

PROJECT MANUAL

for

LAKE OSWEGO SCHOOL DISTRICT LAKERIDGE HIGH SCHOOL STADIUM IMPROVEMENTS - 2019

1235 Overlook Drive
Lake Oswego, OR 97034

JOB NO. 18079.00.L
Date: 20 September 2019

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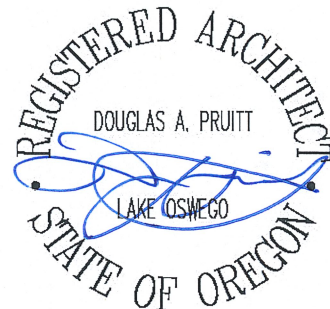


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NOTE: Division and Section numbers listed in the Table of Contents and items of work included in each Section conform in general to CSI's MasterFormat, 2010 Upgrade Edition. Section numbers listed are merely for identification and may not be consecutive. Users of this Project Manual shall check the specification with the Table of Contents to be sure each Section is included and shall check each Section to be sure each consecutively numbered pages within each Section is included. The last page of each Section has the statement "END OF SECTION".

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SUMMARY OF WORK

PART 1 – GENERAL

1.1 WORK INCLUDED

- A. The Work of the Contract consists of improvements to the existing grandstand and other associated Work at the Lakeridge High School at 1235 Overlook Drive, Lake Oswego, OR 97034, as indicated on Contract Documents (Drawings and Specifications) prepared by BBL Architects, dated 20 September 2019. Without force and effect on requirements of Contract Documents, Work of the Contract includes:
 - 1. Base Bid:
 - a. Construction of new roof canopy, stairways, and press box.
 - b. Construction of new Concessions 101 and Restrooms 104A and 104B and other rooms as indicated on Drawings.
 - c. Other Work as indicated on Drawings.
 - 2. Alternate No. 1: If Alternate No. 1 is exercised by the Owner, provide casework and other work indicated at Concessions 101. See Section 01 23 00 ALTERNATES.
 - 3. Alternate No. 2: If Alternate No. 2 is exercised by the Owner, complete the build-out of Unisex RR 104 and Unisex RR 105 as indicated on Drawings. See Section 01 23 00 ALTERNATES.
- B. Contract Documents: Requirements of the work are contained in the Contract Documents, and include cross-references to published information, which is not necessarily bound within the documents.

1.2 CONTRACTS

- A. Construct the Work under a Stipulated Sum Contract, furnished by the Owner.

1.3 PERMITS AND FEES

- A. Permits and Fees: Contractor shall obtain and pay for all permits and licenses. Refer to GENERAL CONDITIONS (Division 0).

1.4 WORK SEQUENCE

- A. Coordinate the construction schedule, sequencing, and operations with the Owner's Designated Representative.
- B. Award of Contract: It is anticipated that award of Contract will be made on 31 October 2019.
- C. Notice to Proceed: Owner will issue written Notice to Proceed shortly after Award of Contract.
- D. Contractor shall proceed with preparation and submission of submittals in a timely manner to assure that materials for the Project are ordered and received on Site when required to complete the Work within the prescribed time schedule.
- F. Start-up of Work on the Site:
 - 1. It is anticipated that full mobilization may occur on or after 7 November 2019.
- G. Perform demolition work and investigations to determine if additional work will be required to remediate and repair damaged areas. Perform such demolition work and investigations early enough in

SUMMARY OF WORK

the Project to not delay execution of all work within the prescribed timeline.

- H. The Work of the Project, including all additional work that may be discovered during demolition, must be completed within the following timelines:
 - 1. The track and field shall be turned over for use by the District no later than 25 February 2020.
 - 2. Substantial Completion: 25 March 2020.
 - 3. Final Completion: 25 April 2020.
- I. Other Scheduled Activities:
 - 1. Start of Track Season: 25 February 2020.
 - 2. Coordinate work activities in the existing building around the school calendar to avoid conflicts with classes and scheduled events in the building.

1.5 CONTRACTOR USE OF PREMISES

- A. General: Owner will occupy portions of the building during the construction period. Do not interfere with the Owner's operations. Coordinate use of premises under the direction of the Owner.
 - 1. The School Site will be occupied during the school year.
 - 2. Events will take place on the adjacent field.
- B. Use of the Site:
 - 1. Assume full responsibility for the protection and safekeeping of products under this Contract, stored on the Site.
 - 2. Confine operations at the site to the areas permitted. Portions of the site beyond areas on which work is indicated are not to be disturbed.
 - 3. Move any stored Products, under Contractor's control, which interfere with operations of Owner or separate contractors.
 - 4. Keep existing driveways and entrances serving the premises clear and available at all times. Do not use for parking for storage of materials.
 - 5. Maintain continuity of utility services to existing building.
 - 6. Lock automotive type vehicles and other mechanized or motorized construction equipment, when parked and unattended. Do not leave vehicles or equipment unattended with the motor running or ignition key in place.
 - 7. Do not encumber the site with materials or equipment. Confine stockpiling of materials and location of storage sheds to the areas indicated.
- C. Contractor's Use of the Existing Building:
 - 1. Maintain the existing building in a safe and weathertight condition throughout the construction period. Repair damage caused by construction operations. Take all precautions necessary to protect the building and its occupants during the construction period.
 - 2. Keep public areas such as hallways, stairs, elevator lobbies and toilet rooms free from accumulation of waste material, rubbish, or construction debris.
 - 3. Smoking or open fires will not be permitted within the building enclosure or on the premises.
- D. Contractor's Site Conduct:
 - 1. Identifying name tags will be worn at all times.
 - 2. No loitering in the school buildings.
 - 3. The site is a tobacco-free site. This means no smoking or chewing tobacco on the property.
 - 4. Beyond courtesy, there shall be no interaction between staff, faculty, or patrons.

