregon DEQ Construction Stormwater General Permit.
   8. Document: Geotechnical report.

1.02 REFERENCES

A. ASTM International:
   1. ASTM C127 - Standard Test Method for Specific Gravity and Absorption of Coarse Aggregate.
   2. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort 56,000 ft-lbf/ft^3.
   3. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
   4. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

B. 1200-C Oregon DEQ Best Management Practice Manual.

C. “OSSC” Refers to the State of Oregon/APWA Standard specifications for Construction.

1.03 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Samples:
   1. Submit two samples or rock, minimum 5 tons each or one-half total project quantity, whichever is smaller. Provide one sample in place at construction site and provide another sample at quarry. Construction site sample may be incorporated

into the Work. Samples will be used as reference for judging size, and graduation of rock supplied and placed.

C. Product Data: Submit manufacturer data for materials used in Work:
   1. Sediment Fencing
   2. Biobags
   3. Inlet Protection
   4. Straw Wattles

D. Section 01 78 00 - Closeout Submittals: Requirements for submittals.

1.04 QUALITY ASSURANCE

A. Section 01 78 00 - Closeout Submittals: Requirements for submittals.

B. Perform Work in accordance with these specifications and the Oregon DEQ 1200CN Permit requirements.

C. Perform Work in accordance with OSSC.

D. Maintain one copy of each document on site.

1.05 PRE-INSTALLATION MEETINGS

A. Contractor shall coordinate pre-installation meeting.

B. Convene minimum one week prior to commencing work of this section. Minimum attendees shall be the Contractor's site superintendents and the project's certified erosion control inspector.

1.06 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.

1.07 REGULATORY REQUIREMENTS

A. Conform to the City of North Plains and Clean Water Services requirements.

B. Contractor shall adhere to the requirement of the Oregon DEQ 1200CN permit requirements and shall supplement the erosion control plan requirements to meet the specific site demands to prevent sediment laden water from leaving the site.

1.08 PROJECT CONDITIONS

A. Erosion control is required for this Project and is the responsibility of the Contractor to provide, install and maintain erosion control measures under this Contract. Effective erosion control measures must be installed and maintained to meet jurisdictional requirements. The governing authority having jurisdiction may, at any time, order corrective action and stoppage of work to accomplish effective erosion control. Erosion control measures must be installed prior to commencing Work in this section, and shall be protected and maintained in effective, functioning condition during the construction period and through final acceptance.

PART 2 PRODUCTS

2.01 MATERIALS

A. Gravel Construction Access: All material furnished for “Gravel Construction Entrances” shall be clean pit run with size as indicated on the drawings.

B. Sediment Fences: Woven construction fabric specifically designed to control sediment runoff. Acceptable material is Amoco 1380 Silt Stop, or equal.

C. Posts/Stakes:
1. 2"x2" standard or better wood posts (sediment fences & straw bales).
2. Steel fence posts (sediment fences).

D. Inlet Filter Sack: Woven construction fabric specifically designed to control sediment run-off. Acceptable material is ACF Environmental Siltsack® or approved equal.

E. Bio-Bags: Clean 100% recycled wood product waste. Size of bag to be 18x8x30-inches and weigh approximately 45 pounds and made of ½-inch plastic mesh.

F. Straw Wattles: Wheat straw, rye grass straw, coconut, or excelsior wattles as approved by the Governing Authority having Jurisdiction.

G. Hydro-Seeding: Seed, fertilizer and mulch acceptable to the landscape architect.

H. Straw Mulch: Clean, sterile dry oat or wheat straw free from weeds and other foreign matter detrimental to plant life. Hay or chopped cornstalks are not acceptable. Ensure that the mulch does not contain noxious weed seeds of any species

I. Planting Materials:
1. Seeding: As indicated in the landscape drawings and specifications.
2. Trees, Shrubs and Groundcover: As indicated in the landscape drawings and specifications.

2.02 SOURCE QUALITY CONTROL (AND TESTS)

A. Section 01 40 00 - Quality Requirements: Testing, inspection and analysis requirements.

B. Perform tests on cement, aggregates, and mixes to ensure conformance with specified requirements.

C. Make rock available for inspection at producer’s quarry prior to shipment. Notify Engineer at least seven days before inspection is allowed.

D. Allow witnessing of inspections and test at manufacturer’s test facility. Notify Engineer at least seven days before inspections and tests are scheduled.

PART 3 EXECUTION

3.01 EXAMINATION

A. Contractor shall coordinate verification of existing conditions before starting work.

B. Verify compacted subgrade is acceptable and ready to support devices and imposed loads.

C. Verify gradients and elevations of base or foundation for other work are correct.

D. Verify that all areas to receive erosion control measures are prepared and ready for Work in this section.

E. The contractor shall comply with all regulatory requirements.

F. Prior to performing any site clearing or earthwork operations, install all sediment and erosion control devices as early as practical and as shown on the Drawings.

G. Do not place riprap over frozen or spongy subgrade surfaces.

3.02 CONSTRUCTION ACCESS (ENTRANCE)

A. Install as indicated on the drawing details.

3.03 SEDIMENT FENCING

A. The CONTRACTOR shall place an adequate sediment barrier around the site perimeter as shown on the Drawings.

B. Place sediment barriers at toes of slopes. Embed sediment fences 6 inches below ground. Embed straw bales 4 to 6 inches.

C. Provide posts at 6-foot maximum spacing for sediment fences.

D. Provide (2) stakes per straw bale driven a minimum of 12-inches into the ground.

E. Provide filter fabric inlet barrier around the on-site catch basins and area drains per drawing details.

3.04 BIO-BAGS/STRAW WATTLES

A. Install as indicated on drawing details.

3.05 INLET PROTECTION

A. Install as indicated on drawing details.

3.06 MULCH

A. Install mulch to accomplish the following:
   1. Seeded and Planted Areas: Install as indicated in landscape specifications for seeded and planted areas.
   2. Temporary Erosion Control: Install minimum 2-inch thickness over areas requiring temporary erosion control. Install additional devices as soon as reasonably possible.
   3. Additional Protection: Install in conjunction with other approved erosion control measures, as specified, to provide additional protection per project conditions.

3.07 SITE STABILIZATION

A. Incorporate erosion control devices indicated on the Drawings into the Project at the earliest practicable time.

B. Construct, stabilize and activate erosion controls before site disturbance within tributary areas of those controls.

C. Stockpile and waste pile heights shall not exceed 20 feet. Slope stockpile sides at 2:1 or flatter.

D. Stabilize any disturbed area of affected erosion control devices on which activity has ceased and which will remain exposed for more than 20 days.
   1. During non-germinating periods, apply mulch at recommended rates.
   2. Stabilize disturbed areas which are not at finished grade and which will be disturbed within one year in accordance with Section 32 91 19 or per erosion control permit requirements.
   3. Stabilize disturbed areas which are either at finished grade or will not be disturbed within one year in accordance with Section 32 91 19 permanent seeding specifications.

E. Stabilize diversion channels, sediment traps, and stockpiles immediately.

3.08 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements and 01 78 00 – Closeout Submittals: Field inspecting, testing, adjusting, and balancing.

B. Inspect erosion control devices on a weekly basis and after each runoff event or as required by the Construction Stormwater Erosion Control Permit. Make necessary repairs to ensure erosion and sediment controls are in good working order.

C. If tracking of soil off site continually occurs, construct temporary wheel wash or hose applied tire washing station.

D. If the proposed erosion control measures are proving to be ineffective, contact the projects erosion control inspector for direction and remedial action.

3.09 CLEANING

A. Section 01 78 00 – Closeout Submittals: Requirements for cleaning.

B. When sediment accumulation in sedimentation structures has reached a point one-third depth of sediment structure or device, remove and dispose of sediment.

C. Do not damage structure or device during cleaning operations.

D. Do not permit sediment to erode into construction or site areas or natural waterways.

E. Clean channels when depth of sediment reaches approximately one-half channel depth.

3.10 PROTECTION

A. **Protect at all times adjacent properties, areas and significant resources, including waterways and drainage courses, from erosion / sedimentation caused by Work in other sections.**

B. Protect soil stockpiles from erosion by plastic sheeting (with sand bags) or other approved measures.

C. When sediment accumulation in sedimentation structures has reached a point one-third depth of sediment structure or device or as required by the Construction Stormwater Erosion Control Permit, remove and dispose of sediment.

D. Do not damage structure or device during cleaning / maintenance operations.

E. Repair and/or reestablish barriers that are damaged or temporarily removed immediately after such instance occurs.

F. Remove and replace contaminated gravel with clean gravel as necessary to mitigate mud and dirt transported to public streets. Prior to construction of the asphalt pavement parking area, remove and replace contaminated gravel.

G. Provide slope protection, seeding, and all other erosion control measures as specified and shown on the Drawings.

END OF SECTION

SECTION 32 11 23 - AGGREGATE BASE COURSES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Aggregate base course.

B. Related Sections:
   1. Section 31 05 13 - Earthwork.
   2. Section 32 12 16 - Asphalt Paving.
   3. Section 32 13 13 – Rigid Pavement, Concrete Curbs & Walks
   4. Section 33 05 13 - Manholes and Structures
   5. Section 33 11 16 – Site Water Utility Distribution Piping
   6. Section 33 31 00 – Sanitary Utility Sewerage Piping
   7. Section 33 41 00 – Storm Utility Drainage Piping
   8. Contract Documents - Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division I Specification Sections.
   9. Document: Geotechnical report.

1.02 REFERENCES

A. ASTM International:
   1. ASTM D1557 - Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort 56,000 ft-lbf/ft^3.
   2. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
   3. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

B. OSSC refers to the current edition of the State of Oregon/ APWA, Standard Specifications for Construction.

C. Regulatory Requirements: All materials and construction work within the public rights of way or for public facilities within easements shall be provided and constructed in accordance with the requirements and specifications of the Governing Authority having Jurisdiction.

1.03 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Samples: Submit, in air-tight containers, 10 lb sample of each type of aggregate base rock to testing laboratory.

C. Materials Source: Submit name of imported materials suppliers.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements

1.04 QUALITY ASSURANCE

A. Furnish each aggregate material from single source throughout the Work.

B. Perform Work in accordance with OSSC standards.

C. Maintain one copy of each document on site.

PART 2 PRODUCTS

2.01 MATERIALS

A. Provide aggregate for the various gradations indicated on the drawings meeting "OSSC" standards.

B. Minimum requirements for rock: OSSC Section 02630. Rock for aggregate base course shall meet the State qualifications and meet the graduation designations indicated on the drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Contractor shall coordinate verification of existing conditions before starting work.

B. Verify substrate has been inspected, gradients and elevations are correct, and is dry.

3.02 PREPARATION

A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.

B. Do not place fill on soft, muddy, or frozen surfaces.

3.03 AGGREGATE PLACEMENT

A. Spread aggregate over prepared substrate to a total compacted thickness indicated on the drawings.

B. Place aggregate in maximum 6-inch layers and roller compact to specified density.

C. Level and contour surfaces to elevations and gradients indicated.

D. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.

E. Maintain optimum moisture content of fill materials to attain required compaction density.

F. Use mechanical tamping equipment in areas inaccessible to roller compaction equipment.

G. Grade all areas to drain to collection points.

H. Grade all ADA parking areas to no more than 2% cross-slope in any direction and access ways to no more than 2% cross-slope and no more than 5% running slope.

3.04 TOLERANCES

A. Section 01 40 00 - Quality Requirements: Tolerances.

B. Maximum Variation from Surface Planarity: ¼ inch measured with 10-foot straight edge.

C. Maximum Variation from Thickness: ¼ inch.

D. Maximum Variation from Elevation: Plus, or minus ¼ inch.

3.05 STOCKPILING

A. Stockpile materials on site at locations designated by OWNER REPRESENTATIVE.

B. Stockpile in sufficient quantities to meet Project schedule and requirements.

C. Separate different aggregate materials with dividers or stockpile individually to prevent mixing.

D. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.

3.06 STOCKPILE CLEANUP

A. Remove stockpile, leave area in clean and neat condition. Grade site surface to prevent free standing of surface water.

3.07 FIELD QUALITY CONTROL

A. Section 01 4 00 - Quality Requirements and 01 78 00 – Closeout Submittals: Field inspecting, testing, adjusting, and balancing.

B. Compaction testing will be performed in accordance with ASTM D1557, ASTM D2922 and ASTM D3017 in accordance with the Geotechnical Engineering recommendations.

C. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

D. Frequency of Tests: One test every 500 SY.

END OF SECTION

SECTION 32 12 16 - ASPHALT PAVING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
1. Asphaltic concrete paving - wearing and base course.
2. Surface sealer.
3. Aggregate subbase course.
4. Precast concrete parking bumpers.

B. Related Sections:
1. Section 01 33 00 - Submittal Procedures
2. Section 31 05 13 - Earthwork
3. Section 32 11 23 - Aggregate Base Courses
4. Section 32 13 13 - Rigid Pavement, Concrete Curbs & Walks
5. Section 33 05 13 - Manholes and Structures

1.02 REFERENCES

A. Asphalt Institute:
1. TAI – (The Asphalt Institute) – MS-2 - Mix Design Methods for Asphalt Concrete and Other Hot- Mix Types
2. TAI – (The Asphalt Institute) – MS-3 Asphalt Plant Manual.
3. TAI – (The Asphalt Institute) – MS-8 Asphalt Paving Manual
4. TAI – (The Asphalt Institute) – MS-19 - Basic Asphalt Emulsion Manual.

B. ASTM International:
1. ASTM D946 - Standard Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction.
2. ASTM D2041- Standard test method for theoretical maximum specific gravity and density of Biumious paving mixtures.
3. ASTM D3381 - Standard Specification for Viscosity-Graded Asphalt Cement for Use in Pavement Construction.

C. Oregon Department of Transportation/American Public Works Association
1. OSSC refers to the current edition of the State of Oregon/ APWA, Standard Specifications for Construction.

1.03 PERFORMANCE REQUIREMENTS

A. Paving: Standard duty pavement per OSSC for the type shown on the drawings.

1.04 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit product information and mix design.

C. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

A. **All Work in the public rights of way or easements dedicated to the public shall be in accordance with the local Governing Authority having Jurisdiction.**

B. All Work outside public rights of way shall be in accordance with OSSC Specifications.

C. Obtain materials from same source throughout.

D. Maintain one copy of each document on site.

1.06 QUALIFICATIONS

A. **Installer:** Company specializing in performing work of this section with minimum 5 years documented experience.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.

B. Do not place asphalt when ambient air or base surface temperature is less than 40, 50 or 60 degrees Fahrenheit based on the compacted thickness of pavement being placed, or if surface is wet or frozen as required per OSSC.

C. Place bitumen mixture when temperature is not more than 15 degrees Fahrenheit below temperature at when initially mixed and not more than maximum specified temperature.

PART 2 PRODUCTS

2.01 ASPHALT PAVING MATERIALS

A. Asphalt Cement: PG-64-22 per OSSC Specification Section 00744

B. Aggregate: OSSC Specification Section 00744.10

C. Aggregate Quality: OSSC Specification Section 00745.10

D. Tack Coat: Use CSS-1 or CSS-1H

E. Reclaimed Asphalt Pavement (RAP): Processed material obtained by milling or full depth removal of existing asphalt concrete pavements. No more than 30% RAP shall be allowed per OSSC Specification Section 00745.03.

2.02 ASPHALT PAVING MIX

A. Use dry material to avoid foaming. Mix uniformly.

2.03 ASPHALT PAVING SOURCE QUALITY CONTROL AND TESTS

A. Section 01 40 00 - Quality Requirements: Testing, inspection and analysis requirements.

B. Submit proposed mix design of each class of mix for review prior to beginning of Work.

C. Job Mix Formula: Contractor to supply a current year mix design for the Level of pavement shown in the drawings per OSSC 00744.13.

2.04 PARKING BUMPERS MANUFACTURERS

A. Old Castle Precast Concrete Bumper Curb or approved equal
   1. Size as shown on drawings.
   2. Dowels: Cut reinforcing steel ½ inch diameter inch long, pointed tip
   3. Adhesive: Epoxy

PART 3 EXECUTION

3.01 EXAMINATION

A. Contractor shall coordinate verification of existing conditions before starting work.

B. Verify compacted aggregate base is dry and ready to support paving and imposed loads.

C. Verify gradients and elevations of base are correct.

D. Verify gutter drainage grilles and frames, cleanout and manhole frames and lids are installed in correct position and elevation.

E. Prior to pavement placement, the aggregate base shall be proof-rolled with a fully-loaded dump truck. Any areas that pump, heave or appear soft shall be over excavated and backfilled a minimum of 12 inches as well as placing a geotextile fabric such as Mirafi 600nx with imported fill material or as directed by the Geotechnical Engineer.

3.02 SUBBASE

A. Aggregate Subbase: Install as specified in Section 32 11 23

3.03 PREPARATION - TACK COAT

A. Apply tack coat on asphalt or concrete surfaces at uniform rate of 0.05-0.20 gal/sq.yd per OSSC Specification Section 00730.

B. Apply tack coat to contact surfaces of curbs & gutters.

C. Coat surfaces of manholes, catch basins, and cleanout frames with oil to prevent bond with asphalt pavement. Do not tack coat these surfaces.

3.04 PLACING ASPHALT PAVEMENT - SINGLE COURSE

A. Prior to placement, Contractor shall review and check aggregate base rock to ensure that all areas are sloped adequately to drain to catchment points.

B. Prior to placement, Contractor shall review and check aggregate base rock to ensure that all ADA parking areas do not slope more than 2% cross-slope in any direction.

C. Install Work in accordance with OSSC standards for the level of pavement indicated on the drawings.

D. Place asphalt within 24 hours of applying tack coat.

E. Place to thickness as shown on the typical sections.

F. Compact pavement by rolling to specified density. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.

G. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks.

H. Compact pavement by rolling to not less than 91% of ASTM D2041 (rice maximum density). Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.

I. Minimum and maximum thickness of single courses shall be in accordance with OSSC standards.

3.05 PLACING ASPHALT PAVEMENT - DOUBLE COURSE

A. Prior to placement, Contractor shall review and check aggregate base rock to ensure that all areas are sloped adequately to drain to catchment points.

B. Prior to placement, Contractor shall review and check aggregate base rock to ensure that all ADA parking areas do not slope more than 2% cross-slope in any direction.

C. Place asphalt base course within 24 hours of applying tack coat.

D. Place base course to compacted thickness as shown on the typical sections.

E. Place wearing course within 24 hours of placing and compacting binder course. When binder course is placed more than 24 hours before placing wearing course, clean surface and apply tack coat before placing wearing course.

F. Place base course to compacted thickness as shown on the typical sections

G. Compact each course by rolling to specified density. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.

H. Perform rolling with consecutive passes to achieve even and smooth finish, without roller marks.

I. Compact pavement by rolling to not less than 91% of ASTM D2041 (rice maximum density). Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.

3.06 BUMPER INSTALLATION

A. Install bumper units without damage to shape or finish. Replace or repair damaged units.

B. Install bumper units in alignment with adjacent work.

C. Fasten bumper units in place with 2 dowels for each unit bumper along with adhesive placed at contact points.

3.07 TOLERANCES

A. Section 01 40 00 - Quality Requirements: Tolerances.

B. Flatness: Maximum variation of ¼ inch measured with 10-foot straight edge.

C. Scheduled Compacted Thickness: Within ¼ inch.

D. Variation from Indicated Elevation: Within ¼ inch

3.08 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.

B. Coordinate the Work with pavement placement and parking striping.

C. The contractor shall have a field technician on site to establish the rolling pattern and determine the number of passes of each roller to provide the optimum compaction for the mixture. Once the rolling pattern has been established, the contractor shall maintain the pattern throughout.

D. Test compaction and composition per OSSC Specifications. Minimum one set of compaction tests per 500 ton of asphalt and one composition test per 2000 square yards of material placed.

E. Record asphalt temperature during placement and adhere to the breakdown and intermediate rolling temperature requirements.

3.09 PROTECTION OF FINISHED WORK

A. Section 01 78 00 – Closeout Submittals: Protecting finished work.

B. Immediately after placement, protect pavement from damage for until surface temperature is less than 140 degrees F. Permission from the OWNER'S REPRESENTATIVE is required to allow construction traffic on finished asphaltic pavements.

END OF SECTION

SECTION 32 13 13 - RIGID PAVEMENT, CONCRETE CURBS & WALKS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
1. Concrete sidewalks.
2. Concrete stair steps.
3. Concrete integral curbs and gutters.
4. Concrete Pavement.