SUMMARY OF WORK

5. Keep the project free of pop cans, lunch wrappers, etc.
 6. The supervisor will review the scheduling of any work that is excessively noisy. No disrupting work may be performed during school hours without the approval of the Owner's Representative.
 7. Be considerate of the client, the students, and faculty at the site.
 8. Think! Always consider prior to an act, the safety of students, faculty, and other co-workers.
 9. Profanity is not acceptable.
 10. The wearing of clothing with logos displaying alcohol, tobacco, illegal substances, or suggestive themes are not acceptable attire.
 11. Finally, take pride in all work.
- E. The District will provide the Contractor with two building master keys. The Contractor shall pay to rekey the entire campus if the keys are not returned to the District at the end of the Project.
- F. All deliveries to the Site shall take place off Overlook Drive; no access will be permitted off Cloverleaf Road unless written approval by the District is issued.
1. No deliveries are allowed to occur between 7:30 a.m. and 8:30 a.m. on school days.
 2. No deliveries are allowed to occur between 3:15 p.m. and 4:15 p.m. on Mondays, Tuesdays, Wednesdays, and Fridays when school is in session.
 3. No deliveries are allowed to occur between 2:45 and 3:45 pm on Thursdays when school is in session.
- G. The Contractor shall confine all work, material storage and equipment to areas indicated on the Drawings.

1.6 OWNER OCCUPANCY

- A. Full Owner Occupancy:
1. The Owner will occupy the site and the existing building during the entire period of construction.
 2. Cooperate fully with the Owner or his representative during construction operations to minimize conflicts and to facilitate Owner usage.
- B. Partial Owner Occupancy:
1. The Owner reserves the right to place and install equipment in completed areas of the building and to occupy completed areas prior to substantial completion, provided that occupancy does not interfere with completion of the Work.
 2. Placing of equipment and partial occupancy shall not constitute acceptance of the Work or any part of the Work.
- C. Scheduling Requirements:
1. Contractor shall organize and coordinate work in a manner that does not interfere with the normal operations of areas of the site and facilities being occupied and used by the Owner.

PART 2 – PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

DESIGN/BUILD REQUIREMENTS

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Certain portions and components of the Work under this project are Design/Build. It is the Contractor's responsibility to coordinate and assume or assign to subcontractors the complete responsibility for the design, calculations, submittals, permits, fabrications, transportation, and installation of the Design/Build portions or components as required in this Section. The Contractor is responsible to submit all Design/Build documents to the Building Department as required for the separate approval for each Design/Build item. There are **NO EXCEPTIONS**. Design build portions and components of this Work are defined as complete, operational systems installed for their intended use.
- B. The design professional is the Architect. The Architect's review of Design/Build submittals shall not lessen nor shift the responsibility from the Contractor or the assigned subcontractor to the Owner or the Architect. The Owner shall not be responsible to pay for any delays, additional products, additional hours of work or overtime, restocking or rework required due to failure by the Contractor or the subcontractor to coordinate their work with the work of other trades on the project or to provide the Design/Build portion or component in a timely manner to meet the schedule of the project.
- C. Follow the City of Lake Oswego requirements current at the time of submission. The Contractor is responsible to coordinate and submit all material required by the City, so the City's review will not adversely affect the construction schedule. At or near the time of application, the Contractor shall meet with City to identify Design/Build components and how they are to be submitted and processed.
 - 1. Prior to submittal to Lake Oswego Building Department, submit to Architect for review. The Architect (or his engineer) must review deferred submittals and must sign that they have reviewed, take no exceptions to the proposed design, and that the component is in conformance with the design concept of the Project.
- D. Design/Build portions of the work as defined in the International Building Code, Section 106.3.4.2 Deferred Submittals, shall follow this Section and the requirements of the local building department.

1.2 DESCRIPTIONS FOR SYSTEMS LISTED WITHIN THE PROJECT MANUAL

- A. Refer to systems descriptions in Part 1, General, and Part 2, Products, within each technical specification section listed for references to Design/Build work.

1.3 QUALITY ASSURANCE

- A. Refer to quality assurance described in Part 1, General, within each specification section listing design/build work.
- B. Quality assurance described in the specification sections shall be the minimum acceptable project standards. Should quality assurance not be defined within the specific specifications, then printed industry standards for "normal" quality practices shall govern.

1.4 REFERENCES

- A. Refer to references description in Part 1, General, within each specification section listing design/build work.

1.5 SUBMITTALS

- ## 1.6 CITY OF LAKE OSWEGO'S DESIGN BUILD REQUIREMENTS

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DESIGN/BUILD REQUIREMENTS

1.7 SPECIFIC REQUIREMENTS AND DEFINITIONS

- A. Design/Build elements shown in the Contract Documents are shown for design content. The intent is to have the Design/Build entity responsible to provide, coordinate, and install the Design/Build component.
- B. Provide Design/Build elements attached to the structural frame or supplemental to the structural frame that are designed for the anticipated loads outlined on the structural drawings or found in the State of Oregon International Uniform Building Code, current as of the date of the project. Coordinate these design build elements with the appropriate subcontractors.
- C. Provide design build elements attached to the structural frame including but not limited to glazed curtain wall systems, panelized brick, concrete and stucco, that are designed for the loads imposed and as complete and operational systems.
- D. Clearly define load reactions at the interface between the Design/Build elements and the structural frame to allow for a review by the Architect.
- E. Provide the Design/Build mechanical systems that are complete operational systems ready for their intended use on the project. Design the mechanical systems per the current International Mechanical Code, Plumbing Code, Fire Code, Energy Codes, and any other applicable codes. Coordinate the Design/Build mechanical systems with the building architectural, structural, electrical, and other systems and components as required.
- F. Provide the Design/Build electrical systems that are complete operational systems ready for their intended use on the project. Design the electrical systems per the current International Electrical Code, Energy Codes, and any other applicable codes. Coordinate the Design/Build electrical systems with the building mechanical, structural, architectural, and any other systems or components as required.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