B. Related Sections:
1. Section 31 05 13 - Earthwork
2. Section 32 11 23 - Aggregate Base Courses
3. Section 32 12 16 - Asphalt Paving
4. Section 33 05 13 - Manholes and Structures.

1.02 REFERENCES

A. American Concrete Institute:
1. ACI 301 - Specifications for Structural Concrete.
2. ACI 304 - Guide for Measuring, Mixing, Transporting, and Placing Concrete.

B. ASTM International:
1. ASTM A185 - Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.
2. ASTM A497 - Standard Specification for Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement.
3. ASTM A615/A615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
4. ASTM C33 - Standard Specification for Concrete Aggregates.
5. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.
6. ASTM C150 - Standard Specification for Portland Cement.
7. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
8. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
9. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete.
10. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
11. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
12. ASTM D1752 - Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.

1.03 PERFORMANCE REQUIREMENTS

A. Paving: Designed for parking, light duty commercial vehicles and movement of trucks up to 60,000 lbs.

1.04 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Provide samples, manufacturer's product data, test reports, and materials' certifications as required in referenced sections for concrete and joint fillers, sealers and tactile warning textures & truncated dome product.

C. Furnish certified reports of each proposed mix for each type of concrete at least thirty days prior to start of installation of the work of this section.

1.05 QUALITY ASSURANCE

A. **All Work in the public rights of way or easements dedicated to the public shall be in accordance with the local Governing Authority having Jurisdiction.**

B. Perform Work in accordance with ACI 301.

C. All codes referenced herein, shall include but not be limited to the following
   1. American Society for Testing and Materials, ASTM
   2. American Concrete Institute
      a. ACI 214 Recommended Practice for Evaluation of Strength Tests results; of Concrete
      b. ACI 301 Details and Detailing of Concrete Reinforcement
      c. ACI 305 Recommended Practices for Cold Weather Concreting
      d. ACI 306 Recommended Practices for Hot Weather Concreting
      e. ACI 308 Standard Practice for Curing Concrete
      f. ACI 347 Recommended Practice for Concrete Formwork

D. Maintain one copy of each document on site.

E. NRMCA National Ready Mix Concrete Association, latest revision: Certificate of Conformance for Concrete Production Facilities.

F. Obtain cementitious materials from same source throughout.

1.06 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum 3 years documented experience.

B. Installer: Company specializing in performing work of this section with minimum 5 years documented experience.

1.07 MOCKUP

A. Section 01 40 00 - Quality Requirements: Requirements for mockup.

B. Construct mockup, 5 x 5 feet, including showing specified paving, joints, surface texture, exposed aggregate, etc as shown in the drawings.

C. Incorporate accepted mockup as part of Work.

1.08 PRE-INSTALLATION MEETINGS

A. Contractor shall coordinate pre-installation meeting.

B. Convene minimum one week prior to commencing work of this section.

1.09 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.

B. Do not place concrete when base surface temperature is less than 40 degrees Fahrenheit, or surface is wet or frozen.

PART 2 PRODUCTS

2.01 MATERIALS

A. Form Materials: Conform to ACI 301. Steel, wood or other suitable material of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion and defects.
   1. Use flexible spring steel forms or laminated boards to form radius bends as required.
   2. Coat forms with a non-staining form release agent that will not discolor or deface surface of concrete.

B. Reinforcing Materials:
   1. Reinforcing Bars: Deformed steel bars, ASTM A 615, Grade 60.
   2. Fabricated Bar Mats: Welded or clip-assembled steel bar or rod mats, ASTM A 184. Use ASTM A 615, Grade 60 steel bars, unless otherwise indicated.
   3. Joint Dowel Bars: Plain steel bars, ASTM A 615, Grade 60. Cut bars true to length with ends square and free of burrs. Provide slip pin dowels as a product commercially manufactured for this use.
   4. Supports for Reinforcement: Chairs, spacers, dowel bar supports and other devices for spacing, supporting, and fastening reinforcing bars, welded wire fabric, and dowels in place. Use wire bar-type supports complying with CRSI specifications.

C. Concrete Materials:
   1. Portland Cement: ASTM C150, Type IA or IIA.
      a. Use one brand of cement throughout Project unless otherwise acceptable to OWNER'S REPRESENTATIVE.
   2. Fly Ash: ASTM C 618; Type F.
   3. Normal-Weight Aggregates: ASTM C 33, Class 4, and as follows. Provide aggregates from a single source.
      a. Maximum Aggregate Size: 1½ inches.
      b. Do not use fine or coarse aggregates that contain substances that cause spalling.
      c. Local aggregates not complying with ASTM C 33 that have been shown to produce concrete of adequate strength and durability by special tests or actual service may be used when acceptable to OWNER'S REPRESENTATIVE.
   4. Water: Potable.
   5. Air Entrainment: ASTM C 260.

6. Chemical Admixture: ASTM C 494

D. Isolation Joint Materials:
1. ASTM D 994, preformed asphalt impregnated, ½ inch thick

E. Joint Sealer Material:
1. A polymer, designed for gun application, containing no free Toluene Diisocyanate (TDI), complying with ASTM C 920, Standard Specification for Elastomeric Joint Sealants. Scofield LITHOSEAL Trafficalk-3G, color grey, or approved equal.

F. Liquid-Membrane Forming and Sealing Curing Compound: Comply with ASTM C 309, Type I, Class A unless other type acceptable to OWNER'S REPRESENTATIVE. Moisture loss no more than 0.055 gr./sq.cm. when applied at 200 sq. ft./gal.

G. Bonding Compound:
1. Acrylic or styrene batadiene base, re-wetable type.

H. Epoxy Adhesive:
1. ASTM C 881, 2-component material suitable for use on dry or damp surfaces. Provide material "Type", "Grade" and "Class" to suit project requirements

I. Detectable Warning Texture: Provided as shown on Plans.
1. Texture: Diamond texture or Truncated dome style where shown on drawings.
2. Pattern: Diamond or Domes to be arranged in an in-line pattern only.
3. Application: Cast in Place or approved equal.
4. Color: As shown on the drawings.

2.02 CONCRETE MIX DESIGN

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.
2. Limit use of fly ash to 25 percent of cement content by weight.

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):
   a. Sidewalks and Curbs: 3300 psi.
   b. Crosswalks in drive aisles: 4000 psi
   c. Thrust blocks: 2,500 psi
2. Slump Limit at Point of Placement: 4 inches ± 1inch
   a. Slump limit for concrete containing high-range water-reducing admixture (superplasticizer): Not more than 8 inches.
3. Air Entrained: 5 percent +/- 1%.

C. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, project conditions, weather, test results or other circumstances warrant.

D. Use accelerating admixtures in cold weather only when approved by the Engineer in writing. Use of admixtures will not relax cold weather placement requirements.

E. Ready-Mixed Concrete: Comply with requirements and with ASTM C 94

2.03 SOURCE QUALITY CONTROL AND TESTS

A. Section 01 40 00 - Quality Requirements: Testing and Inspection Services:

B. Submit proposed mix design of each class of concrete to appointed firm for review prior to commencement of Work.

C. Tests on cement, aggregates, and mixes will be performed to ensure conformance with specified requirements.

D. Test samples in accordance with ACI 301.

PART 3 EXECUTION

3.01 EXAMINATION

A. Contractor shall coordinate verification of existing conditions before starting work.

B. Verify compacted granular base is acceptable and ready to support paving and imposed loads.

C. Verify gradients and elevations of base are correct.

D. Remove loose material from compacted base immediately before placing concrete.

E. Proof-roll prepared base surface to check for unstable areas and need for additional compaction. Do not begin paving work until such conditions have been corrected and are ready to receive paving.

3.02 PREPARATION

A. Moisten base to minimize absorption of water from fresh concrete.

B. Coat surfaces of manholes, catch basin, and clean out frames with oil to prevent bonding with concrete pavement.

C. Notify Architect/Engineer minimum 24 hours prior to commencement of concreting operations.

3.03 FORMING

A. Place and secure forms to correct location, dimension, profile, and gradient.

B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.

C. Place joint filler vertical in position, in straight lines. Secure to formwork during concrete placement.

D. Set forms to required grades and lines, braced and secured. Concrete flatwork thickness is noted on plans and details. Install forms to allow continuous progress of work and so that forms can remain in place at least 24 hours after concrete placement.

E. Check completed formwork for grade and alignment to following tolerances:
   1. Top of forms not more than ¼ inch in 10 feet.
   2. Vertical face on longitudinal axis, not more than ¼ inch in 10 feet

F. Clean forms after each use and coat with form release agent as required ensuring separation from concrete without damage.

3.04 REINFORCEMENT

A. General: Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars" for placing and supporting reinforcement.

B. Place reinforcement as indicated.

C. Interrupt reinforcement at contraction/expansion joints.

D. Place dowels and reinforcement to achieve pavement and curb alignment as detailed.

E. Provide doweled joints 24 inches o.c. at transverse joints and interruptions of concrete with one end of dowel set in capped sleeve to allow longitudinal movement.

3.05 PLACING CONCRETE

A. Comply with requirements and with ACI 304R for measuring, mixing, transporting, and placing concrete.

B. Do not place concrete until subbase and forms have been checked for line and grade. Moisten subbase if required to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

C. Place concrete by methods that prevent segregation of mix. Consolidate concrete along face of forms and adjacent to transverse joints with 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 dislocation of reinforcing, dowels and joint devices.

D. Use bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

E. Deposit and spread concrete in a continuous operation between transverse joints as far as possible. If interrupted for more than ½ hour, place a construction joint.

F. 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.

G. Place concrete in two operations; strike off initial pour for entire width of placement and to the required depth below finish surface. Lay 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 OWNER'S REPRESENTATIVE.

H. Curbs: When automatic machine placement is used for curb placement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce curbs to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not acceptable, remove and replace with formed concrete.

I. Slip-Form Pavers: When automatic machine placement is used for paving, submit revised mix design and laboratory test results that meet or exceed requirements. Produce paving to required thickness, lines, grades, finish and jointing as required for formed paving.
   1. Compact base and prepare subgrade of sufficient width to prevent displacement of paver machine during operations.

J. When adjoining pavement lanes are placed in separate pours, do not operate equipment on concrete until pavement has attained 85 percent of its 28-day compressive strength.

K. Cold-Weather Placement: Comply with provisions of ACI 306R and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions or low temperatures.
   1. When air temperature has fallen to or is expected to fall below 40 degrees F (4 degree C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 degrees F (10 degrees C) and not more than 80 degrees F (27 degrees C) at point of placement.
   2. Do not use frozen materials or materials containing ice or snow.
   3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix design.

L. Hot-Weather Placement: Place concrete complying with ACI 305R and as specified when hot weather conditions exist.
   1. Cool ingredients before mixing to maintain concrete temperature at time of placement to below 90 degrees F (32 degrees C). 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 standing water, soft spots, or dry areas.

M. Ensure reinforcement, inserts, embedded parts and formed joints are not disturbed during concrete placement.

N. Place concrete continuously over the full width of the panel and between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.

O. Place concrete to pattern indicated.

3.06 JOINTS

A. General: Construct isolation, weakened-plane (contraction), and construction joints true to line with face perpendicular to surface of concrete. Construct transverse joints at right angles to the centerline, unless otherwise indicated.

B. When joining existing structures, place transverse joints to align with previously placed joints, unless otherwise indicated.

C. Weakened-Plane (Contraction) Joints: Provide weakened-plane (contraction) joints, sectioning concrete into areas as shown on Drawings or at approximate 10' intervals if not shown. Align curb, gutter, and sidewalk joints. Construct weakened-plane for a depth equal to ¼ concrete thickness, as follows:
   1. Tooled Joints: Form weakened-plane joints in fresh concrete by grooving top portion with a recommended cutting tool and finishing edges with a jointer.
   2. Inserts: Use embedded strips of metal or sealed wood to form weakened-plane joints. Set strips into plastic concrete and carefully remove strips after concrete has hardened.

D. Construction Joints: Place construction joints at end of placements and at locations where placement operations are stopped for more than 2 hour, except where such placements terminate at isolation joints.
   1. Construction joints as shown or, if not shown, use standard metal keyway-section forms.
   2. Where load transfer-slip dowel devices are used, install so that one end of each dowel bar is free to move.

E. Isolation Joints: Provide pre-formed asphalt impregnated joint material.
   1. Locate expansion joints abutting catch basins, manholes, inlets, structures, foundations, footings, and other fixed objects, unless otherwise indicated, and as shown on Drawings.
   2. Locate expansion joints at a maximum of 45' o.c. for continuous sidewalks and within 8 - 16 feet from ends of walks which abut curbs or as shown on drawings.

F. Extend joint fillers full width and depth of joint, not less than 1-inch or more than 2-inches below finished surface for placement of backer rod and joint sealer. Place joint filler between paving components and building or other appurtenances. Recess top of filler as shown in drawings for sealant placement.

G. Finish 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.

H. Protect top edge of joint filler during concrete placement with a metal cap or other temporary material. Remove protection after concrete has been placed on both sides of joint.

I. Fillers and Sealants: Apply joint sealant to all joints in pedestrian or vehicular traffic areas, in accordance with the Scofield Tech-Data Bulletin S-404-3G, or equal if a different sealer is approved for use.

J. Provide keyed joints as indicated.

3.07 FINISHING

A. After striking-off and consolidating concrete, smooth surface by screeding and floating. Use hand methods only where mechanical floating is not possible. Adjust floating to compact surface and produce uniform texture.

B. After floating, test surface for trueness with a 10-foot straightedge. Distribute concrete as required to remove surface irregularities, or abrupt angles and refloat repaired areas to provide a continuous smooth finish, true to within ¼ inch in 10 feet.

C. Work edges of gutters, back top edge of curb, and formed joints with an edging tool, and round to 2-inch radius, unless otherwise indicated. Eliminate tool marks on concrete surface.

D. After completion of floating and when excess moisture or surface sheen has disappeared, complete troweling and finish surface as follows:
   1. Broom Finish: Broom finish by drawing a fine-hair broom across concrete surface perpendicular to line of traffic. Repeat operation if required to provide a fine line texture acceptable to OWNER'S REPRESENTATIVE.
   2. Exposed Aggregate: Apply surface retarder where exposed aggregate finish is required. Wash exposed aggregate surface with clean water and scrub with stiff bristle brush, acid etch solution exposing aggregate to match sample panel.

E. Sidewalk Paving: Light broom or Exposed aggregate where shown on drawings.

F. Curbs and Gutters: Light broom.

G. Inclined Vehicular Ramps: Broomed perpendicular to slope.

H. Place curing compound/sealer on exposed concrete surfaces immediately after finishing.

I. Do not remove forms for 24 hours after concrete has been placed, except where required for finishing. After form removal, clean ends of joints and point-up any minor honeycombed areas. Remove and replace areas or sections with major defects, as directed by OWNER'S REPRESENTATIVE.

J. Place detectable warning texture/truncated domes per manufacture's recommendations.

3.08 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 with an evaporation-control material. Apply according to manufacturer's instructions after screeding and bull floating, but before floating.

C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

D. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these.

E. Curing/Sealer Compound: Apply uniformly in continuous operation according to manufacturer's instructions.

3.09 JOINT SEALING

A. Separate pavement from vertical surfaces with ¼ inch thick joint filler.

B. Place joint filler in pavement pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.

C. Extend joint filler from bottom of pavement to within ¼ inch of finished surface.

3.10 TOLERANCES

A. Section 01 40 00 - Quality Requirements: Tolerances.

B. Maximum Variation of Surface Flatness: ¼ inch in 10 ft.

C. Maximum Variation From True Position: ¼ inch.

3.11 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements and 01 78 00 – Closeout Submittals: Field inspecting, testing, adjusting, and balancing.

B. Three concrete test cylinders will be taken for every 100 or less cu yds of each class of concrete placed each day or as directed by OWNER'S REPRESENTATIVE.

C. One additional test cylinder will be taken during cold weather and cured on site under same conditions as concrete it represents.

D. One slump and entrained air test will be taken for each set of test cylinders taken in accordance with ACI 301.

3.12 REPAIR AND PROTECTION

A. Immediately after placement, protect pavement from premature drying, excessive hot or cold temperatures, and mechanical injury.

B. Repair or replace broken or defective concrete, as directed by OWNER'S REPRESENTATIVE.

C. Drill test cores where directed by OWNER'S REPRESENTATIVE when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement with Portland cement concrete bonded to pavement with epoxy adhesive.

D. Sweep concrete pavement and wash free of stains, discolorations, dirt, and other foreign material just before final inspection.

E. Do not permit pedestrian traffic over sidewalks for 7 days and vehicular traffic over pavement until 85 percent of design strength of concrete has been achieved. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.

END OF SECTION

SECTION 32 84 00 - IRRIGATION SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Irrigation system shall be installed by a contractor licensed and bonded to perform such work in the State of Oregon.

B. Furnish all labor, tools, equipment, material, transportation and perform all operations necessary and incidental to proper execution and completion of the irrigation system installation in accordance with the Drawings and Specifications.

C. The irrigation system shall be a complete and operable landscape irrigation system, constructed to grades, and comply in all respects with these Specifications and Drawings and recognized good practice industry standards. **Existing irrigation systems are assumed to be present on site and to have a dedicated irrigation service and double check valve from the well house with its own controller. This system shall be maintained and preserved for all existing irrigation on site. Contractor shall coordinate with the Owner and shall protect and replace and/or repair where necessary to ensure continuous irrigation control to all areas affected by work performed under this scope. The new irrigation system shall be separately sourced by diverting water from the vacated domestic water service line from the well house and a new double check valve and controller shall be installed in the well house to serve the new system. Final exact location shall be coordinated with the General Contractor and Owner. Prior to beginning any irrigation work, Contractor shall coordinate a pre-installation meeting with the Owner and General Contractor to test the existing system for functionality and to determine area of service. Contractor shall also test and verify available pressure and flow rates. Adjustments and/or repairs to the irrigation systems may be required based on the findings of these tests. After completion of irrigation work, contractor shall again test existing and new irrigation systems to ensure functionality to the satisfaction of the Owner.**

D. Contractor shall test to confirm the static water pressure as per design. If the static water pressure is not within five (5) PSI of the design specified pressure the irrigation contractor will communicate this reading to the general contractor, the irrigation designer and Owner’s Representative.

E. Protect equipment, buildings, utilities, sidewalks, trees, landscaping monuments, markers, adjacent property, and work by others.

1.02 RELATED REQUIREMENTS

A. Section 01 33 00 - Submittal Procedures

B. Section 31 05 13 - Earthwork

C. Section 32 93 00 - Planting

1.03 RELATED WORK

A. Irrigation Contractor to install connections to new central controller system as per manufacturer’s instructions. Coordinate final location with Owner’s Representative.

B. Sleeving – Install sleeving prior to paving. Coordinate sleeve installation with General Contractor.

C. Install new double check valve for new irrigation system and test and confirm existing double check valve for existing systems meets current jurisdictional code requirements prior to irrigation system revisions/installation. Verify location with Owner’s Representative.

1.04 REFERENCES

A. ASTM International:

1. ASTM B32 - Standard Specification for Solder Metal
2. ASTM B42 - Standard Specification for Seamless Copper Pipe, Standard Sizes
3. ASTM D2235 - Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings
4. ASTM D2241 - Standard Specification for Poly Vinyl Chloride (PVC) Pressure-Rated Pipe (SDR Series)
5. ASTM D1785 - Standard Specification for Poly Vinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, and 120
6. ASTM D2466 - Standard Specification for Poly Vinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 40
7. ASTM D2564 - Standard Specification for Solvent Cements for Poly Vinyl Chloride (PVC) Plastic Piping Systems
8. ASTM F876 Standard Specification for Cross-linked Polyethylene (PEX) Tubing
9. ASTM F1960 Standard Specification for Cold Expansion Fittings with PEX Reinforcing Rings for Use with Cross-linked Polyethylene (PEX) Tubing
10. Uponor Professional Plumbing Installation Guide, current edition
11. Uponor Plumbing Design Assistance Manual, current edition

B. National Electrical Manufacturers Association:

1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

1.05 REGULATORY REQUIREMENTS

A. All work specified and detailed will conform to the U*niform Plumbing Code* and the *National Electric Code* as modified by the State of Oregon unless more stringent requirements are specified.

B. **The contractor will be responsible for obtaining all necessary electrical and plumbing permits and including those costs into the bid price.**

1.06 SUBMITTALS

A. The contractor will provide to the Owner's Representative a record of all equipment and supplies within 30-days after the award of the contract, and before any construction begins. Submit catalog performance data with product name and model number.

B. Any change in materials, equipment or the design, will be submitted in writing to the Owner Representative's for approval.