UNIT PRICES

PART 1 - GENERAL

1.1 GENERAL

- A. Description: Contractor shall provide, with his Bid, unit prices for doing work as described in the Schedule of Unit Prices at the end of this Section. If the Owner elects to have the work performed, change order(s) will be issued describing extent of work, and Contractor will be compensated on the basis of the unit price submitted by the Contractor on the Bid Form.
- B. Unit prices shall include all costs to the Owner including cost of work, overhead and profit. All material wastage shall be factored into the unit cost.
- C. Referenced Sections: Specification Sections contain pertinent requirements for materials and installation to achieve the Work described by each unit price.
- D. Coordination: Coordinate related Work and modify surrounding Work as required to complete the Project under each unit price.
- E. Bidders are required to provide all unit prices that may be indicated on the Bid Form.
- F. Schedule:
 - 1. A "Schedule of Unit Prices" is included at the end of this section.
 - 2. Specification Sections that may be referenced in each Unit Price contain pertinent requirements for materials and installation to achieve the Work described by each Unit Price.
 - 3. Include as part of each unit price, miscellaneous devices, appurtenances and similar items incidental to or required for a complete system whether or not mentioned as part of the unit price.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF UNIT PRICES

- A. Unit Price 1: Provide unit price for additional over excavation, off-site disposal of unacceptable materials, and the installation of replacement materials as defined in the specifications as recommended by the Geotechnical Inspector. Provide unit pricing on a cubic yard basis.
- B. Unit Price 2: Provide unit price for additional purchase and installation of ¾ minus crushed rock aggregate. Provide unit pricing on a cubic yard basis.
- C. Unit Price 3: Provide unit price for additional purchase and installation of top soil. Provide unit pricing on a cubic yard basis.
- D. Unit Price 4: Provide unit price for removal, off-site disposal of Rock Excavation, and the installation of replacement materials as defined in the specifications as recommended by the Geotechnical Inspector. Provide unit pricing on a cubic yard basis.

UNIT PRICES

- E. Unit Price 5: Seeding of Additional Areas: Provide unit price for seeding of additional areas not indicated on Drawings. Provide unit pricing on a square foot basis.

END OF SECTION

ALTERNATES

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. Description: Alternates indicated Bid Proposal, include changes in Work as described by the Alternates listed in this Section. Alternates may be either additive or deductive to the Base Bid. The alternate amount will either be added to or deducted from the Base Bid amount if the Owner decides to accept a corresponding change in either scope of work or in products, materials, equipment, systems, or installation methods described in the Contract Documents.
- B. Coordination: Coordinate related Work and modify or adjust surrounding Work that is affected by each accepted alternate and ensure that work is complete and fully integrated as required to complete the Project under each alternate.
- C. Note that the Information for Bidders requires that bidders bid upon all Alternates that may be indicated on the Bid Proposal. Bid the Alternate as Lump Sums which will be considered independently of each other.
- D. The Owner's electing to exercise any Alternate does not relieve the Contractor of timely completion of the project, within the periods indicated.
- E. Evaluation of Alternate Prices: Bid evaluation will be based on lowest total of base bid modified by Owner accepted alternates.
- F. Notification: Immediately following award of Contract, prepare and distribute to each party involved, notification of the status of each alternate. Indicate whether alternates have been accepted, rejected, or deferred for consideration at a later date.
- G. Schedule:
 - 1. A "Schedule of Alternates" is included at the end of this section.
 - 2. Specification Sections that may be referenced in each Alternate contain pertinent requirements for materials and installation to achieve the Work described by each Alternate.
 - 3. Include as part of each Alternate, miscellaneous devices, appurtenances and similar items incidental to or required for a complete installation whether or not mentioned as part of the Alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

2.1 SCHEDULE OF ALTERNATES

- A. Additive Bid Alternate No. 1 – Build-out of Concessions 101: If Additive Bid Alternate No. 1 is exercised by the Owner, provide:
 - 1. Casework at Concessions 101 as indicated on Drawings and as specified in Section 06 41 00 ARCHITECTURAL WOOD CASEWORK.
 - 2. Fixtures at Concessions 101, including:
 - a. Sink and faucet.
 - b. Plumbing to connect the waste and hot and cold water supply
 - 3. Accessories at Concessions 101 as indicated on Drawings and as specified in Section 10 28 13 TOILET ACCESSORIES.
 - 4. Flooring and base as specified in Section 09 67 23 RESEINOUS URETHANE FLOORING.
 - 5. Painting on the interior of the concessions at the walls and ceiling (*The interior of the door and frame should be painted as part of the Base Bid.*)

ALTERNATES

6. Lighting.
 7. Electrical power.
- B. Additive Bid Alternate No. 2 – Build-out of Unisex 104 and Unisex 105: If Additive Bid Alternate No. 2 is exercised by the Owner:
1. Furnish and install (and paint) CMU walls dividing the toilet rooms from one another.
 2. Furnish and install (and paint) CMU wall dividing hand washing area from toilet rooms.
 3. Provide flooring and base as specified in Section 09 67 23 RESEINOUS URETHANE FLOORING.
 4. Provide door assemblies and hardware as indicated on Drawings and as specified.
 5. Provide plumbing fixtures as indicated on Drawings and as specified.
 6. Provide plumbing connections to rough-in connection points as shown on the Drawings.
 7. Provide toilet accessories as indicated on Drawings and as specified in Section 10 28 13 TOILET ACCESSORIES.
 8. Provide signage at toilet room locations indicated on Drawings and as specified in Section 10 14 00 SIGNAGE.
 9. Mechanical.
 10. Plumbing chase wall north of the toilet rooms.
 11. Lighting.
 12. Plumbing chase heaters.
 13. Unit heaters in the hand washing area.
 14. Access panels to the plumbing chase.
 15. Painting at the interior of the restroom area.

END OF SECTION

PROJECT COORDINATION

PART 1 - GENERAL

1.1 GENERAL COORDINATION

- A. Coordinate various elements of the work and entities engaged to perform work.
- B. Coordinate the work with existing facilities/conditions, and with work by separate contractors (if any) and by the Owner.

1.2 MECHANICAL AND ELECTRICAL DRAWINGS

- A. Mechanical and Electrical Contract Drawings are diagrammatic. Additional offsets and bends may be required.
- B. Install additional offsets and bends in the systems where required by field conditions.
- C. The Architect may make minor adjustments in fixture, outlet, grille, louver, or ventilator locations prior to rough-in work with no additional cost.

1.3 INSTALLER INSPECTIONS

- A. Require installer of each major unit of work to inspect substrate and conditions for installation and to report unsatisfactory conditions in writing.
- B. Correct unsatisfactory conditions before proceeding with installation.
- C. Inspect each product immediately before installation.
- D. Do not install damaged or defective products, materials or equipment.
- E. Start of installation shall be understood as acceptance of substrate conditions by the installer.

1.4 CLEARANCES

- A. Provide adequate clearance between Architectural, Structural, Mechanical, and Electrical Systems. Verify physical dimensions of equipment and its available space. Check access routes through concealed or existing spaces for installation of systems or equipment.
- B. Review the Construction Documents for possible conflicts prior to rough-in. Contractor is responsible for verification that equipment will fit in the space provided. Resolve conflicts with the Architect prior to rough-in work.

1.5 CUTTING AND PATCHING FOR MODIFICATION OF EXISTING AND NEW WORK

- A. Execute cutting, fitting, or patching of work required to remove and replace defective Work or Work not conforming to Contract Documents.
- B. Inspect existing conditions of work, including elements subject to movement or damage during cutting and patching.

PROJECT COORDINATION

- C. Provide shoring, bracing, and support as required to maintain structural integrity of the Project.
- D. Execute cutting, product removal, and patching by methods which will prevent damage to other work, will provide proper surfaces to receive installation of repairs, and comply with specified tolerances and finishes.
- E. Fill openings cut oversized to install equipment systems or sleeves until finished surface is tight against the equipment, system, or sleeve installed in the opening.
- F. Repair surfaces adjacent to cut areas to match the adjacent finish.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PREPARATION

- A. Pre-Installation Conference:
 - 1. Prior to starting installation of each major component of the work, hold a pre-installation conference attended by each entity involved or affected by planned installation.
 - 2. Include technical representatives of product manufacturers and others recognized as expert or otherwise capable of influencing success of the installation.
 - 3. Review significant aspects of requirements for the work. Record discussion and distribute as plan of action.
 - 4. Pre-installation conferences are specifically required for (but not limited to) the following installations:
 - a. Section 04 22 00 CONCRETE UNIT MASONRY; Pre-Installation Conference.
 - b. Section 04 22 10 CONCRETE UNIT VENEER MASONRY; Pre-Installation Conference.
 - c. Section 07 13 00 SHEET WATERPROOFING: Pre-Installation Conference.
 - d. Sheet 07 19 00 WATER REPELLENT / GRAFFITI BARRIERS; Pre-Installation Conference.
 - e. Section 07 27 14 SELF-ADHERED SHEET MEMBRANE AIR BARRIERS; Pre-Installation Conference.
 - f. Sheet 07 27 26 FLUID APPLIED AIR MEMBRANE BARRIERS: Pre-Installation Conference.
 - g. Section 07 41 00 PREFORMED METAL ROOF PANELS: Pre-Installation Conference.
 - h. Section 07 41 13 METAL WALL PANELS: Pre-Installation Conference.
 - i. Section 07 52 00 SBS-MODIFIED BITUMINOUS MEMBRANE ROOFING: Pre-Installation Roofing Conference.
 - j. Section 07 62 00 SHEET METAL FLASHING AND TRIM; Pre-Roofing Conference.
 - k. Section 07 65 26 SELF-ADHERING SHEET FLASHING; Pre-installation Conference.
 - l. Section 07 92 00 JOINT SEALANTS: Pre-installation Conference.
 - m. Section 09 67 23 URETHANE RESINOUS FLOORING; Pre-Installation Conference.

PROJECT COORDINATION

- n. Section 22 00 00 BASIC PLUMBING REQUIRMENTS; Owner Meeting.
- o. Section 31 13 13 SELECTIVE TREE AND SHRUB REMOVAL; Preconstruction Meeting.
- p. Section 32 12 16 ASPHALT PAVING; Preinstallation Conference.

3.2 INSTALLATION

- A. Comply with manufacturer's instructions and recommendations to the extent printed information is more detailed or stringent than requirements contained directly in the contract documents.
- B. Timing: Install work during time and under conditions which will ensure best possible results, coordinated with required inspection and testing.
- C. Anchor work securely in place, properly located by measured line and level, organized for best possible uniformity, visual effect, operational efficiency, durability, and similar benefit to Owner's use. Sufficiently isolate non-compatible materials from contact to prevent deterioration.
- D. Mount individual units of work at industry-recognized mounting heights, if not otherwise indicated. Refer uncertainties to Architect before proceeding.

3.3 CLEANING AND PROTECTION

- A. Clean each element of work at time of installation.
- B. Provide sufficient maintenance and protection during construction to ensure freedom from damage and deterioration at time of Substantial Completion.

END OF SECTION

PROJECT MEETINGS

PART 1 – GENERAL

1.1 PRE-BID CONFERENCE

- A. A non-mandatory Pre-Bid Conference will be held at the Bond Office at 10:00 a.m. (PDT) Wednesday, 14 October 2019. The Conference shall convene at District Bond Office at Palisades School at 1500 Greentree Road, Lake Oswego, OR 97034.

1.2 PRE-CONSTRUCTION CONFERENCE

- A. Purpose:
 - 1. To discuss items of interest in such detail that the Contractor shall have a clear understanding of the Owner's requirements, Contract Documents, and conditions affecting the Work. Items to be discussed include, but are not limited to:
 - a. Roles of Architect, Owner's Representative(s), Contractor, and Inspectors.
 - b. Procedures for handling change orders, requests for payment, and other administrative details.
 - c. Procedures for handling shop drawing, substitutions, inspections, etc.
 - d. Scheduling of the work.
 - e. Contractor's comments on any inaccuracies or ambiguities found in the Contract Documents.
 - f. To discuss any and all questions by the Contractor to make sure that the Contractor is aware of all conditions affecting the work prior to the awarding of the Contract.
 - 2. For the General Contractor to discuss with the Owner, subcontractors, and other interested parties the design, methods, organization, schedule of the work, contract requirements, mutual understandings relative to the Contract Documents, and procedures of the Administration of the Contract. Items to be discussed include, but are not limited to:
 - a. Construction Schedule.
 - b. Project Coordination: Designation of responsible personnel.
 - c. Procedures and processing of submittals, pay requests, change orders.
 - d. Record Document maintenance.
 - e. Hazardous materials.
 - f. Review of existing building conditions.
- B. Date of Conference: Before actual construction begins, when scheduled by the Owner's Representative.
- C. Attendance: The Owner's Representative(s), Architect, Contractor and his superintendent, and all subcontractors shall attend. Suppliers designated by the Owner or Contractor shall also attend.
- D. Place: To be designated by the Owner's Representative.