C. After completion of construction, submit neat and legible As-Built drawings as 'Record Drawings' to the Owner's Representative. Dimension and note all underground work vertically and horizontally. Measure from a permanent structure for location after burial.

D. Submit two copies of maintenance & operation manuals, parts list, warranty information, specification sheets, winterization instructions, precipitation rates and programming schedule.

1.07 PRE-INSTALLATION MEETINGS

A. Contractor shall coordinate pre-installation meeting. At a minimum this meeting shall test the existing irrigation system for functionality, condition, and service area; determine final locations for the new irrigation system connection, double check valve, and controller to the vacated domestic water line from the well house; and verify system water pressure and flow rates.

B. Convene minimum one week prior to commencing work of this section. Minimum attendees shall be the Contractor's site superintendents, General Contractor, the owner, and the project's irrigation installer.

1.08 SYSTEM DESCRIPTION

A. Central controller, metal indoor housing cabinet, weather-based control system as indicated on the Drawings. Controller shall be located in existing pump house or as directed by the Owner. Coordinate exact location with Owner's Representative.

B. Source Power: 110-volt, single phase or per manufacturer's recommendations.

C. Double-check valve assembly, flow sensor, master valve, weather sensor, grounding and surge equipment.

D. Sleeving

E. Quick Coupler Valves

F. Underground irrigation system, PVC piping, sprinklers and rotators, bubblers, and low-flow heads as indicated on the Drawings.

1.09 QUALIFICATIONS

A. Installer: The Contractor installing work covered by this Specification must be a state licensed and bonded Contractor. Contractor must be experienced in work of best-accepted trade practices and have equipment and personnel adequate to perform the work specified. Contractor must be familiar and comply with applicable governing regulations.

B. The firm shall be Oregon Landscape Contractor Association (OLCA) certified with a Certified Landscape Technician in irrigation installation and has at least four years of experience in irrigation system installation.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials in manufacturer's original, unopened, undamaged packaging with identification labels intact, or alternative, secure packaging provided by distributor.

B. Storage and Protection: Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.

C. The Owner or their Representative reserves the right to inspect and reject or order repair of irrigation system at any time until final review and acceptance.

1.11 WARRANTY

A. Contractor shall guarantee workmanship, materials, and performance of installation for at least 2-years from date of Final Acceptance. Comply with terms of manufacturer's warranty to ensure product performance.

B. The Contractor will be responsible for maintaining the irrigation system and protecting it from damage (at no cost to the Owner Representative) until the date of final acceptance. This includes damage caused by vandalism or adverse weather conditions.

C. Piping system warranty shall apply to potable water distribution and water service systems constructed of pipe and fitting products sourced from the same manufacturer.

D. The Contractor will be responsible for the programming of the new controller, the proper watering of all plants and any damage from over or under watering until the date of final acceptance.

E. Repair any settling of backfilled trenches, restore damaged turf, plants and paving (caused by settling), during the warranty period at no cost to the Owner's Representative.

1.12 EXISTING UTILITIES

A. The Contractor will, at their expense, have all existing utilities located at job sites prior to commencement of work.

B. The Contractor will protect any utilities that remain in place. Any located utilities damaged during construction will be repaired at the cost of the Contractor.

C. If utilities not located are damaged during construction, the Contractor will cooperate with utility company during the utility company repairs.

1.13 EXTRA MATERIALS

A. The Contractor will provide the Owner Representative (at no extra cost) with two controller keys, two quick coupler keys with hose swivels, two adjustment / removal tools for each different type of sprinkler head and two gate valve keys.

PART 2 - PRODUCTS

2.01 GENERAL

A. All products will be new and of types and models shown on the plans or as specified herein.

B. All products will be obtained from in state, local suppliers.

C. Substitutions must be approved by the Owner's Representative and be of equal function, quality, and compatible with other irrigation system components.

2.02 PIPE

A. Plastic pipe for main line 4" and smaller will be PVC (polyvinyl chloride) Schedule 40, bell end, continuously bearing the seal of NSF International and complying with the requirements of ASTM D -1785.

B. Depth of mainlines will be 18" min. to 24" max. (Top of pipe).

C. Plastic pipe for lateral lines will be PVC (polyvinyl chloride) Class 200, SDR 21, bell end, continuously bearing the seal of NSF International and complying with the requirements of ASTM D -1784, D-2241.

D. Depth of lateral lines will be 12" min. to 18" max. Lateral lines should be installed to conform to the depth of the head being installed.

E. In all pipe installations, the manufacturer's printed seal will be visible.

F. In all cases, installation of two or more pipes in the same trench is not permitted.

G. Plastic pipe for sleeves under paved areas, will be PVC (polyvinyl chloride) Schedule 40, bell end, continuously bearing the seal of NSF International and complying with the requirements of ASTM, D -1785. Sleeves will be a minimum of 6" in diameter or twice the diameter of the mainline or lateral line, whichever is larger.

H. Plastic nipples will be PVC (polyvinyl chloride) Schedule 80, NSF International-approved pipe, threaded both ends (TBE) or threaded one end (TOE) and complying with the requirements of ASTM D-1785.

I. Metal pipe will be copper tube type K.

J. Metal nipples will be brass.

K. NOTE: No galvanized pipe will be allowed underground.

2.03 FITTINGS

A. Plastic fittings will be solvent weld PVC (polyvinyl chloride) Schedule 40, Type 1, I.P.S., NSF International- approved meeting requirements of ASTM D- 2466.

B. Metal fittings will be 125-PSI bronze.

C. NOTE: No galvanized fittings will be allowed underground.

2.04 CEMENT AND PRIMER

A. PVC solvent cement will be used on all solvent weld fittings. Weld-On 711 or approved cement equal meeting NSF International Standards for Type I and II PVC through 6-inch pipe and meeting requirements of ASTM D- 2564.

B. PVC solvent primer will be used on all solvent weld fittings. Weld-On P-70 or approved primer equal meeting the requirements of ASTM F-656, with purple color.

2.05 THREAD SEALANT

A. All PVC threads will be sealed with a Teflon sealant.

B. On main line threads (under continuous pressure) Rectorseal T+2 or approved equal for PVC.

C. On lateral lines (at heads) all threads will be sealed with three wraps of Teflon tape, meeting requirements of MIL-T-27730A.

D. Only Teflon tape will be used at plastic valves and heads per manufacturer's specifications.

2.06 BACKFLOW PREVENTOR

A. Double-check valve assembly per water purveyor and/or jurisdictional authority requirements. Confirm suitability of existing double-check valve for existing irrigation systems on site and supply new double-check valve assembly for new irrigation systems.

B. Install PVC or brass unions or cast-iron flanges on both sides of the device to match pipe size.

C. It is the responsibility of the contractor to obtain permits and allow inspection by the water purveyor and the plumbing inspector.

D. The Contractor will, at their cost, have the initial Backflow Assembly Test Report performed by a State certified tester immediately after installation. Copies of the Test Report will then be immediately submitted to the water purveyor and Owner Representative.

E. If the device fails its initial test, the contractor will have the device repaired and retested at the contractor's expense.

F. Valve box sizes for double-check valve assemblies:

1. 2"- Brooks green plastic 1730VB-18. A 1730 E8 extension will be used if needed to set to grade. Two valve boxes will be used and set base to base to create a void for double check and to allow a technician to stand in and around device.

G. Depth of devices: On 3/4" to 2" sizes the depth of the devices will be 24". The final determination will be with the water purveyor and/or the jurisdictional authority.

2.07 VALVES

A. Isolation Valves:

1. 2" and smaller will be heavy duty brass globe or manual angle valves. 125-PSI min. with standard seat, threaded ports and a cross handle on the stem.
2. 3" and larger valves will be 125 PSI min. cast iron, flanged and have square top nut on the stem.

B. Valve Boxes:

1. A Highline (Armor) or Rain Bird 12" standard box with extensions is to be installed on 3" and smaller valves.
2. A Highline (Armor) or Rain Bird jumbo box with extensions is to be installed on 4" and larger valves.

C. Manual drains will be installed on the low points of the mainline with two (2) cubic feet of 3/4" drain rock. Champion 3/4" brass angle valve with rising swivel (200RS-075) will be used. A 3/4"

X 4" PVC nipple will be installed into the drain rock from the bottom of the valve. A Highline (Armor) or Rain Bird 10" round box will be used over this valve.

D. Automatic control valves as indicated on the Drawings. Accu sync pressure regulator shall be installed where pressure regulation is required. Valve size is noted in valve schedule on Drawings. A Highline (Armor) or Rain Bird 12" standard box will be installed on 1” automatic valves. A Highline (Armor) or Rain Bird jumbo box will be installed on 1½”, 2” and 3” automatic valves.

E. Quick coupler valves as indicated on the Drawings, installed in a Highline (Armor) or Rain Bird 10" round box with one (1) cubic foot of 3/4" drain rock. Quick couplers will be installed with PVC swing joint fittings and nipples of the same size as the threading of the quick coupler. Quick couplers will be secured to a 1” or 1½” aluminum angle iron 30” long with #32 or #36 stainless steel clamps.

F. Pressure Regulator (as needed) shall be Wilkens, Watts, or Conbraco top entry with double unions, as approved.

2.08 VALVE BOXES

A. All valves, wire splices and ground rods will have valve boxes with covers installed over them.

B. All valve boxes will be from:

1. Highline Products, 131 Hartwell Ave., Lexington, MA 02421 USA or
2. Rain Bird Corporation 970 West Sierra Madre Ave. Azusa, CA 91702.

C. The valves will have complete access for maintenance.

D. The bottom of the box will be below the bottom of the valve to prevent soil from covering valve body.

E. All valve boxes will have a base of 3/4" drain rock. Each size of box will have a corresponding amount of rock.

1.	10" round box:	one	(1) cubic foot
2.	12" standard box:	two	(2) cubic feet
3.	Jumbo box:	three	(3) cubic feet
4.	Brooks 1730:	four	(4) cubic feet

F. Protect rock from contamination with filter fabric.

G. Install box with a 2" space over the pipe.

H. All boxes in turf areas will be installed flush to grade and use extensions if needed.

I. All boxes in shrub areas will be installed 2" above grade and use extensions if needed, to accommodate the application of bark mulch.

2.09 SPRINKLER HEADS

A. All popup spray body sprinkler heads will be by manufacturer as indicated on the Drawings or as otherwise approved. See schedule on Drawings for proper nozzle sizes. All heads will have a sealing check device installed to prevent low head drainage. Locate heads no closer than three inches (3") from any adjacent walk, drive or road (paved or gravel).

B. All rotor heads will have swing joints of the same thread size installed or as recommended by manufacturer.

C. Six-inch pop-up heads will be installed in turf areas and planting beds.

D. All heads in shrub beds will be installed 2" above grade to accommodate the application of bark mulch.

E. All heads in turf areas will be installed to grade per manufacture’s specifications. Refer also to irrigation details on Drawings.

2.10 CONTROLLERS

A. Controller to be weather- based central controlled system as specified in the Drawings. Install per manufacturer's specifications.

B. Controller station size and location as noted on the Drawings and approved by the Owner.

C. Grounding: To be installed per manufacturer's specifications.

D. Interior housing cabinet installed per manufacturer's specifications.

2.11 ELECTRICAL

A. Confirm and coordinate power source for irrigation system with Owner and General Contractor.

B. All wiring shall follow the "National Electric Code" as modified by the State of Oregon unless more stringent requirements are specified.

C. All primary power connections and disconnects shall be performed by a state-certified electrician at the contractors' expense and inspected by the proper jurisdictional authority.

D. All automatic remote-control valves, including master valves, shall be wired with single strand copper, UL approved for direct burial, AWG (UL) Type UF, 600 V, sized per manufacturer's recommendations -14 Gauge minimum.

E. All valve wire connections shall be 3M DBY / DBR.

F. At each valve, a three (3) foot length of wire shall be provided neatly coiled.

G. The wire run shall be installed along the side of the mainline at the bottom of the trench

H. All valve field wire splices made will be installed in valve boxes, with no splices between valve boxes and valve boxes and controllers.

2.12 CONCRETE THRUST BLOCKS

A. Install concrete thrust blocks where the mainline changes direction at ells and tees and where the irrigation main ends.

B. Install thrust blocks on all mainline 2 1/2" and larger. Pour thrust blocks against pipe and firm undisturbed soil with at least one cubic foot of concrete.

C. Thrust blocks must cure for five (5) days before mainline pressure test.

PART 3 - EXECUTION

3.01 IRRIGATION SYSTEM – INSPECTION PROCEDURE

A. Owners Representative may request inspection at any time during installation of irrigation system including the following milestones:

1. Pre-construction Static Pressure Test
2. Layout
3. Excavation
4. Mainline and Wire Installation
5. Mainline Flushing
6. Automatic Valve Installation
7. Mainline Pressure Test
8. Lateral and Swing Joint Installation
9. Lateral Flushing and Head Installation
10. Controller, Primary Power Installed, and Grounded
11. Valve and Controller Wiring
12. Controller Stations Wired as per Design
13. Backfilling of Trenches
14. Finish Work

15. Heads, Valves and Controller Match Specifications
16. Head and Valve Box Grade
17. Head Adjustment
18. Submit Copy of Back Flow Assembly Test Report
19. Submit “As Built” Drawings

3.02 INSTALLATION PROCEDURE

A. No work shall be covered or enclosed until it has been inspected, tested, approved and signed off on the checklist. A 24-hour notice for approval shall be given. The Owner’s Representative will maintain the inspection checklist.

B. Before construction begins contractor will confirm design static pressure. A change in more than five (5) PSI may require a redesign. Contractor will notify Owners Representative of this difference.

C. Layout: Stake, flag and/or paint the location of all heads, valves and piping according to the schematic design shown on the drawings. The layout is then to be approved.

D. Excavation shall proceed after layout approval. If during excavation, a large amount of unknown material (asphalt, concrete, wire, steel, etc.) is uncovered, the debris shall be removed from site, at Contractor expense. Bottom of trench shall be free of rocks, asphalt, concrete, wire, steel and any other debris. Trenching is the preferred method for pipe installation. Pipe pulling is only allowed when the soils are known to be clean and free of debris. Hand trench around existing tree roots of 2" and larger when encountered. Pipe shall have firm and uniform bearing on all pipe runs to prevent uneven settlement. Wedging or blocking of pipe is not permitted.

E. Mainline, thrust blocks and isolation valves shall be installed according to the specifications. Valve wiring will be installed as per specifications and details. The mainline installation is then to be approved.

F. The mainline is to be flushed before the installation of the automatic remote-control valves. Soil may be placed in trenches between fittings to insure the stability of the line under pressure. Thoroughly flush all mainline pipe. The flushing is then to be approved.

G. The mainline is to be pressure tested, after valve installation, with the pipe filled with water and all air expelled. Minimum pressure test shall be 100 PSI without losing three (3) PSI over a two-hour period. Pressure can be achieved with a pump but shall not be maintained with a pump. Supply certified pressure gauge during testing. Detect and repair all leaks and retest until approval is granted.

H. The lateral lines, swing joints and flexible pipe joints shall then be installed and then approved.

I. The lateral lines shall be thoroughly flushed to remove all debris and expel all air from the piping. The flushing is then to be approved.

J. Delay complete backfilling until pressure tests have been accepted. Backfill, settle with water and compact trenches in 6" lifts with material free of rocks and debris. Backfilling will then be approved.

K. The installation of valve boxes and heads shall be inspected and approved.

L. The installation of all wiring at valves and controller shall be inspected and approved.

M. Valve pressures will be adjusted. The contractor will then adjust all heads. The head adjustment shall be inspected and approved.

N. During a walk through with the Contractor and the Owners Representative a system test will be performed to establish a final punch list. All items on the punch list will be corrected by the Contractor to the Owner Representative’s satisfaction.

O. Signing of the warranty will begin at date of final acceptance.

3.03 PIPE AND FITTINGS

A. All solvent weld cement joints are to be clean, dry and follow all manufacture's specifications. All cuts are to be square and debarred.

B. No solvent welding of PVC pipe will be permitted in freezing weather. In rainy weather, solvent weld PVC pipe only under cover.

C. All solvent weld joints are to be given at least 24-hours cure time before testing.

D. No fittings are to be closer than 12" apart.

E. All mainline threaded fittings will be applied with approved paste, hand tightened, and tool tightened with no more than two (2) turns.

F. All sleeving is to be marked and taped over during and after construction to keep soil out of sleeves.

G. All swing joints will be assembled and installed per manufacturer's specifications.

3.04 VALVES

A. All systems will have a brass angle valve with union installed before the automatic valve. On the downstream side of the valve, a MPT X SOC union will be installed. All fittings, unions, angle valve and nipples will match valve size.

B. Do not use Teflon paste on automatic plastic valves. Teflon tape will be used on valve threads.

C. Only one (1) valve per valve box unless otherwise indicated.

3.05 HEADS

A. All heads are to be installed per Specifications and manufacturer's instructions after lateral flushing.

B. Contractor will use Teflon tape only on all head threads.

C. Install heads called for in the Irrigation Schedule at locations shown on Drawings. Some field adjustment may be necessary to achieve desired coverage. Written notification and approval are required before making any significant changes.

D. Heads are to be adjusted not to water walks, streets or other pavement.

3.06 CONTROLLERS

A. Controller shall be installed in existing well house for new irrigation system. Final location of controller shall be determined by the Owner. Existing controllers shall be maintained for existing irrigation systems.

B. All valve and communication wire shall be installed in a clean and neat manner into all equipment.

C. The Contractor will note valve number, location, run time and program on the label affixed to the controller door.

D. The Contractor will have a Megger test performed on the installed specified ground rod to verify proper installation.

E. Installation of controller and other irrigation related equipment shall not damage, interfere, or restrict access to other systems located within the existing well house

3.07 CLEAN UP

A. Remove all debris, boxes, wrappings, excess material and equipment before final walk through and leave area in a clean and neat condition as good or better than before construction.

B. The Contractor will complete site restoration, including reestablishment of trenches and all disturbed areas, with seed mix as specified on the Drawings. If the season of the year does not permit viable seed establishment, then restoration will be completed with sod as approved.

C. Clean up and restoration will be done at Contractor's expense.

END SECTION 32 84 00

SECTION 32 91 19 - LANDSCAPE GRADING, TOPSOIL, AND SOIL PREPARATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This section covers all work necessary to furnish and place topsoil mixes, and general preparation of planting areas as denoted on the Drawings, including:

1. Soil preparation and testing
2. Fertilizing
3. Clean up

B. All disturbed areas to receive soil preparation and specified landscape treatment (trees, shrubs, groundcover, grass seed mix, etc.) for establishment of permanent erosion control on all areas of the project site. Installation shall comply in all respects with these Specifications and the site Drawings. Site restoration of disturbed areas will be completed by the Contractor with specified seeding or as otherwise approved by the Owner, whether explicitly shown on the Drawings or not.

C. Furnish all labor, tools, equipment, material, transportation, and perform all operations necessary and incidental to proper execution and completion of all landscape installation work in accordance with the Drawings and Specifications.

D. Observe the conditions under which Work is to be performed and notify the Owner's Representative of unsatisfactory conditions. When conditions detrimental to plant growth are encountered, such as rubble, rock fill, utility conflicts, or adverse drainage conditions, notify the Owner's Representative before planting, adding soil amendments, and other soil work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Owner.

E. Comply with governing regulations applicable to landscape materials.

1.02 RELATED REQUIREMENTS

A. Section 01 33 00 – Submittal Procedures

B. Section 31 05 13 – Earthwork

C. Section 31 25 13 – Erosion Controls

D. Section 32 93 00 - Planting

1.03 SUBMITTALS

A. Provide certification that the following materials meet the specified requirements:

1. Compost amendment.
2. Soil fertility test results for imported topsoil with recommended soil additives (if any).

B. Quantity Certification: Provide certification of quantities of fertilizer, topsoil, and compost delivered to the site.

C. Submit any change in materials, equipment, or the design in writing to the Owner's representative for review and final approval.

D. Samples:

1. Submit duplicate samples and manufacturer's guaranteed analysis of the following items and submit other materials as may be required by the Owner's representative and obtain written approval thereof before beginning installation or delivery of materials to the project site. Finished work shall match approved samples.

a. Soil additive conditioners (if required): 1/2 pound
b. Imported topsoil: 1/2 pound
c. Compost amendment with analysis report: 1/2 pound

1.04 QUALIFICATIONS

A. Installer: The Contractor installing work covered by this Specification section must be a state licensed and bonded Landscape Contractor. Contractor must be experienced in landscape work of best-accepted trade practices and have equipment and personnel adequate to perform the work specified.