1.3 PROGRESS MEETINGS

- A. Purpose: Project meetings will be held on an as-needed basis, from beginning of construction to final acceptance, to discuss items of mutual interest regarding coordination and progress of the work.
- B. Meeting Times: To be mutually determined by the Architect, Owner's Representative, and the Contractor.

PROJECT MEETINGS

- C. Attendance: The Owner's Representative(s), Architect, Contractor, and his superintendent shall attend, or their representatives. Other subcontractors, suppliers, or manufacturer's representatives shall attend when requested by the Contractor or Owner's Representative(s).
- D. Place: Project site or as otherwise designated by the Owner's Representative.
- E. Chairman: The Owner's Representative shall chair the meeting.
- F. Meeting Date Changes: Only the Owner's Representative can change the meeting date after 24 hour notice. The Owner's Representative will set the new date.
- G. Meeting Report: The Architect will later issue a meeting report to the Contractor and Owner.
- H. The Contractor shall be responsible for notifying subcontractors and other representatives of scheduled construction meetings where their attendance is requested.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SURVEY AND LAYOUT DATA

PART 1 - GENERAL

1.1 ENGINEERING REQUIREMENTS

- A. Provide survey work required in execution of the Project.
- B. Provide civil, structural, or other professional engineering services specified or required to execute Contractor's construction methods.
- C. Verify all subbase elevations and building dimensions against elevations and layout established by the Drawings.

1.2 QUALIFICATIONS OF SURVEYOR OR ENGINEER

- A. Qualified engineer or registered land surveyor acceptable to the Owner.
- B. The registered professional engineer of the discipline required for the specific service on the Project must be licensed in the state in which the Project is located.

1.3 SURVEY REFERENCE POINTS

- A. Existing basic horizontal and vertical control points for the Project are those designated on the Drawings.
- B. Save and protect from dislocation all benchmarks, monuments, and other reference points shown on the Drawings. Notify the Architect at once if such datum points are or should be disturbed.
- C. Locate and protect control points prior to starting site work and preserve all permanent reference points during construction.
 - 1. Establish and safeguard in at least 2 widely separated places on the site. Establish benchmarks at each level as work progresses.
 - 2. Make no changes or relocations without prior written notice to the Architect.
 - 3. Report to the Architect when any reference point is lost, destroyed, or requires relocation because of necessary changes in grades or locations.
 - 4. Replace Project control points that may be lost or destroyed. Establish replacements based on original survey control.
 - 5. Report errors in horizontal and vertical dimensions and grades prior to starting Work.

1.4 PROJECT SURVEY REQUIREMENTS

- A. Establish lines and levels, locate and lay out by instrumentation and similar appropriate means:
 - 1. Site improvements.
 - a. Stakes for grading, fill, and topsoil placement.
 - b. Utility slopes and invert elevations.
 - 2. Batter boards for structures.
 - 3. Building foundation, column locations, and floor levels.
 - 4. Controlling lines and levels required for the mechanical and electrical trades.
- B. From time to time, verify layouts by the same methods.

SURVEY AND LAYOUT DATA

1.5 RECORDS

- A. Maintain a complete, accurate log of all control and survey work as it progresses.
- B. On completion of foundation walls and major site improvements, prepare a certified survey showing all dimensions, locations, angles, and elevations of construction.

1.6 SUBMITTALS

- A. Submit name and address of Surveyor and professional engineer to the Architect.
- B. On request of the Architect, submit documentation to verify accuracy of field engineering work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Submit overall construction schedule, 3-week work schedule, shop drawings, product data, samples, schedule of values (per General Conditions Section 3.2.6.2), record documents (per General Conditions Section 3.6.15), and products list as specified.
 - 1. Submit to Architect only through Contractor. Submit 2 copies to Owner's Representative.
 - a. Submit copies to Architect in quantities indicated herein.
 - b. Submit 2 copies to Owner's Representative.
 - 2. Do not submit directly to Consulting Engineers without prior approval by the Architect for each individual submittal.
 - 3. Submit electronic submittals (pdf's) when possible and practical in lieu of paper copies. Limit each electronic transmission to 10 megabytes or smaller.

1.2 QUALITY ASSURANCE

- A. Within 15 days of the Award of Contract, submit schedules of values, list of principal subcontractors and suppliers, progress schedule, copies of building permits, and similar start-up authorization.
 - 1. Submit 1 copy each to Architect and to Owner's Designated Representative

PART 2 - PRODUCTS

2.1 CONSTRUCTION SCHEDULE

- A. Content: Within 15 days of the award of contract, submit a comprehensive progress schedule indicating a time bar for each significant category of work to be performed. Show product and installation dates for major products. Show dates for each construction activity, Substantial Completion and punch list preparation, Final Completion, and Occupancy. Submit 1 copy each to Architect and to Owner's Designated Representative
- B. Designate in the Construction Schedule, the dates for submission and review of Shop Drawings, product data and samples that are needed for the product. Show critical submittal dates or prepare a separate coordinated listing of critical submittal dates.
- C. Updating: Indicate progress of each activity and show revised completion dates. Provide listing of current and anticipated accelerations and delays. Describe proposed corrective action when required. Revise at intervals matching payment requests and redistribute with each payment request.

2.2 SCHEDULE OF VALUES

- A. Submit a Schedule of Values covering various parts of work including quantities aggregating the total sum of the Contract. Show dollar value and percent of total for each unit of work scheduled. This Schedule will be the basis for the Contractor's Application for Payment. Submit 4 copies each to Architect and to Owner's Designated Representative.
- B. Submit on the latest edition of AIA Document G703, Continuation Sheet, within 15 days of Award of Contract and with each payment request. Revise each time schedule is affected by change order or other revision.
- C. Upon request by the Architect, support values given with data that will substantiate their correctness.

SUBMITTAL PROCEDURES

- D. Comply with requirements of General Conditions Section 3.2.6.2.