1.05 QUALITY ASSURANCE

A. Comply with all governing regulations applicable to grading and soil work.

B. Protection:

1. Protect buildings, utilities, subgrade, site improvements, existing vegetation, fences, lighting, and underground irrigation systems during tiling and related soil work.
2. Protection of Work: Contractor is responsible for protecting all work during site construction.
3. Repair any item detailed above, not part of any demolition detail, damaged during construction to the approval of, and at no additional cost to, the Owner.

C. Field Superintendent – provide one person who shall:

1. Be present at all times during execution of work in this section;
2. Be familiar with the materials and best methods for installation; and
3. Direct work performed under this section.

D. Topsoil placement and soil preparation shall not take place during periods where saturated soil or surface water is present in work areas. Soil shall be in friable (workable) condition when placed. Work shall not take place when temperature is less than 32-degrees Fahrenheit or when frozen soil exists on site.

1.06 COORDINATION

A. Coordinate work with other trades.

B. Installation of irrigation system, if used, and other utilities.

C. It is the Landscape Contractor’s responsibility to coordinate the performance of work in this Specification. Damage to existing systems, utilities, facilities, landscaping, or properties resulting from lack of coordination will be the Contractor’s responsibility

D. Protection of subgrade: Do not allow vehicles or equipment to pump or rut subgrade, stripped areas, footing excavations, or other areas prepared for the project. Protect subgrades, fills, and excavation areas from surface waters flowing into the work areas.

E. Coordinate the removal of grass and weeds for planting areas prior to Work in this Section.

1.07 PRE-INSTALLATION MEETINGS

A. Contractor shall coordinate pre-installation meeting.

B. Convene minimum one week prior to commencing work of this section. Minimum attendees shall be the Contractor’s site superintendents, General Contractor’s site superintendents, and the project’s certified erosion control inspector. Pre-installation meeting may be coordinated with other work.

1.08 EXISTING UTILITIES

A. The Contractor will, at their expense, have all existing utilities located at job sites. Call Utilities Notification Center, (503) 232-1987.

B. The Contractor will protect any utilities that remain in place. Any located utilities damaged during construction will be repaired at the cost of the Contractor.

C. Locate and identify, with visible marking, existing underground utilities in the areas of work. If utilities are to remain in place, provide adequate means of protection during excavation operations.

D. If utilities not located are damaged during construction, the Contractor will comply and work with the utility company during the utility company's repairs.

E. Do not interrupt existing utilities or service facilities occupied and used by the Owner or others.

PART 2 - PRODUCTS

2.01 GENERAL

A. Native topsoil: Native (existing/stockpiled) topsoil shall be a natural friable soil and shall be reasonably free from subsoil, clay lumps, stone, or similar objects larger than 3/4-inch in greatest diameter, brush, stumps, roots, objectionable weeds or litter, growth or a hindrance to subsequent smooth grading and maintenance operations.

B. Imported topsoil: Imported topsoil shall be naturally friable; dark brown in color; pH range of 5.5 to 7.0, a minimum of 10%-30% organic material content (may include composted yard waste consisting of 100% recycled plant waste); free draining and free of stones or debris 3/4-inch or larger in any dimension and other extraneous materials harmful to plant growth. Sodium absorption ratio maximum 4.0.

C. Compost: Compost shall be a commercially manufactured material, medium grind, made from dead plant material such as grass clipping, green and dead dry leaves, garden and vegetable material, and ground branches of trees and shrubs. Furnish a product that is composted under controlled aerobic decomposition, with the internal temperature reaching 135-degrees Fahrenheit for 15 days, without exceeding 155-degrees Fahrenheit. Ensure that it contains less than 10% bacteria and less than 10% fungus, is a mature compost, and does not contain detrimental components. If it contains more than 10% bacteria and/or fungus, it is not mature compost and will not be acceptable. Certification by testing will be required.

1. Compost Analysis: Have a Compost Foodweb Analysis test performed on a sample of the compost at a soil food web lab and submit a copy of the test results to the Owner for approval. The compost must meet the criteria of this section. The test must give resuls in the following categories:
   a. Active Bacterial Biomass
   b. Total Bacterial Biomass
   c. Active Fungal Biomass
   d. Total Fungal Biomass
   e. Hyphal Diameter
   f. Protozoa Numbers
   g. Total Nematode Numbers
2. An approved Soil Food Web Lab is:
   Soil Foodweb Inc.
   728 SW Wake Robin Ave
   Corvallis, OR 97332
   (541) 752-5066
3. Approved Material: City of Portland Leaf Compost Available through Sunderland Recycling Facility or approved equal.

D. Substitutions will only be allowed with written approval.

E. Provide fertilizer that meets the recommendations of the "Soil Fertility Test" as required by these Specifications.

2.02 SOIL ADDITIVES

A. Soil additives for correction of pH and trace elements deficiencies shall be in factory labeled containers and approved prior to application.

2.03 COMMERCIAL FERTILIZER

A. Provide fertilizer that meets the recommendations of the “Soil Fertility Test” as required in these Specifications.

2.04 EXAMINATION

A. Obtain a “Soil Fertility Test” for imported topsoil for areas to receive the Work of this Section. Test results will include recommendations for soil amendments and other particulars needed to sustain plant growth.

B. Verify prepared soil base is ready to receive the Work of this Section, including the removal of existing grass, weeds/ vegetation, gravels, etc. per these Specifications and as shown on the Drawings.

C. Saturate soil with water to test drainage.

D. Verify required underground utilities are available, in proper location, and ready for use

2.05 SOIL FERTILITY TEST AND RECOMMENDATION

A. Obtain and submit soil samples to a qualified testing laboratory for a soil fertility test and recommendation report.

B. Imported Topsoil: Test and analyze imported topsoil to ascertain percentage of nitrogen, phosphorus, potash, soluble salt and organic matter, and pH Value. Provide recommendation for fertilizer and soil amendment application rates for specified planting as result of testing.

C. Testing is not required for imported topsoil when recent tests are available. Submit these test results to testing laboratory. Indicate, by test results, information necessary to determine suitability.

D. Submit the soil fertility test report(s) and laboratory recommendations for appropriate plant growth to the Owner’s Representative for approval before beginning soil preparation work.

E. The cost for testing and the fertilizer and soil additives recommended by the tests is to be borne by the Contractor and is incidental to the soil preparation work.

PART 3 - EXECUTION

3.01 PREPARATION OF PLANTING AREAS

A. All areas shall be finish graded and approved by the Owner’s Representative before commencement of planting. All areas shall allow for removal of gravels and undesirable/contaminated soils and placing planting soil amendments added to planting areas as specified. Sufficient topsoil (native soil, soil stockpiled and reused on site, and/or imported where necessary) shall be required for healthy plant growth in all new planting areas (refer also to Section 32 93 00 Planting and Drawings). All grades shall flow smoothly into one another and produce positive drainage. The Contractor is responsible for any adverse drainage conditions that may affect plant growth and architectural features unless the Contractor contacts the Owner’s Representative immediately, indicating any possible problems.

B. Finish grading: Finish grade all planting areas by floating and hand raking to an acceptable smooth, even grade. Remove high points and fill low pockets to eliminate the possibility of standing water. Ensure all areas have positive drainage.

1. Slope all areas to prevent puddling and drain surface water toward catch basins, drains, curbs, or as shown on the Drawings.
2. Bring finished grade even with adjacent curbs, walks, and level with existing grades. Remove all rocks greater than 3/4-inch diameter from the top 4-inches of soil.
3. Soil in all areas shall be thoroughly settled, with a smooth surface free of humps and hollows, and shall be firm enough to resist undesirable impressions when stepped upon.

C. Lightly irrigate soil prior to seeding. Plants shall be watered after installation.

3.02 CLEAN UP

A. Pressure washing of concrete, masonry, and asphaltic paving: Any paved area or surfaces stained or soiled from landscaping materials having been hauled, carried, or spilled over or around it shall be cleaned with a power sweeper using water under pressure. Building surfaces shall be washed with proper equipment and materials as approved by the Owner.

B. At completion of work, remove all debris, equipment, and surplus materials from project site.

C. Leave project site in a neat and orderly condition.

D. Clean up and restoration will be done at Contractor's expense.

END SECTION 32 91 19

SECTION 32 93 00 - PLANTING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Furnish all labor, tools, equipment, material, transportation, and perform all operations necessary and incidental to proper execution and completion of all planting work and landscape installation work in accordance with the Drawings and Specifications.

B. All planting work shall include lawn/seeded areas, shrubs, trees, groundcovers, and as shown in the Drawings and incidental to restoration of disturbed existing landscaping within the project area.

C. All disturbed existing lawn/turf areas, including irrigation trenches and areas disturbed by construction activity, to receive soil preparation and specified grass seed mix for complete restoration to pre-construction condition, whether expressly shown on the Drawings or not.

D. Comply with all governing regulations applicable to landscape materials.

1.02 RELATED REQUIREMENTS

A. Section 01 33 33 – Submittal Procedures

B. Section 31 05 13 - Earthwork

C. Section 32 91 19 - Landscape Grading, Topsoil, and Soil Preparation

1.03 SUBMITTALS

A. Certified Confirmed Orders: Certify in writing to the Owner's Representative within thirty (30) days of the award of the contract, confirmed orders for plants and provide the quantity, location, phone number and address of the grower who has agreed to provide any plant material. Should the Contractor neglect to provide this documentation within the allocated time, contractor may forfeit any substitution benefits.

B. Submit all substitution requests, including suggested equivalent plant material and reason for substitution request, to Owner's Representative for approval.

C. Certificates: Certificates required by law shall accompany shipments. Upon completion of the installation, submit certificates to the Owner's Representative.

D. Quantity Certification: Provide certification of quantities of mulch, fertilizer, herbicide, and planting accessories delivered to the site.

E. Topsoil soil test results with recommended soil additives per Section 32 91 19

F. Samples:

1. Submit duplicate samples and manufacturer's guaranteed analysis of the following items and submit other materials as may be required by the Owner's Representative and obtain written approval thereof before beginning installation or delivery of materials to the project site. Finished work shall match approved samples.
    a. Soil additive conditioners (if required): 1/2 pound
    b. Bark Mulch: 1/2 pound
    c. Imported topsoil: 1/2 pound
    d. Compost (soil amendment): 1/2 pound

G. Project Record Documents: Upon completion of work, submit neat and legible As-Built drawings as 'Record Drawings' indicating any changes from approved design.

1.04 QUALIFICATIONS

A. Installer: The Contractor installing work covered by this Specification section must be a state licensed and bonded Landscape Contractor. Contractor must be experienced in landscape work of best-accepted trade practices and have equipment and personnel adequate to perform the work specified. Contractor must be familiar and comply with the *American Standard for Nursery Stock* (ANSI Z60.1-2014 (or current edition) published by the American Horticulture Industry Association (AmericanHort) and other governing regulations applicable to landscape materials and their installation.

1.05 QUALITY ASSURANCE

A. Comply with all governing regulations applicable to landscape materials.

B. Tree pruning, if required, shall comply with ANSI A300 *Tree, Shrub, and other Woody Plant Management – Standard Practices (Pruning)*, current edition.

C. Field Superintendent – provide one person who shall:

1. Be present at all times during execution of work in this section;
2. Be familiar with the materials and best methods for installation; and
3. Direct work performed under this section.

D. Government Inspection: All plants and planting material shall meet or exceed the specifications of federal, state, and local laws requiring inspection for plant disease and control.

E. Industry Standards: Quality definitions, size tolerances, root ball sizes, and caliper-to-height ratios shall be no less than minimums specified in *American Standard for Nursery Stock* published by the American Horticulture Industry Association ANSI Z60.1-2014 (or current edition). All plant materials shall be fully rooted, well-branched, evenly formed, and typical for their species, free from disease, pests, damage or mechanical injury.

F. Acceptance: The Owner or their Representative reserves the right to reject any or all plant material at any time until final review and acceptance. Remove rejected plants immediately from site.

G. Certification: Produce upon request, sales receipts for all nursery stock and certificates of inspection from federal, state, and other authorities.

1.06 GUARANTEE

A. All plant materials shall be guaranteed to take root and grow and thrive for a period of 365-days after final acceptance of work. Contractor shall replace at no additional expense to the Owner, any plant material that fails to thrive during that period except in cases of gross neglect and vandalism.

1.07 CHANGE ORDERS AND SUBSTITUTIONS

A. The Contractor shall provide all plants of the size, species, variety, and quality noted and specified. If unavailable, the Contractor shall notify the Owner's Representative in writing immediately and provide the names and telephone numbers of five (5) nursery suppliers that they have contacted. If substitutions should be permitted, it can be made only with the prior written approval of the Owner.

1.08 PRE-INSTALLATION MEETINGS

A. Contractor shall coordinate pre-installation meeting.

B. Convene minimum one week prior to commencing work of this section. Minimum attendees shall be the Contractor's site superintendents, General Contractor's site superintendents, and the project's certified erosion control inspector. Pre-installation meeting may be coordinated with other work.

PART 2 - PRODUCTS

2.01 PLANT MATERIALS

A. Quantities: Plant materials shall be furnished in quantities required to complete work as indicated on the Drawings and shall be of species, kinds, sizes, etc. specified. If discrepancies occur, design intent of the Drawings prevails over quantities listed. Contractor shall be responsible for verifying plant and material quantities prior to bidding and construction.

B. Nomenclature: Plant names listed on the Drawings conform to those established by custom in the nursery trade.

2.02 QUALITY

A. Plants shall conform to current *American Standard for Nursery Stock*, in accordance with ANSI Z60.1 current edition, in all ways.

B. Plants shall be symmetrical and typical for variety and species.

C. Plants shall be nursery-grown under climatic conditions similar to those in the project area.

D. Plants shall be sound, healthy, vigorous, and free from plant disease, insect pests, or their eggs.

E. Container stock shall be grown in the containers in which delivered for at least eight (8) months but shall not be root bound.

F. Root balls of “balled and burlapped” (B&B) trees shall be grown under favorable growing conditions in the nursery, having received the proper cultural treatment to develop a well-branched root system and harvested with the ball of earth in which they are growing remaining intact. Root ball size shall be of a depth and diameter to encompass enough of the root system as necessary for the full recovery of the plant and the trunk of the tree shall be centered in the root ball. Refer to *American Standard for Nursery Stock* ANSI Z60.1.

G. Plants shall not be pruned prior to delivery, except as authorized by the Owner’s Representative.

H. Protect plants in transit and after delivery to the project site. Plants in broken containers and plants with broken branches or injured trunks will be rejected. Remove rejected material from the site immediately.

2.03 INSPECTION

A. Right of inspection for approval or rejection is reserved at the place of growth and/or the project at any time upon delivery or during works. Plants may be inspected for size, variety, condition, and defects or injury.

B. Any additional required inspections caused by failure to assemble the required materials or rejection of plant material shall be paid for by the Contractor.

C. Certifications or inspections shall be furnished as may be required by city, county, or state authorities.

2.04 DIMENSIONS

A. Height and spread of screening materials are specified in the Drawings.

B. Container plants shall meet minimum size and soil volume standards per *American Standard for Nursery Stock* ANSI Z60.1.

2.05 GROUNDCOVER PLANTS

A. Groundcover plants, unless otherwise indicated on the Drawings, shall be rooted plants grown in containers.

2.06 FERTILIZERS AND SOIL CONDITIONERS

A. Materials delivery and storage: Manufactured materials shall be delivered in original container with brand and makers name marked thereon. Materials in broken containers or showing evidence of damage will be rejected and must be immediately removed from the site. Odorous material shall not be brought to the site until they are to be used.

B. Bark Mulch:

1. Planting Beds and Mulched Areas: Well-aged medium grind or shredded dark fir or hemlock mulch as specified on the Drawings.
2. Mulch shall not be placed in frequently inundated areas or in direct flow patterns to minimize migration of the mulch.

C. Peat: A natural residue formed by decomposition of reeds, sedges or mosses from fresh water site, free from lumps, roots and stone, absorbing at least four times its dry weight of water, organic matter not less than 90% on a dry weight basis. The maximum moisture content at time of delivery 65% by weight.

D. Rotted Sawdust: Minimum two (2) years old, color chocolate brown.

E. Sand: Clean, coarse, ungraded, meeting the following requirements:

Sieve Size in mm	Tyler Standard Sieve US Series Equiv No.	Percent Passing by Weight
4.5	4	100
2.0	10	95-100
1.0	16	85-100
0.5	30	50-70
0.25	60	0-30
0.10	140	0-10
0.07	200	0-5
0.01	270	0

F. Manure: Shredded, well-rotted, unleached stable or cattle manure, free from weed seed and refuse, containing no chemicals or materials harmful to plant life, not less than four (4) months nor more than two (2) years old. Sawdust or shavings shall not exceed 50% content of the manure.

G. Backfill Soil Mix for planting holes: 1 cubic yard organics; 1 cubic yard sand; 1 cubic yard sandy loam topsoil; controlled release fertilizer at manufacturers recommended application rate.

H. Fertilizer:

1. All fertilizers and soil conditioners shall be first quality, standard brand, agricultural products.
2. Trees and Shrubs: Controlled release fertilizer; 18-10-10-7 (N-P-K) with iron (resin coated). 18% nitrogen, 10% phosphoric acid, 10% potash, 7% sulfur or similar.
3. Lawns: Granular, pelleted, or liquid/flowable fertilizer; composition 20% nitrogen, 20% phosphorous, 10% potassium, and 3% iron, by weight or as recommended by turfgrass sod supplier.

I. Herbicides:

1. Initial Herbicides: Devrinol and manufactured by Stauffer Chemical Co., Romstar as manufactured by Chip Star or approved equals.
2. Herbicides that can be used after 6-months: Simazine “Princep” as manufactured by Geigy CO., “Round-Up” as manufactured by Monsanto Chemical Co. or approved equals.

2.07 TOPSOIL

A. Contractor shall remove existing gravels and contaminated and/or unsuitable soils in new planting areas within project work area.

B. Import new topsoil or use existing topsoil stockpiled on site where available to make up required amounts for installation.

C. Topsoil required; pH range of 5.5 to 7.0, a minimum of 10%-30% organic material content (may include composted yard waste consisting of 100% recycled plant waste), be dark brown in color, friable, free draining, free of stones or debris 3/4-inch or larger in any dimension and other extraneous materials harmful to plant growth. Sodium absorption ratio maximum 4.0.

D. Topsoil source: On-site topsoil or imported or manufactured soil void of roots, plants, sod, stones, clay lumps, alkali salts, and other extraneous material harmful to plant growth.

2.08 MISCELLANEOUS MATERIALS

A. Tree Stakes: 2” x 2” square or 2” diameter round S4S Douglas fir pressure treated tree stakes stained with Olympic Semi-transparent #916.

B. Tree support: 1” plastic chain or rigid guy with hose loop or approved equal.

C. All material incidental to the completing installation of plant material part of this scope of work.

PART 3 - EXECUTION

3.01 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Notify the Owner’s Representative of delivery schedule so plant materials may be inspected upon job site delivery. Remove unacceptable products immediately from job site.

B. Plant material damaged as a result of delivery, storage, or handling will be rejected.

C. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

D. Storage and Handling: Protect products against damage and dehydration. Store plants and materials in area dedicated for such purpose by the Owner’s Representative. Do not impeded normal use of the site. Cover plant roots and root balls with soil or other accepted material upon job site delivery if not to be planted within 4-hours. Store plant material in light shade and protect against harmful weather until planted. Maintain plant materials not to be planted within 4-hours.

E. Turfgrass sod may be used in place of seeding depending on weather conditions with approval by the Owner’s Representative. Sod, if used, shall be harvested, delivered, and installed/transplanted within a period of 24-hours, unless a suitable preservation method is approved prior to delivery. Turfgrass sod not transplanted within this period, or preserved by approved methods, shall be inspected and approved by the Owner’s Representative prior to its installation.

F. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
3. Accompany each delivery of bulk materials with appropriate certificates.

3.02 EXAMINATION

A. Examine areas to be planted for compliance with requirements and other conditions affecting installation and performance of the Work.

1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, rock fill, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
2. When conditions detrimental to plant growth are encountered, notify the Owner's Representative before planting or adding soil amendments. Do not proceed with the work until satisfactory conditions have been corrected in a manner acceptable to the Owner.
3. If contamination by foreign or deleterious material or liquid is present in the soil within a planting area, remove the soil and contaminations as directed by the Owner's Representative and replace with new planting soil. Contaminated soil shall be disposed of in accordance with applicable federal, state, and local jurisdictional requirements.

3.03 ENVIRONMENTAL REQUIREMENTS

A. Do not install plant material when ambient temperatures may drop below 35-degrees F or rise above 90-degrees F.

B. Do not install plant material when wind velocity exceeds 30-mph.

C. Do not install plant material in adverse drainage conditions.

D. Turfgrass sod, if used, shall not be installed if sod is dormant or if ground is frozen or muddy.

3.04 COORDINATION

A. Install plants after, and coordinate with, installation of any underground irrigation system piping and sprinkler heads, pavement, retaining walls, fencing materials, earthwork, and other site work.

3.05 PROTECTION

A. Verify location of underground utilities and facilities prior to doing work.

B. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations. Repair and make good any damage to services lines or improvements caused by planting operations at no additional cost to the Owner.

1. Protect grade stakes set by others until directed to remove them.
2. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing runoff or airborne dust to adjacent properties, and walkways.
3. If encountered, repair and/or replace existing irrigation components necessary to maintain full operation of the irrigation system to areas inside and outside of the project work area where it is affected by work completed as part of this scope. Coordinate with the Owner's Representative to test any existing irrigation system after repair work to ensure it is completed to the satisfaction of the Owner.

C. Protect all planted areas and plants against trespassing and damage at all times until date of final acceptance. If any plants are damaged, treat or replace as directed by the Owner's Representative, without additional cost to the Owner.

D. Contractor shall make, at the Contractor's expense, whatever arrangements are necessary to ensure an adequate supply of water to meet the needs of this contract. If an irrigation system is used, Contractor shall also furnish necessary hose, equipment, attachments, and accessories for the adequate irrigation of planting areas during planting and until irrigation system is fully operational, as may be required to protect plants in good condition. All costs of water incurred during the contract period shall be borne by the Contractor unless other arrangements are

made with the Owner or utility purveyor. Water must be clean, fresh, and free of substances or matter capable of inhibiting vigorous plant growth.

3.06 PREPARATION

A. Do not install plant materials until all construction work has been completed and any irrigation systems have been installed and tested.

B. Grades: Meet the desired elevations next to all paving and curbs.

C. Soil shall be at an optimum moisture content for planting and be in friable (workable) condition. Soil shall not be worked when moisture content is so great that excessive compaction will occur, nor when it is so dry that dust will form in the air or that clots will not break readily. Water shall be applied, if necessary, to bring soil to an optimum moisture content for tilling and planting.

D. Soil loosening: Subgrade in all new planting areas shall be cultivated to 6” depth. Do not disturb root zones of existing trees to remain.

E. After topsoil has been completed and the soil water-settled, high and low spots regraded, add soil amendments where required.

F. Turf Area Preparation:

1. Reduce elevation of planting soil bed as required to allow for soil thickness of sod (if used) or seed application (1/2” below adjacent pavement or as shown in the Drawings).
2. Moisten prepared planting bed area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
3. Before laying sod or applying seed, obtain Owner’s Representative acceptance of finish grading. Restore planting areas if eroded or otherwise disturbed after finish grading.

G. All areas to be planted shall be cleaned of all weeds and debris prior to any soil preparation or grading work. Noxious weeds and grasses shall be removed by the roots wherever they are found at any stage of the work and disposed of offsite. Initially apply Devrinol or equal as necessary to assure weed eradication and control in all new planting areas in accordance with manufacturer’s printed instructions.

H. Tree Planting Holes:

1. Locate tree planting holes per Drawings, bringing any conflict with underground utilities and facilities to the attention of the Owner’s Representative. Locations for holes shall be staked on the site and the Owner’s Representative’s approval thereof obtained prior to excavating planting holes.
2. Excavate holes to the sizes and depths indicated on the Drawings or as necessary to maintain soil level of plants as grown in the Nursery. Top of finished soil level shall not cover root crown/trunk flair of trees.
3. Clean topsoil may be used in backfill.
4. Scarify the sides and bottom of the planting holes.

3.07 INSTALLATION OF TOPSOIL

A. Areas to receive topsoil: all planting beds and lawn areas as described in the Drawings. New planting areas shall be excavated to a depth to reach free-draining subsoil free of contaminates, deleterious material, or other material harmful to plant growth.

B. Add soil conditioners as recommended by soil test to meet minimum soil requirements as indicated on the Drawings and Specifications.

C. Installation: In all new planting bed areas, loosen prepared subgrade 2” and place topsoil the minimum depth indicated on the Drawings. Spread in not more than 6” lifts, making sure soil is thoroughly integrated. Add 2” compost amendment and till to a depth of 8”. Bring to a smooth even grade. Soil shall be thoroughly water-settled and high and low areas regraded to provide positive drainage and as indicated on the Drawings.

3.08 SOIL CONDITIONS

A. Finished grading: When weeding, soil preparation, and soil conditioning have been completed and soil has been thoroughly water-settled, all planting areas shall be smooth graded, ready for placement of plant materials.

B. Finished Grades shown on the Drawings: Slope uniformly between given spot elevations.

1. Mulch areas: Finished grades shall be 2” below top of adjacent pavement, curbs or walls unless otherwise indicated on the Drawings to allow for mulch application.
2. Lawn areas: Finished grades shall be 1/2" below top of adjacent pavement curbs or walls unless otherwise indicated on the Drawings.

3.10 WEED CONTROL

A. Apply initial pre-emergence herbicide to all mulch areas in accordance with the manufacturer’s recommended rates.

3.11 MULCHING

A. Install a 3” deep mulch layer over all planting beds and mulch areas, except where lawn areas occur or in frequently inundated areas or in direct flow patterns to minimize migration of the mulch.

3.12 TREE STAKING

A. Set stakes plumb and in such a way as to limit obstruction to vehicular or pedestrian movement. Securely tie trunks to stakes as detailed or as recommended by tie manufacturer.

3.13 GENERAL CLEAN UP

A. Construction site shall be kept free of debris, excess dirt, etc. during construction to the maximum extent practicable.

B. Remove all cans, surplus materials, and other construction debris from site. Neatly dress and finish all planting areas. Flush walks, paved areas, and the like clean to the satisfaction of the Owner’s representative.

C. Rinse foliage of all plant materials within the construction area as often as necessary to keep the foliage free of dust from work of this contract. Remove tags and nursery labels from plant material.

END SECTION 32 93 00

SECTION 33 05 13 - MANHOLES AND STRUCTURES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
1. Modular precast concrete manhole and structures with tongue-and-groove joints, frame, covers, anchorage, and accessories.
2. Bedding and cover materials.
3. Raising manhole frames and covers.
4. Replacing manhole frames and covers.

B. Related Sections:
1. Section 31 05 13 - Earthwork
2. Section 32 12 16 - Asphalt Paving.
3. Section 33 31 00 – Sanitary Utility Sewerage Piping
4. Section 33 41 00 - Storm Utility Drainage Piping.

1.02 REFERENCES

A. American Concrete Institute:
1. ACI 318 - Building Code Requirements for Structural Concrete.

B. ASTM International:
1. ASTM A48/A48M - Standard Specification for Gray Iron Castings.
2. ASTM C478 - Standard Specification for Precast Reinforced Concrete Manhole Sections.
3. ASTM C497 - Standard Test Methods for Concrete Pipe, Manhole Sections, or Tile.
4. ASTM C923 - Standard Specification for Resilient Connectors between Reinforced Concrete Manhole Structures, Pipes and Laterals.
5. ASTM C990 - Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants.
6. ASTM F593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
7. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.

1.03 DESIGN REQUIREMENTS

A. Equivalent strength: Based on structural design of reinforced concrete as outlined in ACI 318.

B. Design of Lifting Devices for Precast Components: In accordance with ASTM C913.

C. Design of Joints for Precast Components: In accordance with ASTM C913; maximum leakage of 0.025 gallons per hour per foot of joint at 3 feet of head.

1.04 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Shop Drawings: Indicate manhole and structure locations, rim elevations, piping sizes, angles of entry/exit, and invert elevations of penetrations.

C. Product Data: Submit cover and frame construction, features, configuration, dimensions.

D. Manufacturer's Certificate: Certify Products meet or exceed specified requirements

1.05 CLOSEOUT SUBMITTALS

A. Section 01 78 00 – Closeout Submittals: Requirements for submittals.

B. Project Record Documents: Record actual grade adjustment elevation of manhole.

C. Provide manufacturer warranty information.

1.06 QUALITY ASSURANCE

A. **All Work in the public rights of way or easements dedicated to the public shall be in accordance with the local Governing Authority having Jurisdiction**

B. Maintain one copy of each document on site.

1.07 DELIVERY, STORAGE AND HANDLING

A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Accept materials on site in undamaged, unopened container, bearing manufacturer’s original labels. Inspect for damage.

C. Comply with precast concrete manufacturer’s instructions for unloading, storing and moving precast manholes and structures.

D. Store precast concrete manholes and structures to prevent damage to Owner’s property or other public or private property. Repair property damaged from materials storage.

E. Mark each precast structure by indentation or waterproof paint showing date of manufacture, manufacturer, and identifying symbols and numbers shown on Drawings to indicate its intended use.

1.08 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.01 MANHOLES AND STRUCTURES

A. Manhole Sections: Reinforced precast concrete manhole sections and integral steps in accordance with ASTM C478, with gaskets in accordance with ASTM C923. Minimum wall thickness four inches. Provide eccentric cones or flat top sections where necessary. All materials to be H20 rated.

B. Mortar: Standard pre-mix mortar conforming to ASTM C387, Type N.

2.02 FRAMES AND COVERS

A. Product Description: ASTM A48/A48M, Class 30B Cast iron construction, machined flat bearing surface, removable or lockable or boltable lid, of the size and shape detailed on the drawings with load rating of H20.

2.03 COMPONENTS

A. Manhole and Structure Steps: As indicated on Drawings.

B. Base Pad: As indicated on Drawings.

C. Manhole Steps: Copolymer polypropylene encapsulated steel bars.

2.04 CONFIGURATION

A. Shaft Construction: Concentric with eccentric cone top section; lipped male/female joints; sleeved to receive pipe.

B. Shape: Cylindrical

C. Clear Inside Dimensions: As indicated on Drawings.

D. Design Depth: As indicated on Drawings.

E. Clear Cover Opening: As indicated on Drawings.

F. Pipe and Conduit Entry: Furnish openings as indicated on Drawings.

G. Steps: As indicated on Drawings. Positioned so as not to interfere with pipe penetrations

2.05 BEDDING AND COVER MATERIALS

A. Bedding: Fill Type as specified in Section 31 05 13.

B. Cover: Fill Type, as specified in Section 31 05 13.

C. Soil Backfill from Above Pipe to Finish Grade: Soil Type as specified in Section 31 05 13

PART 3 EXECUTION

3.01 EXAMINATION

A. Contractor shall coordinate verification of existing conditions before starting work.

B. Verify items provided by other sections of Work are properly sized and located.

C. Verify built-in items are in proper location, and ready for roughing into Work.

D. Verify correct size of manhole and structure excavation.

E. Verify and locate manholes requiring grade adjustment.

3.02 PREPARATION

A. Coordinate placement of inlet and outlet pipe or duct sleeves required by other sections.

B. Do not install structures where site conditions induce loads exceeding structural capacity of structures.

C. Inspect precast concrete structures immediately prior to placement in excavation to verify structures are internally clean and free from damage. Remove and replace damaged units.

3.03 INSTALLATION

A. Excavation and Backfill:
   1. Excavate for manholes [and structures] in accordance with Section 31 05 13 in location and to depth shown. Provide clearance around sidewalls of structure for construction operations.
   2. When groundwater is encountered, prevent accumulation of water in excavations. Place manholes and structures in dry trench.
   3. Where possibility exists of watertight structure becoming buoyant in flooded excavation, anchor structure to avoid flotation.

B. Place base pad, smooth top surface level.

C. Install manholes and structures plumb and level, supported at proper grade and alignment on crushed stone bedding as shown on Drawings.

D. Backfill excavations for manholes and structures in accordance with Section 31 05 13.

E. Cut and fit for pipe.

F. Grout base of shaft sections to achieve slope to exit piping. Trowel smooth. Contour to form continuous drainage channel as indicated on Drawings.

G. Set cover frames and covers level without tipping, to correct elevations.

H. Coordinate with other sections of Work to provide correct size, shape, and location.

3.04 PRECAST CONCRETE MANHOLE AND STRUCTURE INSTALLATION

A. Lift precast components at lifting points designated by manufacturer.

B. When lowering manholes and structures into excavations and joining pipe to units, take precautions to ensure interior of pipeline and structure remains clean.

C. Set precast structures bearing firmly and fully on crushed stone bedding, compacted in accordance with provisions of Section 31 05 13 or on other support system shown on Drawings.

D. Assemble multi-section structures by lowering each section into excavation. Lower, set level, and firmly position base section before placing additional sections.

E. Remove foreign materials from joint surfaces and verify sealing materials are placed properly. Maintain alignment between sections by using guide devices affixed to lower section.

F. Joint sealing materials may be installed on site or at manufacturer's plant.

G. Verify manholes and structures installed satisfy required alignment and grade.

H. Remove knockouts or cut structure to receive piping without creating openings larger than required to receive pipe. Fill annular space with mortar.

I. Cut pipe to finish flush with interior of structure.

J. Shape inverts through manhole and structures as shown on Drawings.

3.05 FRAME AND COVER INSTALLATION

A. Set frames without tipping using non-shrink and grout. Set frame and cover 2 inches above finished grade for manholes and structures with covers located within unpaved areas to allow area to be graded away from cover beginning 1 inch below top surface of frame. Set frames flush with finished grades when located in pavement or other hard surface areas.

3.06 RAISING MANHOLE FRAMES AND COVERS

A. Locate and raise manholes to grade as indicated on Drawings.

B. Seal joints between manhole top and frame with sealant.

C. Reinstall removed manhole frame and cover.

3.07 RESTORATION

A. Restore bituminous paving areas in accordance with Section 32 12 16. Restore grassed areas in accordance with Section 32 93 00.

3.08 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements, 01 78 00 – Closeout Submittals: Field inspecting, testing, adjusting, and balancing.

B. Vertical Adjustment of Existing Manholes and Structures:
   1. Where required, adjust top elevation of existing manholes and structures to finished grades shown on Drawings.
   2. Reset existing frames, grates and covers, carefully removed, cleaned of mortar fragments, to required elevation in accordance with requirements specified for installation of castings.

END OF SECTION

SECTION 33 11 16 - SITE WATER UTILITY DISTRIBUTION PIPING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
1. Pipe and fittings for site water line including domestic water line and fire water line.
2. Pipe and fittings for domestic water service connections to buildings.
3. Valves & Valve Boxes.
4. Fire Hydrants.
5. Backflow preventers.
6. Underground pipe markers.
7. Precast concrete vault.
8. Bedding and cover materials.
9. Disinfection of potable water distribution system; and testing and reporting results.

B. Related Sections:
1. Section 31 05 13 – Earthwork.
2. Section 33 05 13 - Manholes and Structures.
3. Section 32 84 00 – Irrigation System.

1.02 REFERENCES

A. American Society of Mechanical Engineers:
1. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
2. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

B. American Society of Sanitary Engineering:
1. ASSE 1012 - Backflow Preventer with Intermediate Atmospheric Vent.
2. ASSE 1013 - Reduced Pressure Principle Backflow Preventers.

C. ASTM International:
1. ASTM B88 - Standard Specification for Seamless Copper Water Tube.
2. ASTM C858 - Standard Specification for Underground Precast Concrete Utility Structures.
3. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3).
4. ASTM D1785 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
5. ASTM D2241 - Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
6. ASTM D2466 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
7. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
8. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
9. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

10. ASTM D3035 - Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter.
11. ASTM D3139 - Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.

D. American Water Works Association:
1. AWWA C104 - American National Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
2. AWWA C111 - American National Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
3. AWWA C151 - American National Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water.
4. AWWA C500 - Metal-Seated Gate Valves for Water Supply Service.
5. AWWA C502 - Dry-Barrel Fire Hydrants.
6. AWWA C504 - Rubber-Sealed Butterfly Valves.
7. AWWA C508 - Swing-Check Valves for Waterworks Service, 2 in. (50 mm) Through 24 in. (600 mm) NPS.
8. AWWA C509 - Resilient-Seated Gate Valves for Water-Supply Service.
9. AWWA C550 - Protecting Epoxy Interior Coating for Valves and Hydrants.
10. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances.
11. AWWA C651 - Disinfecting Water Mains.
12. AWWA C706 - Direct-Reading, Remote-Registration Systems for Cold-Water Meters.
13. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4 in. through 12 in., for Water Distribution.
14. AWWA C901 - Polyethylene (PE) Pressure Pipe and Tubing, 1/2 in. through 3 in., for Water Service.

E. Underwriters Laboratories Inc.:
1. UL 246 - Hydrants for Fire - Protection Service.

F. National Fire Protection Association:
1. NFPA 281 - Recommended Practice for Fire Flow Testing and Marking of Hydrants

1.03 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit data on pipe materials, pipe fittings, valves and accessories. Submit procedures, proposed chemicals, and treatment levels for disinfection for review.

C. Test Reports: Indicate results comparative to specified requirements.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

E. Certificate: Certify cleanliness of water distribution system meets or exceeds Governing Authority having Jurisdiction.

1.04 CLOSEOUT SUBMITTALS

A. Section 01 78 00 – Closeout Submittals: Requirements for submittals.

B. Project Record Documents: Record actual locations of piping mains, valves, connections, thrust restraints, and invert elevations.

C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

D. Disinfection Report:
1. Type and form of disinfectant used.
2. Date and time of disinfectant injection start and time of completion.
3. Test locations.
4. Name of person collecting samples.
5. Initial and 24-hour disinfectant residuals in treated water in ppm for each outlet tested.
6. Date and time of flushing start and completion.
7. Disinfectant residual after flushing in ppm for each outlet tested.

E. Bacteriological Report:
1. Date issued, project name, and testing laboratory name, address, and telephone number.
2. Time and date of water sample collection.
3. Name of person collecting samples.
4. Test locations.
5. Initial and 24-hour disinfectant residuals in ppm for each outlet tested.
6. Coliform bacteria test results for each outlet tested.
7. Certify water conforms, or fails to conform, to bacterial standards of Governing Authority having Jurisdiction.

F. Water Quality Certificate: Certify water conforms to quality standards of Governing Authority having Jurisdiction, suitable for human consumption.

G. Provide manufacturer warranty information.

1.05 QUALITY ASSURANCE

A. **All Work in the public rights of way or easements dedicated to the public shall be in accordance with the local Governing Authority having Jurisdiction.**

B. Perform Work in accordance with AWWA C651, Governing Authority having Jurisdiction, the Oregon Plumbing Specialty Code and Uniform Fire Code.

C. Maintain one copy of each document on site.

D. Valves: Manufacturer's name and pressure rating marked on valve body.

1.06 QUALIFICATIONS

A. Water Treatment Firm: Company specializing in disinfecting potable water systems specified in this section with minimum three years documented experience.

B. Testing Firm: Company specializing in testing potable water systems, certified approved by State of Oregon.

C. Submit bacteriologist's signature and authority associated with testing.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Deliver and store valves in shipping containers with labeling in place.

PART 2 PRODUCTS

2.01 GENERAL

A. All water pipe in the public right of way or easement prior to backflow device, shall be in accordance with the Governing Authority having Jurisdiction.

B. All water pipe on private property after the backflow device, shall be in accordance with the Oregon Plumbing Specialty Code and the Uniform Fire Code.

2.02 WATER PIPING

A. Ductile Iron Pipe: AWWA C151, C104 CL 51
   1. Fittings: Ductile iron, CL 51.
   2. Joints: AWWA C111, rubber gasket with rods.

B. PVC Pipe: (Private domestic service) ASTM D1785, Schedule 40, Schedule 80:
   1. Fittings: ASTM D2466, PVC.
   2. Joints: ASTM D2855, solvent weld.

C. PVC Pipe: (Private lines 4" and larger) AWWA C900 DR 18:
   1. Fittings: AWWA C111, cast iron.
   2. Joints: ASTM D3139 compression gasket ring.

D. Restrained Joint Pipe: Restrained joint pipe and fittings, use a mechanical joint with a MEGALUG follower gland as manufactured by EBAA Iron Corporation, or equal. Other acceptable restrained joints are “Loc-Tyte” joint as manufactured by the Pacific States Cast Iron Pipe Company and the United States and Foundry Company, the “Locked Fas-tite” joint as manufactured by the American Cast Iron Company, the “TR Flex” joint as manufactured by the United States Pipe and Foundary Company, the “Snap-Lok” joint as manufactured by the Griffin Pipe Products Co., the “Field-Lok”, joint as manufactured by the United States Pipe and Foundry Company. Set screw-type retainer gland and joint harness systems will not be allowed.