2.3 PAYMENT REQUESTS

- A. Submit a request each calendar month. Use the latest edition of AIA Document G702, Application and Certificate for Payment, fully completed, notarized, and executed. Submit 3 copies minimum.

2.4 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

A. General:

1. Review, stamp with Contractor's stamp, and sign each submittal to certify Contractor has reviewed submittal for compliance with Contract Documents prior to submitting to the Architect. Submittals issued without the Contractor's review may be returned to the Contractor without being reviewed by the Architect.
2. Provide 3" x 4" clear space on each submittal for the Architect's stamp.
3. Provide additional copies as required by governing authorities.
4. The Architect will not mark-up more copies than the number established at the Pre-Construction meeting.
5. Submit electronic submittals (pdf's) when possible and practical.

B. Shop Drawings:

1. Submit shop drawings showing connections, details, dimensions, finishes, fasteners, etc.
2. Submit 10 blackline prints. Maintain 1 print as a mark-up copy for the "Record Drawings".
 - a. In lieu of blackline prints, submit pdf file via email to Owner's Representative and Architect.
3. In the event that the submittal is a partial submittal, identify related shop drawings to be submitted at a later date.

C. Product Data:

1. Submit manufacturer's catalog sheets, brochures, diagrams, schedules, performance charts, illustrations, and other description data on manufactured products and systems.
2. Mark each copy to indicate the actual product to be provided. Show selections from among options in the manufacturer's printed product data.
3. Submit 10 copies to Architect. Submittal is for information and record purposes only. Maintain 1 copy at the project site for reference purposes.
 - a. In lieu of paper copies, submit pdf file via email to Owner's Representative and Architect.

D. Office Samples:

1. Submit 3 sets of samples; 2 sets will be returned. Maintain one returned set at the project site for purposes of quality control comparisons.
2. Sample submittals are for Architect's observation of color, texture, pattern, and "kind".

E. Miscellaneous Submittals: Provide copies of miscellaneous submittals as follows:

1. Warranties: Submit 3 executed copies, plus additional copies as required for maintenance manual.
2. Field Records: Submit 3 copies, including 1 copy that will be returned for inclusion in the submittal of "Record Documents".
 - a. In lieu of blackline prints, submit pdf file via email to Owner's Representative and Architect.
3. Maintenance Manuals: Submit 1 bound copy and digital version on USB Thumb Drive or CD.
4. "Record Drawings": Submit original maintained marked-up prints.

SUBMITTAL PROCEDURES

5. Construction Schedule and Schedule of Values: Submit 4 copies to the Architect.
 - a. In lieu of paper copies, submit e file via email to Owner's Representative and Architect.

2.5 3-WEEK WORK SCHEDULE

- A. Each week, provide to the Architect a 3-Week Work Schedule on a form approved by the Architect. Each 3-Week Work Schedule is to show the description of all phases of the work to be accomplished during the week submitted and the 2 following weeks. The 3-Week Work Schedule is to be updated every week and presented to the Architect.

PART 3 - EXECUTION

3.1 CONTRACTOR'S SUBMITTAL

- A. Review submittals prior to submission and provide stamp of approval signed or initialed by the Contractor indicating the Contractor has inspected the submittals and certifying that they are complete, correct, in compliance with the Contract Documents and suitable for the Project.
 1. Provide all submittals required by each Section of Work as a single complete submittal package.
- B. Verify field measurements and other field construction criteria.
- C. Submit submittals required by each Specification Section to the Architect. Notify the Architect in writing at time of submission of deviation in submittals from requirements of the Contract Documents.

3.2 ARCHITECT'S REVIEW

- A. Architect will review submittals for design concept and conformance with the Contract Documents and return submittals to the Contractor for distribution with corrections noted thereon.
- B. Stamp: The Architect will stamp each submittal to be returned with a uniform, self explanatory action stamp, appropriately marked and executed to indicate the status of the submittal. The stamp indicates and requires the follow action:
 1. No Exception Taken: No further action is required.
 2. Make Corrections Noted: Make the corrections upon fabrication of the material only.
 3. Rejected: The material submitted is not acceptable and another material submission is required.
 4. Revise and Resubmit: The material submittal is not acceptable, and it is to be elaborated upon or corrected and resubmitted prior to material fabrication.
 5. Submit Specified Item: Submittal is rejected and the material specified is to be submitted.
 6. Checking is only for general conformance with the design concept of the Project and general compliance with the information given in the Contract Documents. Any action shown is subject to the requirements of the plans and specifications. Contractor is responsible for dimensions which shall be confirmed and correlated at the job site, fabrication processes and techniques of construction, coordination of his work with that of all other trades and the satisfactory performance of his work.
- C. Contractor's responsibility for deviations in submittals from requirements of the Contract Documents is not relieved by the Architect's review of submittals unless the Contractor has made written request for the deviations and the Architect gives written acceptance of specific deviations requested.

SUBMITTAL PROCEDURES

3.3 CORRECTIONS

- A. Immediately incorporate all required corrections in the submittals and resubmit for further review, if required.

3.4 TIME SCHEDULE FOR SUBMITTALS

- A. Construction Schedule: Submit to the Architect no later than 5 calendar days after receipt of the Notice to Proceed.
- B. Shop Drawings: Submit to the Architect for review. The Architect will review within 14 calendar days. Schedule submissions to allow ample time for ordering and delivery of materials after review.
- C. Product Data: Submit to the Architect for review. The Architect will review within 14 calendar days. Schedule submissions to allow ample time for ordering and delivery of materials after review.
- D. Office Samples: Submit to the Architect for review. The Architect will review within 14 calendar days. Schedule submissions to allow ample time for ordering and delivery of materials after review.
- E. Schedule of Values: Submit to the Architect no later than 15 calendar days after receipt of the Award of Contract.
- F. The Contractor shall make all submittal to the Architect and Owner's Representative in ample time for review and for product ordering to assure delivery prior to time materials are required on Site.

3.5 SUBMITTAL SCHEDULE

- A. Submittals required by Specifications and the Drawings shall be made regardless of whether or not they are scheduled herein. Each specification section should be reviewed for exact submittal requirements. All submittals must be reviewed by the Architect prior to being used and must be submitted in sufficient time to preclude a delay in meeting the approved Construction Schedule.