2.03 GATE VALVES

A. 2-1/2 inches and Smaller: Brass or Bronze body, non-rising stem, inside screw, single wedge or disc, compression ends, with control rod, extension box and valve key.

B. 3 inches and Larger: AWWA C500, Iron body, bronze trim, non-rising stem with square nut, single wedge, flanged or mechanical joint ends, control rod, extension box and valve key.

2.04 SWING CHECK VALVES

A. 2 inches to 24 inches: AWWA C508, iron body, bronze trim, 45-degree swing disc, re-newable disc and seat, flanged ends.

2.05 BUTTERFLY VALVES

A. 2 inches to 24 inches: AWWA C504, iron body, bronze disc, resilient replaceable seat, water or lug ends, infinite position lever handle.

2.06 HYDRANT

A. Hydrant: In accordance with local fire department and/or Governing Authority having Jurisdiction requirements.
   1. Meet AWWA C502 specifications.
   2. Have 6-inch flanged joint inlet.
   3. Have one 4½-inch pumper connection and two 2½-inch connections with ANSI B26 standard threads.
   4. Have “O” ring seals on operating stem.
   5. Operating stem nut dimensions conforming to the Governing Authority having Jurisdiction and/or Tualatin Valley Fire & Rescue.
   6. Have break-off joint located approximately 2-inches above ground surface.
   7. Have drain hole in base.
   8. Open counterclockwise

B. Hydrant Extensions: Fabricate in multiples of 6 inches with rod and coupling to increase barrel length.

C. Hose and Streamer Connection: Match sizes and type of thread with local fire department two hose nozzles one pumper nozzle.

D. Finish: Primer and two coats of enamel color in accordance with Governing Authority having Jurisdiction and/or fire department requirements.

2.07 WATER METERS

A. Coordinate with Governing Authority having Jurisdiction.

2.08 BACKFLOW PREVENTERS

A. Double Check Valves (DCV): Comply with ASSE 1015; Bronze body with corrosion resistant internal parts and stainless-steel springs; two independently operating check valves with intermediate atmospheric vent, Watts, Conbraco, Febco, or approved equal:

B. Furnish materials in accordance with Oregon Plumbing Specialty Code.

2.09 UNDERGROUND PIPE MARKERS

A. Trace Wire: Magnetic detectable conductor, clear, brightly colored, plastic covering, imprinted with "Water Service" in large letters Brimar or approved.

2.10 PRECAST CONCRETE VAULT

A. Utility Vault or approved equal.

B. Furnish materials in accordance with Governing Authority having Jurisdiction standards.

C. Product Description: Precast vault designed in accordance with ASTM C858, comprising modular, interlocking sections complete with accessories.

D. Shape & size: As indicated on Drawings.

E. Frames and Covers: As indicated on Drawings

F. Pipe Entry Locations: As indicated on Drawings.

G. Steps: As indicated on Drawings.

2.11 BEDDING AND COVER MATERIALS

A. Bedding: Fill Type as specified in Section 31 05 13

B. Cover: Fill Type as specified in Section 31 05 13

2.12 ACCESSORIES

A. Valve Boxes: 2 piece sliding cast iron, cover to be cast with “W” in lid.

PART 3 EXECUTION

3.01 EXAMINATION

A. Contractor shall coordinate verification of existing conditions before starting work.

B. Verify building service connection and municipal utility water main size, location, and invert are as indicated on Drawings.

C. Verify piping system has been cleaned, inspected, and pressure tested.

D. Perform scheduling and disinfecting activity with start-up, water pressure testing, adjusting and balancing, demonstration procedures, including coordination with related systems.

3.02 PREPARATION

A. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, remove burrs.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare pipe connections to equipment with flanges or unions.

3.03 BEDDING

A. Excavate pipe trench in accordance with Section 31 05 13 for Work of this Section.

B. Form and place concrete for pipe thrust restraints at change of pipe direction. Place concrete to permit full access to pipe and pipe accessories. Provide sq ft area thrust restraint bearing on subsoil as indicated on the drawings.

C. Place bedding material at trench bottom, level fill materials in one continuous layer not exceeding 8 inches compacted depth; compact to in accordance with Section 31 05 13.

D. Backfill around sides and to top of pipe in accordance with Section 31 05 13.

E. Maintain optimum moisture content of fill material to attain required compaction density.

3.04 INSTALLATION - PIPE

A. Maintain separation of water main from sewer in accordance with Governing Authority having Jurisdiction.

B. Group piping with other site piping work whenever practical.

C. Install pipe to indicated elevation to within tolerance of 5/8 inches.

D. Install ductile iron piping and fittings to AWWA C600.

E. Route pipe in straight line.

F. Install pipe to allow for expansion and contraction without stressing pipe or joints. Excavate for pipe bells to provide uniform support along its full length.

G. Form and place concrete for thrust restraints at each elbow or change of direction of pipe main.

H. Establish elevations of buried piping with not less than 3 ft of cover or as shown on drawings.

I. Install access fittings to permit disinfection of water system.

J. Install trace wire continuous over top of pipe buried above pipe line; coordinate with Section 31 05 13.

K. Backfill trench in accordance with Section 31 05 13.

3.05 INSTALLATION - VALVES AND HYDRANTS

A. Set valves on solid bearing soil.

B. Center and plumb valve box over valve. Set box cover flush with finished grade.

C. Set hydrants plumb; locate pumper nozzle perpendicular to and facing roadway.

D. Set hydrants to grade, with nozzles above ground as shown on drawings.

E. Locate control valve away from hydrant as shown on drawings.

3.06 INSTALLATION - METERS

A. Coordinate with Governing Authority having Jurisdiction.

3.07 SERVICE CONNECTIONS

A. Install water service to 5 feet of building. Coordinate with building plumbing and fire sprinkler contractors.

3.08 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Provide and attach required equipment to perform the Work of this section.

B. Inject treatment disinfectant into piping system.

C. Maintain disinfectant in system for time period as required.

D. Flush, circulate, and clean until required cleanliness is achieved, use municipal domestic water.

E. Replace permanent system devices removed for disinfection.

3.09 FIELD QUALITY CONTROL

A. Section 01450 - Quality Requirements and 01700 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.

B. Perform pressure test on domestic site water distribution system in accordance with AWWA C600 and Governing Authority having Jurisdiction

OR

C. Perform pressure test on domestic site water distribution system in accordance with Oregon Plumbing Specialty Code, AWWA 600, AWWA 605 and/or the Governing Authority having Jurisdiction whichever is more stringent. Repair leaks and retest. In general pressure testing shall be as follows:

1. After completion of pipeline installation, including backfill, but prior to final connection to existing system, conduct, in presence of Architect/Engineer, concurrent hydrostatic pressure and leakage tests in accordance with AWWA C600.
2. Provide equipment required to perform leakage and hydrostatic pressure tests.
3. Test Pressure: Not less than 200 psi or 50 psi in excess of maximum static pressure, whichever is greater.
4. Conduct hydrostatic test for at least two-hour duration.
5. No pipeline installation will be approved when pressure varies by more than 5 psi at completion of hydrostatic pressure test.
6. Before applying test pressure, completely expel air from section of piping under test. Provide corporation cocks so air can be expelled as pipeline is filled with water. After air has been expelled, close corporation cocks and apply test pressure. At conclusion of tests, remove corporation cocks and plug resulting piping openings.
7. Slowly bring piping to test pressure and allow system to stabilize prior to conducting leakage test. Do not open or close valves at differential pressures above rated pressure.
8. Examine exposed piping, fittings, valves, hydrants, and joints carefully during hydrostatic pressure test. Repair or replace damage or defective pipe, fittings, valves, hydrants, or joints discovered, following pressure test.
9. No pipeline installation will be approved when leakage is greater than that determined by the following formula:

$L = (SD\sqrt{P})/133{,}200$
L = allowable, in gallons per hour
S = length of pipe tested, in inches
D = nominal diameter of pipe, in inches
p = average test pressure during leakage test, in pounds per square inch (gauge)

10. When leakage exceeds specified acceptable rate, locate source and make repairs. Repeat test until specified leakage requirements are met.

D. Compaction Testing for Bedding: In accordance with ASTM D1557, ASTM D2922, and ASTM D3017.

E. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

F. Disinfection, Flushing, and Sampling:
   1. Disinfect pipeline installation in accordance with AWWA C651. Use of liquid chlorine is not permitted
   2. Upon completion of retention period required for disinfection, flush pipeline until chlorine concentration in water leaving pipeline is no higher than that generally prevailing in existing system or is acceptable for domestic use.
   3. Legally dispose of chlorinated water. When chlorinated discharge may cause damage to environment, apply neutralizing chemical to chlorinated water to neutralize chlorine residual remaining in water.
   4. After final flushing and before pipeline is connected to existing system, or placed in service, employ an approved independent testing laboratory to sample, test and certify water quality suitable for human consumption.

END OF SECTION

SECTION 33 31 00 - SANITARY UTILITY SEWERAGE PIPING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
1. Sanitary sewage pipe.
2. Underground pipe markers.
3. Manholes and cleanouts.
4. Bedding and cover materials.
5. Pipeline flushing and cleaning.
6. TV inspection of sewer pipelines.
7. Audio-video taping of pipeline interior.

B. Related Sections:
1. Section 31 05 13 - Soils for Earthwork: Soils for backfill in trenches. Aggregates for Earthwork: Aggregate for backfill in trenches. Excavation: Product and execution requirements for excavation and backfill required by this section. Excavation: Product and execution requirements for excavation and backfill required by this section. Trenching: Execution requirements for trenching required by this section. Fill: Requirements for backfill to be placed by this section.

1.02 REFERENCES

A. ASTM International:
1. ASTM A746 - Standard Specification for Ductile Iron Gravity Sewer Pipe.
2. ASTM D1157 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3).
3. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
4. ASTM D2729 - Standard Specification for Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
5. ASTM D2751 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings.
6. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
7. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
8. ASTM D3034 - Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
9. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

1.03 DEFINITIONS

A. Bedding: Fill placed under, beside and directly over pipe, prior to subsequent backfill operations.

1.04 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit data indicating pipe material used and pipe accessories

C. Where required by the Administrative Authority having jurisdiction, submit completed tape cassettes, cd, dvd or digital files, identified by number, project name, street name, right-of-way property name, and manhole numbers. Video files become the property of Owner.

D. Submit cleaning and television inspection logs for each section of sewer line to be rehabilitated and three copies of color videotapes, cd, dvd or digital files for work performed. Include the following as minimum information: stationing and location of lateral services, wyes or tees, clock references, pipe joints, infiltration/inflow defects, cracks, leaks, offset joints, and other information required to assess condition of sewer.

E. Submit a specific detailed description of proposed bypass pumping system to include written description of plan and addressing quantity, capacity, and location of pumping equipment. Submit spill plan to address any spills that might occur.

F. Manufacturer's Installation Instructions: Indicate special procedures required to install Products specified.

G. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.05 CLOSEOUT SUBMITTALS

A. Section 01 78 00 – Closeout Submittals: Requirements for submittals.

B. Project Record Documents: Record location of pipe runs, bends, connections, manholes, cleanouts, and invert elevations.

C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

D. Provide manufacturer warranty information.

1.06 QUALITY ASSURANCE

A. **All Work in the public rights of way or easements dedicated to the public shall be in accordance with the local Governing Authority having Jurisdiction.**

B. All Work outside public rights of way shall conform to Oregon Plumbing Specialty Code for materials and installation of the Work of this section.

C. Use cameras with video output capable of producing minimum of 600 lines of horizontal resolution at center; optimum imagery with minimum illumination; and meet requirements of EIA Standard Video Signal.

D. Maintain one copy of each document on site.

1.07 FIELD MEASUREMENTS

A. Verify field measurements and elevations are as indicated.

1.08 COORDINATION

A. Contractor shall coordinate project conditions.

B. Coordinate work with Owner and Administrative Authority having jurisdiction and other contractor’s work.

C. Coordinate the Work with termination of sanitary sewer connection outside building, connection to municipal sewer utility service and trenching.

PART 2 PRODUCTS

2.01 SANITARY SEWAGE PIPE

A. Ductile Iron Pipe: ASTM A746, Extra Heavy Service type, inside nominal diameter as indicated on the drawings, bell and spigot ends.
   1. Fittings: Ductile iron.
   2. Joints: AWWA C111, rubber gasket joint devices.

B. Plastic Pipe: ASTM D3034, Type PSM, Poly (Vinyl Chloride) (PVC) material; inside nominal diameter as indicated on the drawings, bell and spigot style rubber ring sealed gasket joint.
   1. Fittings: PVC.
   2. Joints: ASTM F477, elastomeric gaskets.

2.02 ACCESSORIES:

A. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, clean-outs, reducers, traps and other configurations required.

B. Trace Wire: Magnetic detectable conductor, clear, brightly colored plastic covering, imprinted with "Sewer Service" in large letters. Brimar or approved equal.

2.03 MANHOLES

A. Shaft Construction: Reinforced precast concrete sections as shown in the drawings

B. Manhole Lid and Frame:
   1. Cast iron construction, as shown on the drawings.

C. Construction and Concentric/Eccentric Cone Top Section: Reinforced precast concrete sections, lipped male/female dry joints, ladder rungs into shaft sections at 12 inches; nominal manhole diameter of 48 inches or as shown on the drawings.

D. Base Pad: Cast-In-Place concrete for connection to existing sewer mains, precast sleeved to receive sewer pipe sections for connection to new sewer mains.

2.04 CLEANOUTS

A. Cleanout Lid and Frame: Cast iron construction, as indicated on drawings.
   1. Lid Design: As indicated.

B. Shaft Construction: Of the same material as the pipe, nominal shaft diameter of eight inches.

C. Concrete: 3000 psi concrete.

2.05 BEDDING AND COVER MATERIALS

A. Bedding: Fill Type as specified in Section 31 05 13.

B. Cover: Fill Type as specified in Section 31 05 13.

C. Soil Backfill from Above Pipe to Finish Grade: as specified in Section 31 05 13.

2.06 SEWER VIDEO INSPECTION

A. VHS, DVD or acceptable digital format.

B. Audio track containing simultaneously recorded narrative commentary and evaluations of electrographer describing in detail condition of pipeline interior.

PART 3 EXECUTION

3.01 EXAMINATION

A. Contractor shall coordinate verification of existing conditions before starting work.

B. Verify trench cut excavation base is ready to receive work and excavations, dimensions, and elevations are as indicated on drawings.

3.02 PREPARATION

A. Correct over excavation with fine or coarse aggregate.

B. Remove large stones or other hard matter which could damage pipe or impede consistent backfilling or compaction.

C. Flush and clean pipeline interiors to remove sludge, dirt, sand, stone, grease, and other materials from pipe to ensure clear view of interior conditions. Do not flush materials into sewer system.

D. Furnish materials, labor, equipment, power, maintenance, to implement a temporary by-pass pumping system around work area for time required to complete connections to or reroutes of existing sewer mains.

3.03 BEDDING

A. Excavate pipe trench in accordance with Section 31 05 13.

B. Place bedding material at trench bottom, level materials in continuous layer not exceeding that shown in the drawings.

C. Maintain optimum moisture content of bedding material to attain required compaction density.

3.04 INSTALLATION - PIPE

A. Install pipe, fittings, and accessories in accordance with ASTM D2321 Seal joints watertight.

B. Lay pipe to slope gradients noted on drawings with maximum variation from indicated slope of 1/8 inch in 10 feet.

C. Install bedding at sides and over top of pipe to minimum compacted thickness of 12 inches.

D. Refer to Section 31 05 13 for backfilling and compacting requirements. Do not displace or damage pipe when compacting.

E. Refer to Section 33 05 13 for manhole requirements.

F. Install trace wire and colored marker tape continuous over top of pipe; coordinate with Section 31 05 13.

G. Install site sanitary sewage system piping to 5 feet of building. Connect to building sanitary waste system and municipal sewer system.

3.05 INSTALLATION – CLEANOUTS

A. Form and place cast-in-place concrete pad with provision for sanitary sewer pipe ends.

B. Establish elevations and inverts for inlets and outlets as indicated.

C. Mount lid and frame level to elevation indicated.

3.06 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements, 01 78 00 – Closeout Submittals: Field inspecting, testing, adjusting, and balancing.

B. Perform test on site sanitary sewage system in accordance with Oregon Plumbing Specialty Code and Oregon Health Division.

C. Request inspection as required by Governing Authority having Jurisdiction.

D. Compaction Testing: In accordance with ASTM D1557, ASTM D2922, ASTM D3017.

E. When tests indicate Work does not meet specified requirements, remove work, replace and retest.

F. Frequency of Compaction Tests per section 31 05 13.

G. When required by Governing Authority having jurisdiction, closed-circuit TV Camera System:
   1. Utilize cameras specifically designed and constructed for closed-circuit sewer line inspection. Utilize camera equipment with pan and tilt capability to view each lateral connection at multiple angles.
   2. Utilize camera capable of moving both upstream and downstream; minimum 1,000 feet horizontal distance with one setup, direct reading cable position meter.

H. Pipeline Inspection:
   1. Audio-video tape sections of sewer pipeline between manholes designated.
   2. Identify and record locations of flat grades, dips, deflected joints, open joints, broken pipe, protrusions into pipeline, and points of infiltration.
   3. Locate and record service connections.
   4. Record locations of pipeline defects and connection horizontal distance, in feet, and direction from manholes.

5. Video with pipe section plugged as to view 100 percent of inside pipe diameter, use flow control methods as specified for bypass pumping system, to eliminate surcharging and reduce flow.

3.07 PROTECTION OF FINISHED WORK

A. Section 01 78 00 – Closeout Submittals: Requirements for protecting finished Work.

B. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.

END OF SECTION

SECTION 33 41 00 - STORM UTILITY DRAINAGE PIPING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
1. Storm drainage piping.
2. Accessories.
3. Underground pipe markers.
4. Catch basins, trench drains & landscape area drains.
5. Cleanouts.
6. Bedding and cover materials.
7. Slope protection at culvert pipe end.
8. Building perimeter drainage system.
9. Retaining wall drainage system.
10. Riprap placed loose.

B. Related Sections:
1. Section 31 05 13 - Earthwork
2. Section 32 91 19 - Landscape Grading, Topsoil, and Soil Preparation
3. Section 33 05 13 - Manholes and Structures.
4. Section 33 31 00 - Sanitary Utility Sewerage Piping:

1.02 REFERENCES

A. ASTM International:
1. AASHTO M252 - Specification for Corrugated Polyethylene Pipe, 3 - to 10-In. Diameter.
2. AASHTO M288 – Specification for Geotextiles Specification for Highway Applications
3. AASHTO M294 - Specification for Corrugated Polyethylene Pipe, 12- to 36-In. Diameter.
4. ASTM D1557 - Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3).
5. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
6. ASTM D2729 - Standard Specification for Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
7. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
8. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
9. ASTM D3034 - Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
10. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
11. ASTM F2418 - Standard Specification for Polypropylene (PP) Corrugated Wall Stormwater Collection Chambers.
12. ASTM F2787 - Standard Practice for Structural Design of Thermoplastic Corrugated Wall Stormwater Collection Chambers
13. ASTM F2922 - Specification for Polyethylene (PE) Corrugated Wall Stormwater Collection Chambers.
14. AWWA C900

B. Oregon Department of Transportation/American Public Works Association
   1. OSSC refers to the current edition of the State of Oregon/ APWA, Standard Specifications for Construction.

1.03 DEFINITIONS

A. Bedding: Fill placed under, beside and directly over pipe, prior to subsequent backfill operations.

1.04 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit data indicating pipe, pipe accessories, and material to be used in the work.

C. Manufacturer's Installation Instructions: Submit special procedures required to install Products specified.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.05 CLOSEOUT SUBMITTALS

A. Section 01 78 00 – Closeout Submittals: Requirements for submittals.

B. Project Record Documents:
   1. Accurately record actual locations of pipe runs, connections, basins, cleanouts, and invert elevations.
   2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

C. Provide manufacturer warranty information.

1.06 QUALITY ASSURANCE

A. **All Work in the public rights of way or easements dedicated to the public shall be in accordance with the local Governing Authority having Jurisdiction.**

B. All Work outside public rights of way shall conform to Oregon Plumbing Specialty Code for materials and installation of the Work of this section.

C. Furnish each riprap & aggregate material from single source throughout the Work.

D. Maintain one copy of each document on site.

1.07 COORDINATION

A. Contractor shall coordinate project conditions.

B. Coordinate the Work with termination of storm sewer connection outside building, trenching, connection to foundation drainage system and municipal sewer utility service.

PART 2 PRODUCTS

2.01 PIPE MATERIALS

A. Plastic Pipe: ASTM D3034, Type PSM, Poly (Vinyl Chloride) (PVC) material; inside nominal diameter as shown on the drawings inches, bell and spigot style rubber ring sealed gasket joint.
   1. Fittings: PVC.
   2. Joints: ASTM F477, elastomeric gaskets.

B. Corrugated Polyethylene Pipe (CPE): AASHTO M252 or M294 type S smooth interior, bell and spigot style, ADS, Hancor Sure-Loc or approved equal.
   1. Fittings: CPE.
   2. Joints: Water Tight.

C. Perforated Corrugated Polyethylene Pipe (CPE): AASHTO M252 or M294 type S smooth interior, bell and spigot style, ADS, Hancor Sure-Loc or approved equal.

D. Corrugated Plastic Tubing: Flexible type; inside diameter as shown on drawings, with required fittings.

2.02 BEDDING AND COVER MATERIALS

A. Bedding: Fill Type as specified in Section 31 05 13.

B. Cover: Fill Type as specified in Section 31 05 13.

C. Subdrainage pervious Fill Materials: 1 ½" – ¼" clean drain rock.

2.03 ACCESSORIES

A. Geotextile Fabric: Non-biodegradable, woven & non-woven.
   1. AMOCO
   2. Mirafi
   3. Tensar Earth Technologies, Inc.
   4. Substitutions: Section 01 60 00 - Product Requirements

B. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, clean-outs, reducers, traps and other configurations required.

C. Trace Wire: Magnetic detectable conductor, clear, brightly colored plastic covering, imprinted with " Storm Sewer Service " in large letters. Brimar or approved equal

2.04 CATCH BASINS, TRENCH DRAINS, AREA DRAINS AND OVERFLOW STRUCTURES

A. Trapped Inlets: Square, Lynch style catch basin. Gibson Steel or approved equal
   1. H20 Load rated, 10 guage asphalt dipped steel.
   2. Lid design: Square, bike proof linear grill .
   3. Nominal lid and frame size: as shown on drawings.

B. Area Drain: Square 10 ga. asphalt dipped as indicated on the Drawings. Gibson Steel or approved equal.

C. Trench Drain: ACO Drain Klassik Drain or approved equal.

a. Grate: ACO 661Q, meeting ADA requirements, ACO Drain – Iron slotted grate or approved equal.
b. Catch Basin: ACO Drain K200 or approved equal.

D. Overflow Structure: Size, material, and product as indication on drawings.

2.05 CLEANOUTS

A. Cleanout Lid and Frame: Cast iron construction, as indicated on drawings.
1. Lid Design: Standard cast iron frame and cover.

B. Shaft Construction: Of the same material as the pipe, nominal shaft diameter of eight inches.

C. Base Pad: Cast-in-place concrete: 3000 psi.

2.06 BEDDING AND COVER MATERIALS

A. Bedding: Fill Type as specified in Section 31 05 13.

B. Cover: Fill Type as specified in Section 31 05 13.

PART 3 EXECUTION

3.01 EXAMINATION

A. Contractor shall coordinate verification of existing conditions before starting work.

B. Do not place riprap bags over frozen or spongy subgrade surfaces.

C. Verify trench cut or excavation base is ready to receive work and excavations, dimensions, and elevations are as indicated on drawings.

3.02 PREPARATION

A. Hand trim excavations to required elevations. Correct over excavation with fine or coarse aggregate.

B. Remove large stones or other hard matter which could damage piping or impede consistent backfilling or compaction.

3.03 BEDDING

A. Excavate pipe & culvert trench in accordance with Section 31 05 13 for work of this Section. Hand trim excavation for accurate placement of pipe to elevations indicated.

B. Place bedding material at trench bottom, level materials in continuous layer not exceeding 8 inches compacted depth.

C. Maintain optimum moisture content of bedding material to attain required compaction density.

3.04 INSTALLATION – STORM UTILITY PIPE

A. Install pipe, fittings, and accessories in accordance with ASTM D2321. Seal joints water-tight.

B. Lay pipe to slope gradients noted on drawings with maximum variation from indicated slope of 1/8 inch in 10 feet.

C. Install aggregate at sides and over top of pipe. Install top cover to minimum compacted thickness of 12 inches.

D. Refer to Section 31 05 13 for backfilling and compacting requirements. Do not displace or damage pipe when compacting.

E. Refer to Section 33 05 13 for manhole requirements.

F. Connect to building drain outlet and municipal storm sewer system.

G. Install trace wire and colored marker tape continuous over top of pipe; coordinate with Section 31 05 13.

H. Connect to subdrainage tile system piping.

I. Install perforated pipe with perforations facing down. Mechanically join pipe ends.

J. Place pervious fill over perforated drainage pipe aggregate cover and compact.

K. Install storm detention chambers system per manufacturer's recommendations.

3.05 INSTALLATION - CATCH BASINS, TRENCH DRAINS AND CLEANOUTS

A. Form bottom of excavation clean and smooth to correct elevation.

B. Level top surface of base pad; sleeve concrete shaft sections to receive storm sewer pipe sections.

C. Establish elevations and pipe inverts for inlets and outlets as indicated on Drawings.

D. Mount lid and frame level in grout/concrete to elevation indicated

E. Install trench drains as shown on the drawings and per manufacturer's recommendations.

3.06 RIPRAP PLACEMENT

A. Place geotextile fabric over substrate, overlap edges and ends.

B. Place riprap at culvert pipe ends and at embankment slopes as indicated on Drawings.

C. Installed Thickness: As shown on the drawings.

3.07 STORM UTILITY INSTALLATION TOLERANCES

A. Section 01 40 00 - Quality Requirements: Tolerances.

B. Lay pipe to alignment and slope gradients noted on Drawings; with maximum variation from indicated slope of 1/8 inch in 10 feet.

C. Maximum Variation From Intended Elevations: ¼ inch.

D. Maximum Offset From Indicated Alignment: 1 inch.

3.08 FIELD QUALITY CONTROL

A. Section 01 40 0 - Quality Requirements and 01 78 00 – Closeout Submittals: Field inspecting, testing, adjusting, and balancing.

B. Install Work in accordance with Oregon Plumbing Specialty Code

C. Request inspection as required by the Governing Authority having jurisdiction.

D. Compaction Testing: In accordance with ASTM D1557, ASTM D2922, ASTM D3017.

E. When tests indicate work does not meet specified requirements, remove work, replace and retest.

F. Frequency of Compaction Tests: per section 31 05 13.

G. Deflection and Pressure Test: Test in accordance with Uniform Plumbing Code requirements.

3.09 PROTECTION OF FINISHED WORK

A. Section 01 78 00 – Closeout Submittals: Protecting finished Work.

B. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.
   1. Take care not to damage or displace installed pipe and joints during construction of pipe supports, backfilling, testing, and other operations.
   2. Repair or replace pipe that is damaged or displaced from construction operations.

END OF SECTION

SECTION 41 22 13.15

BRIDGE CRANES, OVERHEAD ELECTRIC, UNDER RUNNING

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN GEAR MANUFACTURERS ASSOCIATION (AGMA)

AGMA 2011	(2014B) Cylindrical Wormgearing Tolerance and Inspection Methods
AGMA ISO 10064-6	(2010A) Code of Inspection Practice - Part 6: Bevel Gear Measurement Methods
AGMA ISO 17485	(2008A; Supplement 2008) Bevel Gears - ISO System of Accuracy (Including Supplement - Tolerance Tables 2008)
ANSI/AGMA 2001	(2004D; R 2010) Fundamental Rating Factors and Calculation Methods for Involute Spur and Helical Gear Teeth
ANSI/AGMA 2015-1	(2001A; R 2014) Accuracy Classification System - Tangential Measurements for Cylindrical Gears
ANSI/AGMA 6013	(2006A; R 2011) Standard for Industrial Enclosed Gear Drives
ANSI/AGMA 6113	(2016B) Standard for Industrial Enclosed Gear Drives (Metric Edition)

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC 325	(2017) Steel Construction Manual
AISC 360	(2016) Specification for Structural Steel Buildings

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M	(2015; Errata 1 2015; Errata 2 2016) Structural Welding Code - Steel
AWS D14.1/D14.1M	(2005; Amd 1 2017) Specification for Welding of Industrial and Mill Cranes and Other Material Handling Equipment

ASME INTERNATIONAL (ASME)

ASME B1.1	(2003; R 2018) Unified Inch Screw Threads (UN and UNR Thread Form)
ASME B18.2.2	(2015) Nuts for General Applications: Machine Screw Nuts, Hex, Square, Hex Flange, and Coupling Nuts (Inch Series)
ASME B30.10	(2014) Hooks
ASME B30.11	(2010) Monorails and Underhung Cranes - Safety Standard for Cableways, Cranes, Derricks, Hoists, Hooks, Jacks, and Slings
ASME B30.16	(2017) Overhead Underhung and Stationary Hoists
ASME B30.17	(2015) Overhead and Gantry Cranes (Top Running Bridge, Single Girder, Underhung Hoists)
ASME HST-4	(2016) Performance Standard for Overhead Electric Wire Rope Hoists
ASME NUM-1	(2016) Rules for Construction of Cranes, Monorails, and Hoists with Bridge or Trolley or Hoist of the Underhung Type.

ASTM INTERNATIONAL (ASTM)

ASTM A194/A194M	(2018) Standard Specification for Carbon Steel, Alloy Steel, and Stainless Steel Nuts for Bolts for High-Pressure or High-Temperature Service, or Both
ASTM A275/A275M	(2018) Standard Practice for Magnetic Particle Examination of Steel Forgings
ASTM A307	(2014; E 2017) Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength
ASTM A325	(2014) Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
ASTM A325M	(2014) Standard Specification for Structural Bolts, Steel, Heat Treated, 830 MPa Minimum Tensile Strength (Metric)
ASTM A563	(2015) Standard Specification for Carbon and Alloy Steel Nuts

ASTM A563M	(2007; R 2013) Standard Specification for Carbon and Alloy Steel Nuts (Metric)
ASTM A668/A668M	(2017) Standard Specification for Steel Forgings, Carbon and Alloy, for General Industrial Use
ASTM A931	(2008; R 2013) Standard Test Method for Tension Testing of Wire Ropes and Strand
ASTM A1023/A1023M	(20152019) Standard Specification for Stranded Carbon Steel Wire Ropes for General Purposes
ASTM E125	(1963; R 2013) Photographs for Magnetic Particle Indications on Ferrous Castings
ASTM E543	(2015) Standard Practice for Agencies Performing Non-Destructive Testing
ASTM F436	(2011) Hardened Steel Washers
ASTM F436M	(2011) Hardened Steel Washers (Metric) ASTM
F959/F959M	(2017a) Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners, Inch and Metric Series

CRANE MANUFACTURERS ASSOCIATION OF AMERICA (CMAA)

CMAA 74	(2015) Specifications for Single Girder Cranes

MATERIAL HANDLING INDUSTRY OF AMERICA (MHI)

MHI MH27.1	(2009) Specifications for Underhung Cranes and Monorail Systems

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250	(2018) Enclosures for Electrical Equipment (1000 Volts Maximum)
NEMA ICS 3	(2005; R 2010) Medium-Voltage Controllers Rated 2001 to 7200 V AC
NEMA ICS 6	(1993; R 2016) Industrial Control and Systems: Enclosures
NEMA ICS 8	(2011) Crane and Hoist Controllers

NEMA MG 1 (2016; SUPP 20162018) Motors and Generators

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (2017; ERTA 1-2 2017; TIA 17-1; TIA 17-2; TIA 17-3; TIA 17-4; TIA 17-5; TIA 17-6; TIA 17-7; TIA 17-8; TIA 17-9; TIA 17-10; TIA 17-11; TIA 17-12; TIA 17-13; TIA 17-14; TIA 17-15; TIA 17-16; TIA 17-17) National Electrical Code

UNDERWRITERS LABORATORIES (UL)

UL 1004-1 (2012; Reprint Aug 2017) UL Standard for Safety Rotating Electrical Machines - General Requirements

1.2 DEFINITIONS

a. Crane Bridge: That part of an overhead crane system consisting of girder(s), end trucks, end ties, walkway, and drive mechanism which carries the trolley(s) and travels along the runway rails parallel to the runway.

b. Crane Runway: The track system along which the crane operates horizontally, including track hangar rods, track connection devices, and runway structural supports.

c. Dead Loads: The loads on a structure which remain in a fixed position relative to the structure.

d. Girder: The principal horizontal beam of the crane bridge. It is supported by the crane end trucks. Normally the crane trolley mounted hoist is suspended from the girder below the crane.

e. Live Load: A load which moves relative to the structure under consideration.

f. Patented Track: A generic term referring to track built in accordance with MHI MH27.1 utilizing a composite track section incorporating a proprietary bottom flange shape. For this crane system, it is provided for the crane bridge girder and also the crane runway track.

g. Rated Load: For the purpose of this specification the rated load is defined as the maximum working load suspended under the load hook.

h. Standard Commercial Cataloged Product: A product which is currently being sold, or previously has been sold, in substantial quantities to the general public, industry or Government in the course of normal business operations. Models, samples, prototypes or experimental units do not meet this definition. The term "cataloged" as specified in this section is defined as "appearing on the manufacturer's published product data sheets. These data sheets must have been published or copyrighted prior to the issue date of this solicitation and have a document identification number or bulletin number.

i. Trolley Mounted Hoist: A combined unit consisting of a wheeled trolley that provides horizontal motion along the bridge girder, and a hoist suspended from the trolley, that provides lifting and lowering of a freely suspended load.

j. Underrunning (Underhung) Crane: An electric overhead traveling crane that is supported by crane end trucks suspended below the crane runway. The load is supported by hanging from the lower flange of a beam.

k. Top Running Crane: An overhead electric traveling crane that is supported by end trucks which run on top of supporting rails.

l. The Contractor is responsible for the coordination and proper relation of his work to the building structure and to the work of all trades. Verify all dimensions of the building that relate to fabrication of the crane and notify the Contracting Officer of any discrepancy before finalizing the crane order.

1.4 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

Shop Drawings
Under Running Overhead Electric Crane System;
Runway Rail;

Product Data
Under Running Overhead Electric Crane System;

Submit data for all system components, including the following:

Bridge End Trucks;
Crane Bridge Girder
Hoist Trolley; Crane
Controllers; Couplings;
Pendant Push-Button Station;
Crane Electrification; Motors;
Brakes;
Crane Runway Track System;
Overload Protection;
Hoist Limit Switches; Design
Data
Load and Sizing Calculations;
Crane Runway Track System;
Custom Runway Track Suspension Devices;

Test Reports
Hook Proof Test;
Hoisting Rope breaking strength; Load Test;
No-load Test;
Post-erection Inspection Report; Operational
Test Report;
Certificates
Brake Setting Record; Overload Test
Certificate;
Loss of Power (Panic Test) Certificate; No Hazardous
Material Certificate;

Certificate of Compliance with Listed Standards;

Operation and Maintenance Data
Under Running Overhead Electric Crane system, including runway system
Submit OPERATION AND MAINTENANCE DATA including weekly, monthly, semi-annual, and annual required maintenance items.

1.5 QUALITY ASSURANCE

1.5.1 Manufacturer Qualification

Under Running Overhead Electric Crane system, including sub-system components manufactured by vendors, must be designed and manufactured by a company with a minimum of 10 years of specialized experience in designing and manufacturing the type of overhead crane required to meet requirements of the Contract Documents and conforming to ASME B30.16 or ASME B30.17 as applicable.

1.5.2 Pre-Delivery Inspections

Contractor is responsible for performance of quality control inspections, testing and documentation of steel castings, hook assembly and trolley as follows.

1.5.2.1 Inspection of Steel Castings

Visually inspect and test load-carrying steel castings. Reference allowable degree of discontinuities to ASTM E125, and relationship to service loads and stresses, critical configuration, location and type. All load bearing components, couplings, shafts, and gears, in the hoist drive train must be rolled or forged steel, except brake drums which may be ductile iron.

1.5.2.2 Inspection of Hook Assembly

Inspect hook and nut prior to delivery. Furnish documentation of hook inspection prior to field operational testing. As part of the acceptance standard, linear indications greater than 1/16 inch are not allowed. Welding repairs of hook are not permitted. A hook showing linear indications, damage or deformation is not acceptable and must be replaced immediately.

1.5.3 Certificates

Submit a statement that the crane can be periodically load tested to 125 percent (plus 5 minus 0) of rated load.

Also provide the following certificates:

Overload Test Certificate
Loss of Power (Panic Test) Certificate
Certificate of Compliance with Listed Standards
No Hazardous Material Certificate, stating no asbestos, lead, cadmium, chromium, PCB's, elemental mercury, or any other hazardous materials.

Submit a loss of power (panic test) certificate stating that a test may be performed in which power is removed from the crane while the hoist, bridge and trolley are in operation to simulate a loss of power.

1.5.4 Drawings: Under Running Overhead Electric Crane System

Submit shop drawings showing the general arrangement of all components in plan, elevation, and end views; hook approaches on all four sides, clearances and principal dimensions, assemblies of hoist, trolley and bridge drives, motor nameplate data, overcurrent protective device ratings, and electrical schematic drawings. Include weights of components and maximum bridge wheel loads and spacing.

Shop drawing quality must be equivalent to the contract drawings accompanying this solicitation. Drawings must be reviewed, signed and sealed by a professional engineer licensed in the state where the crane is to be installed.

Provide integral schedule of crane components on each drawing. Provide maximum wheel loads (without impact) and spacing imparted to the runway track beams. Indicate the crane speeds along the runway, the trolley speeds along the bridge girder, and the hoist lifting speeds; all speeds indicated are speeds with hoist loaded with rated crane capacity load.

1.5.5 Design Data: Load and Sizing Calculations

Submit calculations verifying the sizing of the bridge girder, end trucks and travel drives. Include seismic analysis of bridge girder and end trucks. Calculations must be must be reviewed, signed and sealed by a professional engineer licensed in the state where the crane is to be installed.

1.5.6 Welding Qualifications and Procedure

Welding must be in accordance with qualified procedures using AWS D14.1/D14.1M as modified. Written welding procedures must specify the Contractor's standard dimensional tolerances for deviation from camber and sweep and not exceed those specified in AWS D14.1/D14.1M and CMAA 74. Welders and welding operators must be qualified in accordance with AWS D1.1/D1.1M or AWS D14.1/D14.1M. Allowable stress values must comply with CMAA 74.

1.6 CRANE SAFETY

Comply with the mandatory and advisory safety requirements of ASME B30.11, ASME B30.16, ASME HST-4, NFPA 70, 29 CFR 1910, 29 CFR 1910.147, 29 CFR 1910.179, and 29 CFR 1910.306.

PART 2 PRODUCTS

2.1 UNDER RUNNING CRANE SYSTEM

Provide under running bridge overhead electric crane, with under running trolley mounted hoist , conforming to CMAA 74, Class C (Moderate Service) for indoor service. Crane must be controlled by a pendant push button station mounted on the hoist.

All components of the crane system must comply with MHI MH27.1, Class C (Moderate Service),and CMAA 74, Class C.

The crane span must be +/- 38 feet.

The crane must operate in an indoor environment having an ambient temperature range of 68 to 72 degrees F.

Maximum crane wheel loads (without impact) due to dead and live loads, with the trolley in any position, causing a more severe loading condition in the runway support structure than that produced by the design wheel loads and spacing indicated on the design drawings is not permitted.

2.1.1 Power Characteristics

Provide crane operating from a 440 volt AC, 60 Hz three phase power source.

2.1.2 Capacity

Provide a crane with a minimum rated capacity of **5 tons** . Mark the rated capacity in both ton and pound units printed in different colors on each side of the crane bridge girders. Capacity marks must be clearly legible to the operator at ground level. Individual hoist units must have their rated capacity clearly marked on their bottom block, and additionally labeled on the hoist body. Rated capacity must include all accessories below the hook, such as load bars, magnets, grabs, etc. as part of the load to be handled.

2.1.3 Speeds & Crane Control Parameter Settings

Provide crane with variable speed hoist, trolly, and bridge equipment as recommended by CCMA for the class of crane indicated.

2.1.4 Crane Bridge

2.1.4.1 Crane Bridge Girder

Provide a patented track, in accordance with MHI MH27.1 for the crane bridge girder. The summation of all normal stresses on a girder section under analysis can not exceed the allowable stress for tension or compression as stated in CMAA 74.

2.1.4.2 Bridge End Trucks

Provide swiveling type wheel assemblies for the crane end trucks so that connections between the end truck and the wheel assemblies have rotational movement in two axes. Further, these connections must ensure contact of all end truck wheels with the runway operating (lower) flange at all times. Provide end truck wheels hardened to a minimum hardness of 375 BHN, with flat treads and side guide rollers. No hollow stamped steel wheels are permitted.