SECTION NUMBER	SECTION NAME	REQUIRED SUBMITTAL
01 32 23	Survey and Layout Data	Submit name and address of Surveyor and professional engineer to the Architect Submit documentation to verify accuracy of field engineering work
01 33 00	Submittal Procedures	Construction Schedule Schedule of Values 3 Week Work Schedule
01 45 23	Testing Laboratory Services	Test Reports (by Owner's Testing Agent)
01 70 00	Execution and Closeout Requirements	Substantial Completion Notice Final Completion Notice Project Record Documents Closeout Manuals Release of Liens Documents Certificate of Occupancy

SUBMITTAL PROCEDURES

SECTION NUMBER	SECTION NAME	REQUIRED SUBMITTAL
03 11 00	Concrete Forming and Accessories	Product Data
03 21 00	Concrete Reinforcing Steel	Product Data Steel Reinforcing Drawings Fabrication, Bending and Placement Details Bar Schedule Mill Certificates
03 30 00	Cast-In-Place Concrete	Product Data Test Reports Certificates Mix Design
03 45 00	Precast Architectural Concrete	Shop Drawings Test Reports Design Calculations Design Modifications Job Mockup
04 22 00	Concrete Unit Masonry	Product Data Certifications Color Selection Samples Warranties
04 22 10	Concrete Unit Veneer Masonry	Product Data Certifications Color Selection Samples Warranties
05 12 00	Structural Steel Framing	Shop Drawings Test Reports
05 31 13	Steel Floor Decking	Product Data Shop Drawings
05 31 23	Steel Roof Decking	Product Data Shop Drawings
05 34 00	Acoustical Metal Decking	Product Data Shop Drawings
05 40 00	Cold-Formed Metal Framing	Product Data Shop Drawings
05 50 00	Metal Fabrications	Product Data Shop Drawings

SUBMITTAL PROCEDURES

SECTION NUMBER	SECTION NAME	REQUIRED SUBMITTAL
05 51 00	Metal Stairs	Product Data Shop Drawings Warranty
05 53 16	Plank Gratings	Shop Drawings Test Reports
06 41 00	Architectural Wood Casework	Shop Drawings
06 16 00	Sheathing	Product Data
07 13 00	Sheet Waterproofing	Product Data Field Sample Warranty
07 14 00	Fluid-Applied Waterproofing	Product Data Shop Drawings Submittal Prior to Contract Award Warranties Waterproofing Membrane Manufacturer's Warranty Contractor's Warranty
07 19 00	Water Repellents / Graffiti Barriers	Product Data Manufacturer's Warranty
07 21 00	Thermal Insulation	Product Data
07 26 00	Vapor Retarder	Product Data
07 27 14	Self-Adhered Sheet Membrane Air Barriers	Product Data Shop Drawings Samples Product Certificates Applicator's Qualifications Data Product Test Reports Mock-ups Warranty
07 27 26	Fluid Applied Weather Resistant Membrane	Product Data Shop Drawings Samples Product Certificates Applicator's Qualifications Data Product Test Reports Mock-ups Warranty

SUBMITTAL PROCEDURES

SECTION NUMBER	SECTION NAME	REQUIRED SUBMITTAL
07 41 00	Preformed Metal Roof Panels	Product Data Samples Shop Drawings Attachment Schedule/Supporting Calculations Manufacturer's Product Warranty Contractor's Warranty Manufacturer's Watertightness Warranty
07 42 13	Metal Wall Panels	Product Data Shop Drawings Samples Manufacturer's Qualifications Installer Qualifications Test Reports Warranty Documentation Insurance Documentation Manufacturer's Warranty Installer's Warranty
07 52 16	SBS-Modified Bituminous Membrane Roofing	Product Data Samples for Verification Manufacturer's Certificates Warranty
07 62 00	Sheet Metal Flashing and Trim	Shop Drawings Samples Warranty
07 92 00	Joint Sealants	Installer's Guarantee Manufacturer's 20 year Structural Adhesion Warranty Manufacturer's 20 year Weatherseal Warranty Manufacturer's 20 year Non-Staining Warranty Adhesion Test Reports Product Data
08 11 00	Metal Doors and Frames	Shop Drawings Product Data
08 31 00	Access Doors and Panels	Shop Drawings Manufacturer's Detail Sheets
08 33 00	Coiling Doors and Grilles	Product Data Shop Drawing Quality Assurance/Control Submittals Closeout Submittals Operation and Maintenance Manual. Certificate stating installed materials comply with this specification. Warranty

SUBMITTAL PROCEDURES

SECTION NUMBER	SECTION NAME	REQUIRED SUBMITTAL
08 33 13	Coiling Counter Doors	Product Data Shop Drawing Quality Assurance/Control Submittals Closeout Submittals Operation and Maintenance Manual. Certificate stating installed materials comply with this specification Warranty
08 51 00	Aluminum Windows	Shop Drawings Finish Samples Test Reports Warranties Label Certificate
08 71 00	Door Hardware	Hardware Schedule Samples Templates Surface Door Closer Guarantee
09 21 17	Steel and Gypsum Composite Structural Panels	Product Data
09 29 00	Gypsum Board	Product Data Field Samples Product Preparation Instructions and Recommendations Storage and Handling Requirements Installation Methods
09 65 13	Resilient Base and Accessories	Samples Product Preparation Instructions and Recommendations Storage and Handling Requirements Installation Methods Extra Stock
09 67 23	Urethane Resinous Flooring	Product Data Manufacturer's Material Safety Data Sheet (MSDS) Samples Warranty
09 91 00	Painting	Product Data Office Samples Field Samples Extra Stock
10 14 00	Signage	Shop Drawings Product Data Office Samples