Configure bridge trucks with a feature that limits load movement to one inch in the event of wheel or shaft failure.

2.1.4.3 Bridge Brake

Provide bridge drive with an electro-mechanical brake conforming to the requirements of CMAA 74, capable of stopping the motion of the bridge within a distance in feet equal to 10 percent of the full load speed in feet per minute when traveling at full speed with a full load.

Provide brakes with an externally accessible means to manually defeat the brake.

2.1.4.4 Bumpers

Provide trolley and bridge bumpers conforming to CMAA 74 guidelines.

2.1.5 Hoist Trolley

Configure trolley such that the trolley frame contacts the trolley stops and prevents the trolley from dropping more than one inch in the event of an axle or wheel failure. Trolley must be mounted on straight and flat bridge beam. No hollow stamped steel wheels are permitted.

2.1.5.1 Trolley Drive

Provide motor-driven trolley.

2.1.5.2 Trolley Brake

Provide trolley brake or non-coasting worm drive capable of stopping the trolley within a distance in feet equal to 10 percent of the rated speed in feet per minute when traveling at rated speed with rated load. Provide brakes with an externally accessible means to manually defeat the brake.

2.1.6 Hoist

ASME HST-4, Class H3, double reeved, except as modified and supplemented in this section. Equip hoist with a spring set, electro-mechanically released brake plus a mechanical load brake.

2.1.6.1 Load Block

Construct the load block entirely of steel. The design must preclude the wire rope from being cut, pinched, crushed, or chafed in case of two-blocking.

2.1.6.2 Hook and Hook Nut

Provide hook conforming to ASME B30.10, except as modified and supplemented in this specification section. Do not coat, galvanize, or paint hook nut.

Provide hook and hook nut capable of complete disassembly that enables access to all surfaces of hook, including shank and hook nut for inspection purposes. Make provision for the hook nut, or other hook-to-block fastener, to be keyed to hook shank by means of a set screw or similar, easily removable, securing device. Provide bearing or bushing as necessary to ensure the hook rotates easily within the hook block when loaded at 131.25 percent of the rated hoist capacity. Do not coat, galvanize, or paint hook.

Inspect each hook, including shank and hook nut, over the entire surface areas by magnetic particle inspection. If hook nut is not used, inspect any device that functions the same as the hook nut by magnetic particle inspection.

a. Procedure: Conduct magnetic particle inspection in accordance with ASTM A275/A275M with the following restrictions:

(1) DC yokes (including switchable AC/DC yokes used in the DC mode) and permanent magnet yokes must not be used.

(2) Do not use automatic powder blowers or any other form of forced air other than from a hand-held bulb for the application or removal of dry magnetic particles.

(3) Remove all arc strikes.

(4) Equipment ammeters must have an accuracy of plus or minus 5 percent of full scale (equipment ammeter accuracy other than that stated is acceptable provided the MT procedure states that a magnetic field indicator is used to establish and verify adequate field strength for all aspects of the inspection.)

Conduct this inspection at the factory of the hook manufacturer or hoist manufacturer. Alternately, a recognized independent testing lab may conduct the inspections if equipped and competent to perform such a service, and if approved by the Contracting Officer. The performing organization must provide a written statement of certification to ASTM E543, have the procedures used for testing of the hook and hook nut reviewed and approved by an independent Level III examiner, and submit the approved procedures and certification to the Contracting Officer with the test report.

b. Acceptance Criteria: Defects found on the hook or hook nut will result in rejection of defective items for use on furnished hoist. For this inspection, a defect is defined as a linear or non-linear indication for which the largest dimension is greater than 1/16 inch.

c. Test Report: Provide a test report of the magnetic particle inspection of each hook and hook nut and submit to and secure approval from the Contracting Officer prior to final acceptance of hoist installation. Test reports must be certified by the testing organization.

d. Weld Repair: Weld repairs for defects on hooks or hook nuts are not acceptable.

2.1.6.3 Hoisting Rope

Provide wire rope conforming to ASTM A1023/A1023M, improved or extra improved plow steel as a minimum, regular lay, uncoated, 6 by 37 class construction, with an independent wire rope core. Provide double reeved reeving arrangement. Connect hoisting rope dead end to equalizer bars (if used) by means of zinc-speltered sockets or swaged fittings installed in a manner which develops the full breaking strength of the hoisting rope.

Anchor hoisting rope ends on the drum by means of swaged fittings or by clamping. Neatly and securely seize hoisting rope ends with corrosion resistant wire, except where terminated in zinc-speltered sockets or swaged fittings.

Provide wire rope minimum safety factor of 5 to 1 based on the ratio of actual minimum wire rope breaking load to the calculated load on rope when hoist is assumed loaded to rated capacity. Certification from rope manufacturer verifying provided wire rope breaking strength, conforming to ASTM A931 must be provided. No paint or coatings are allowed on the wire rope. Minimum length of the wire rope must enable the load hook to operate through its full hook lift range and still have a minimum of two full wraps of wire rope around the rope drum.

2.1.6.4 Sheaves

Provide steel sheaves. Machine or grind the grooves to contour and rim toughen, flame, or induction harden to not less than 320 BHN. Provide minimum pitch diameters of running sheaves of not less than 16 times the rope diameter. Provide sheave groove depth of not less than 1.15 times the

hoisting rope diameter. Do not paint wire rope contact surfaces of sheaves.

2.1.6.5 Drum

Provide drum with turned helical grooves cut right and left hand to receive, in a single layer, the full winding length of the rope plus not less than two dead wraps on each end.

Provide drum of steel construction. Design drum so that not less than two dead wraps of hoisting rope remains on each anchorage when the hook is in its extreme low position. Provide right and left hand drum grooving beginning at the ends of the drum and grooving towards the center of the drum. Minimum drum groove depth, must be 0.375 times the rope diameter.

Provide minimum drum groove pitch either 1.14 times the rope diameter, or the rope diameter plus 1/8 inch, whichever is smaller. Do not paint, coat or galvanize the surface of the drum which comes in contact with wire rope.

2.1.6.6 Hoist Brake

Provide both a mechanical load brake and an electro-mechanical brake (shoe or disc). The mechanical load brake and the electro-mechanical brake must each, independently, stop and hold 131.25 percent of rated capacity. The electro-mechanical brake must be adjustable to 50 percent of its rated capacity, and must have an externally accessible means of manual release.

2.2 STRUCTURAL

2.2.1 Welding

Use AWS D14.1/D14.1M for welding design and procedures, including pre-weld and postweld heat treatments. However, the minimum classification of electrodes must be the E70 series.

2.2.2 Structural Bolted Connections

Structural bolted connections must be in accordance with CMAA 74, Section 3.8.

2.3 MECHANICAL

2.3.1 Threaded Fasteners

Fasten base-mounted and flange-mounted components and all mechanical connections subjected to calculable loads with ASTM A325 plain uncoated bolts (ASTM A307) with appropriate ASTM A194/A194M or ASTM A563plain nuts; and ASTM F436 plain, through hardened, flat, circular washers. Match bolt and nut threads. Oversize tapping is not permitted. Bolt and nut threads must conform to ASME B18.2.2 and ASME B1.1. Bolts and screws may be installed into tapped holes only in heat treated steel with a minimum hardness of 195 BHN.

2.3.2 Antifriction Bearings

Provide antifriction type bearings, except where bushings are specifically permitted or required. Provide grease lubricated bearings with means for relubrication through easily accessible lubrication fittings or provide permanently lubricated and sealed bearings.

2.3.3 Bushings

Provide manufacturer's standard bronze alloy bushings and thrust washers. Provide means for relubrication of grease lubricated bushings through easily accessible lubrication fittings or provide oil impregnated type bushings.

2.3.4 Gears

Gears must conform to the applicable requirements of ANSI/AGMA 2015-1, ANSI/AGMA 2001, AGMA ISO 10064-6, AGMA ISO 17485, AGMA 2011, and ANSI/AGMA 6013.

2.4 ELECTRICAL

The design, selection, rating, and installation of the electrical portions of the crane and its accessories must conform to the requirements of NEMA ICS 3,NEMA ICS 8, ASME HST-4, and NFPA 70, and other requirements specified herein.

The crane manufacturer must furnish and install all electrical equipment on the crane conforming to NEMA ICS 6, including motors, conforming to NEMA MG 1, electrically released brakes, switches, crane controllers, panels, operating station, wiring system, cables, and bridge-to-trolley crane electrification, and the runway electrification.

2.4.1 Motors

Motors must meet all applicable requirements of NEMA MG 1 and UL 1004-1. Provide insulated inverter duty motors for Variable Frequency Drives (VFD). Motor insulation must be Class H, but with a Class B temperature rise.

Provide motor overload protection utilizing a thermal sensitive device embedded in its windings.

2.4.2 Pendant Pushbutton Station

Suspend the pendant push-button station from an independent festooned messenger track system, operating the length of the bridge. Locate the pendant pushbutton station 4 feet above the finished floor. Clearly mark all controls for identification of functions. Provide directional contactors with both mechanical and electrical interlocks.

Arrange pushbuttons in accordance with ASME B30.11 recommendations, except as supplemented or modified herein. On the pushbutton station, provide a pilot light to indicate that the pendant is energized . Provide a pilot light on the crane mounted electrical panel to indicate that power is available to the crane . Provide pendant station with an on and off button that removes power from the motors, brakes and control circuit. Provide directional contactors with both mechanical and electrical interlocks.

2.4.3 AC Controls

Provide static reversing, adjustable frequency controllers for the hoist, bridge and trolley electric drives. Provide dynamic braking for all electric drives. Speed control must be of the three step infinitely variable type for the hoist function and two step infinitely variable type for the bridge and trolley functions. The hoist, trolley and bridge brakes must set only after the associated controller decelerates the motor to a controlled stop.

All motors must run smoothly, without torque pulsations at the lowest speed and be energized at a frequency not exceeding 60 HZ at the highest speed. The hoist controller must enable the drive motor

to develop full torque continuously at zero speed.

The use of definite purpose contactors is prohibited. All contactors must be NEMA rated. Feed control circuits from a single phase, air cooled, double wound transformer with a grounded metal screen between the primary and secondary windings of the transformer.

2.4.4 Protection

Protection must not be less than that required by NEMA ICS 3, and NFPA 70. Provide enclosed type circuit breaker for crane disconnect. Provide an On/Off button that removes power from the motors, brakes and control circuit on the operator's control pendant station or radio controller. The control circuit must not operate unless the "On" button is depressed. Provide for lockout/tagout of all hazardous energy sources

2.4.5 Resistors

Provide resistors rated for continuous duty operation based upon 125 percent of the motor nameplate amperes and fabricated of corrosion resistant metal; the use of "wire wound" type resistors is prohibited for segments of 8 ohms or less. Mount resistors in substantial, ventilated enclosures constructed entirely of non-combustible materials. Provide resistors with terminals fitted in the coolest position in the enclosure.

2.4.6 Limit Switches

Provide primary upper and lower geared limit switches. Geared limits must allow reversing direction to back out of the limit without resetting. Provide a backup mechanical hook block activated upper limit switch wired independent of the directional controllers and the primary upper limit switch that removes power from the hoist motor, hoist brake and hoist controls. The backup limit must require hoist resetting prior to operation of the hoist in any direction. Provide a three position keyed switch on the pendant control with positions for bypass of the primary upper limit (to allow testing of the backup upper limit) and bypass of the backup upper limit in the lower direction only.

2.4.7 Overload Protection

Provide overload protection for bridge, runway, and hoist systems. Hoist overload protection must be adjustable between 80 and 150 percent of hoist capacity

2.4.8 Reactors

Provide line reactors rated for continuous duty operation based upon the motor nameplate amperes. Select reactors for 60 Hz operation and having taps for field adjustment of inductance so as to permit achievement of the optimum acceleration characteristics for the drive. For a drive motor branch circuit that exceeds 100 feet in length, a reactor must also be connected in series with the controller load (output) terminals to provide standing wave protection

2.4.9 Warning Devices

Provide a warning horn that is operable from a push button at the pendant pushbutton station. Provide a warning strobe] that is illuminated at all times during movement of the hoist, trolley, or bridge function.

2.4.10 Enclosures

Provide enclosures for control panels, controls, and brakes in accordance with NEMA 250 and NEMA ICS 6, Classification Type 1 indoor, general purpose.

2.4.11 Electrification

Runway electrification includes providing conductors between the electrification system and the junction box indicated on the drawings. Provide enclosures for control panels, for pendent pushbutton station, and for auxiliary devices and mount along the bridge. For runway electrification provide copper conductors enclosed in a solid plastic cover. Provide two sets of current collectors for each conductor.

Provide runway electrification for the crane system in accordance with NFPA 70.

2.5 CRANE PAINTING

Paint exposed portions of the crane and girders in accordance with CMAA 74. Desired color is brilliant yellow.

Paint the following at the center of the crane girder " O M I C – R&D " in a custom color to be determined by the Architect.

Coat faying surfaces of bolted connections per AISC 325, but do not apply finish paint.

Paint the load block brilliant yellow with black diagonal striping, one inch wide diagonal black stripes located on 2 inch centers.

Factory paint electrical and mechanical equipment in accordance with the manufacturer's best standard practice (for the specified environment), except that electrical equipment doors, which expose current-carrying electrical conductors when opened, must be orange.

2.6 IDENTIFICATION PLATES

Furnish and install identification plates. Provide non-corrosive metal identification plates with clearly legible permanent lettering giving the manufacturer's name, model number, serial number, capacity in both kilogram and pound units printed in different colors, and other essential information or identification.

2.6.1 Markings on Crane, Trolley, and Hook

Markings include: bridge motion direction arrows on both sides of the bridge; and trolley motion direction arrows on both sides of trolley. Markings must be visible from push button station and from the loading point, corresponding to the push button labeling on the pendant pushbutton station. Mark the hook rated capacity on both sides of the hoist and hoist load block in tons and in pounds.

2.7 PATENTED TRACK

Provide specially designed beam, i.e., patented track beam, constructed from welded steel components. Provide patented track fabricated by a manufacturer regularly engaged in the

production of this type of beam. Provide the lower flange (T-rail) of the beam section with a flat wheel tread surface. Minimum lower flange width must be 3.25 inches and have a chemical composition of 0.45 to 0.60 percent carbon content, 0.60 to 1.1 percent manganese content. The lower flange wheel tread surface must be tempered to a minimum hardness of 195 BHN.

Provide a structural steel upper flange and web beam section as one monolithic piece rolled to shape or fabricated from two pieces with the flange and web continuously fillet welded on both sides. The joint between the web and the T-rail must be continuously welded from both sides. The structural joint must conform to AISC 360. Size beam, as a minimum, to withstand all expected forces and the load combinations specified herein.

2.8 CRANE RUNWAY TRACK SYSTEM

Provide runway track beams designed and constructed in compliance with MHI MH27.1 Class C (Moderate Service).

Submit manufacturer's standard published tables that verify the crane bridge girder and crane runway track are sized in compliance with all specification requirements. When standard published tables are not available, provide calculations for the strength design and deflection of the bridge beams.

If any runway track suspension device is not the track manufacturer's standard commercial cataloged product, submit complete design data for each instance to substantiate that the device complies with the requirements of MHI MH27.1 .

It is the Contractor's responsibility to provide the complete runway track suspension system that is required to hang the crane runway track at its indicated location from the existing structural supports. For the track suspension system, provide all the standard commercial cataloged products possible.
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PART 3 EXECUTION

3.1 POST-ERECTION INSPECTION

After erection, the Contractor, and the Owners Representative must jointly inspect the crane bridge and hoist systems and components to verify compliance with specifications and approved shop drawings and manufacturer's data. Notify the Owners Representative 7 days before the inspection.

Document the results of this inspection and submit the post-erection inspection report to the Owner’s Representative for approval.

3.2 OPERATIONAL TEST

After erection and inspection, test the hoist, bridge, and trolley as specified herein. All tests must be witnessed by a technical representative of the Owner.

Perform the 125 percent rated load test with the bridge and trolley located to obtain maximum loads on the runway and bridge girders. Test the systems in service to determine that each component of the system operates as specified, is properly installed and adjusted, and is free from defects in material, manufacture, installation, and workmanship.

Rectify all deficiencies disclosed by testing and retest the system or component to prove the crane meets the specified requirements.

Provide all personnel and equipment required to meet the specified test requirements. This includes test loads, and rigging gear, crane operating personnel, instruments, and all other necessary apparatus.

3.2.1 Operational Test Report

Record crane test data on appropriate test record forms suitable for retention for the life of the crane. Include in the test records:

a. Test date
b. Crane identification number
c. Weather conditions.
d. Identification of each test performed
e. Results of each test performed
f. Data collected during testing
g. Remarks

Record operating and startup current and motor terminal voltage measurements for electrical equipment (motors) using appropriate instrumentation (e.g., clamp-on ammeters). Compare recorded values with design specifications or manufacturer's recommended values; abnormal differences (i.e., greater than 10 percent from manufacturer's or design values) must be justified or appropriate adjustments performed. In addition, note, investigate, and correct any high temperatures or abnormal operation of any equipment or machinery. Record hoist, trolley, and bridge speeds during each test cycle. Ensure that any energized drive motor initially rotates only in the direction selected by the operator by depressing the corresponding pushbutton; i.e., is not overhauled.

3.2.2 Hook

Measure hook for hook throat spread before and after load test. Establish a throat dimension base measurement by installing two tram points and measuring the distance between these tram points (plus or minus 1/64 inch). Record this base dimension. Measure the distance between tram points before and after load test. Any increase in throat opening from the base measurement is cause for rejection.

3.2.3 No-Load Test

Check entire clearance envelope to ensure there are no obstructions. Raise and lower the hook through the full range of normal travel at rated speed for three complete cycles. Then raise and lower the hook through the full range of normal travel in slow speed. Verify proper operation of hoist limit switches. Operate the bridge and trolley in each direction the full distance between end stops; bring bumpers into contact with bumper stops at each end of travel. Perform one complete cycle to check each speed point and verify proper brake operation.

3.2.4 Hoist Load Test

Perform the following tests, as specified, with test loads of 100 percent (plus 0 minus 10 percent) and 125 percent (plus 5 minus 0) of rated load.

a. Static Load Test (125 percent only):

Check entire structure, holding brake and hoisting components as follows: With the trolley in the center of the bridge span, raise the test load approximately one foot. Hold the load for 10 minutes. Rotate load and hook a full 360 degrees to check bearing operation. Ensure there is no vertical movement of the load. Verify beam and girder deflections do not exceed CMAA 74 and MHI MH27.1 design limits.

b. Dynamic Load Test (100 percent only):
Raise and lower the test load through the full lift height to test limit switches. Check speed points during raising and lowering. Lower the load to the floor, operate continuously for 5 minutes, then raise and lower the load through two more cycles, in order to demonstrate proper operation and repeatability of all functions without component overheating or malfunction. Completely stop the machinery at least once in each direction during each cycle to ensure proper brake operation.

c. Hoist Load Brake (125 percent only):
Raise test load approximately 5 feet. With neither pushbutton depressed, release (by hand) the holding brake. The load brake must hold the test load. Again with the holding brake in the released position, start the test load down (first point) and then release the pushbutton as the test load lowers. The load brake must prevent the test load from accelerating. Submit 3 copies of the brake setting record.

d. Hoist Loss of Power (Panic Test) Certificate (125 percent only):
Raise the test load to approximately 8 feet. While slowly lowering the test load, disconnect the crane's power source. Verify that the test load does not lower and that the brake is set.

3.2.5 Trolley/Hoist Load Test

Operate the trolley/hoist the full distance of the bridge rails in each direction with a test load of 125 percent of rated load on the hook (one cycle). Check proper functioning of all drive speed control points. Verify proper brake action.

3.2.6 Bridge Load Test

With a test load of 125 percent of rated load on the hook, operate the bridge for the full length of the runway in one direction with the trolley/hoist at the extreme end of the bridge, and in the opposite direction with the trolley at the opposite extreme end of the bridge (one cycle). Check proper functioning of all drive speed control points. Check for any binding of the bridge end trucks and verify proper brake action. Record deficiencies. Secure from testing if deficiencies are found.

3.2.7 Rated Travel Test

Repeat travel tests for trolley/hoist and bridge with a test load of 100 percent of rated load. Repeat the test for 2 cycles to demonstrate proper operation and repeatability of all functions without the overheating or malfunction of any components. Check speed points during each cycle. Completely stop the machinery at least once in each direction during each cycle to ensure proper brake action.

-- End of Section --