SUBMITTAL PROCEDURES

SECTION NUMBER	SECTION NAME	REQUIRED SUBMITTAL
10 28 13	Toilet Accessories	Product Data
10 44 00	Fire Protection Specialties	Product Data
12 31 00	Manufactured Metal Casework	Product Data Warranty
13 34 16.13	Grandstands	Manufacturer's Product Data Shop Drawings Product Sample Color Sample Warranty
21 00 00	Water Based Fire Suppression Systems	Required engineering of the fire sprinkler system Shop Drawings per submittal instructions Manufacturer's catalog or technical data Operation and Maintenance Data
22 00 00	Basic Plumbing Requirements	Performance Data and Technical Information Shop Drawings Record Drawings Operation and Maintenance Manuals Supplier Directory Equipment Directory Manufacturer's Literature Maintenance Instructions Written Guarantee Recommended Spare Parts Stock Contract Cost Data
22 05 23	General Duty Valves for Plumbing	Manufacturer's Catalog or Technical Data Operation and Maintenance Data
22 05 29	Hangers and Supports for Plumbing Piping and Equipment	Manufacturer's Technical Literature Proposed Pre-Manufactured Piping and Duct Vibration Isolation Products Literature or Description of Duct-Supporting Method
22 05 48	Vibration and Seismic Controls for Plumbing Piping and Equipment	Manufacturer's Technical Literature
22 05 53	Identification for Plumbing Piping and Equipment	List of Proposed Equipment and Valve Tags Product Information on Piping Markers
22 05 93	Testing of Plumbing	Operation and Maintenance Data
22 07 19	Plumbing Insulation	Flame and Smoke Rating Data Manufacturer's Catalog or Technical Data

SUBMITTAL PROCEDURES

SECTION NUMBER	SECTION NAME	REQUIRED SUBMITTAL
22 11 00	Facility Water Distribution	Operation and Maintenance Data Certificates of Inspections and Tests
22 11 19	Domestic Water Piping Specialties	Catalog or Technical Data on Automatic Flow Control Valves Operating and Maintenance Data
22 13 000	Facility Sanitary Sewers	Manufacturer's Catalog Literature Operation and Maintenance Data
22 14 00	Facility Storm Drainage	Manufacturer's Catalog Literature Operation and Maintenance Data
22 33 00	Electrical Domestic Water Heaters	Manufacturer's Catalog Literature Operation and Maintenance Data
22 42 00	Commercial Plumbing Fixtures	Manufacturer's Catalog Literature Operation and Maintenance Data
23 00 00	Basic HVAC Requirements	Product Data Shop Drawings Record Drawings Operation and Maintenance Data Written Guarantee Recommended Spare Parts Stock
23 05 29	Hangers and Supports for HVAC Piping and Equipment	Manufacturer's technical literature
23 05 53	Identification for HVAC Piping and Equipment	List of proposed equipment and valve tags Product information on piping markers
23 05 93	Testing, Adjusting and Balancing for HVAC	Operation and Maintenance Data and shall include copies of system balance data
23 31 00	HVAC Ducts and Casings	Shop Drawings
23 33 00	Air Duct Accessories	Manufacturer's Catalog or Technical Data showing performance, dimensions, materials of construction, and recommended methods of installation Operation and Maintenance Data
23 34 00	HVAC Fans	Manufacturer's Catalog or Technical Data showing performance, dimensions, materials of construction, and recommended methods of installation Operation and Maintenance Data

SUBMITTAL PROCEDURES

SECTION NUMBER	SECTION NAME	REQUIRED SUBMITTAL
23 37 00	Air Outlets and Inlets	Manufacturer's Catalog or Technical Data showing performance, dimensions, materials of construction, and recommended methods of installation
23 82 39	Electrical Heating Devices	Manufacturer's Catalog or Technical Data showing performance, dimensions, materials of construction, and recommended methods of installation Operation and Maintenance Data
26 00 00	Electrical General Provisions	Electrical Data Installation and Record Drawings Contract Cost Data Operating and Maintenance Data Electronic Information Record Information Warranty
26 05 19	Conductors and Connectors	Shop Drawings Product Data
26 05 33	Conduits, Raceways, Boxes and Fittings	Shop Drawings Product Data Operational Instructions and Maintenance Data
26 20 00	Electrical Distribution System	Shop Drawings Product Data Operation and Maintenance Data
26 22 00	Dry Type Transformers	Shop Drawings Product Data
26 24 00	Switchboards and Panelboards	Shop Drawings Product Data Operation and Maintenance Data
26 27 26	Wiring Devices and Plates	Shop Drawings Product Data Operation and Maintenance Data Warranty
26 28 00	Circuit Protective Devices	Shop Drawings Product Data Operation and Maintenance Data
26 28 16	Enclosed Switches and Circuit Breakers	Shop Drawings Product Data Operation and Maintenance Data

SUBMITTAL PROCEDURES

SECTION NUMBER	SECTION NAME	REQUIRED SUBMITTAL
26 50 00	Lighting Fixtures and Lamps	Shop Drawings Product Data Operation Instruction and Maintenance Data
27 05 28	Pathways for Communications Systems	Product Data
27 51 16	Exterior Public Address System	Shop Drawings Product Data Project Record Documents Operation and Maintenance Data Warranty
31 10 00	Site Clearing	Documentation of Existing Conditions Record Drawings
31 13 13	Selective Tree and Shrub Removal	Qualification Data
31 20 00	Earth Moving	Product Data Qualification Data
32 01 90	Landscape Warranty	Plant Material Warranty Weed/Pest Control Plan
32 12 16	Asphalt Paving	Product Data Material Certificates
32 13 13	Concrete Paving	Product Data Design Mixtures Qualification Data Material Test Reports Field Quality-Control Reports
32 31 13	Chain Link Fences and Gates	Manufacturer's Literature
32 91 13	Soil Preparation	Topsoil Tests Fertility Analysis Particle Size Distribution Analysis Quantity Certification Quality Certification Mechanical Analysis of Free Draining Sand
32 92 00	Turf and Grasses	Maintenance Notification Certification of Seed Warranty
32 93 00	Plant Materials	Certified Confirmed Orders Mulch Sample Certificates

SUBMITTAL PROCEDURES

SECTION NUMBER	SECTION NAME	REQUIRED SUBMITTAL
33 11 00	Water Distribution	Product Data Shop Drawings Field Quality-Control Test Reports Operation and Maintenance Data
33 31 00	Sanitary Sewerage	Product Data Shop Drawings Coordination Drawings Product Certificates Field Quality-Control Reports
33 41 00	Storm Drainage	Product Data Product Certificates Field Quality-Control Reports
33 46 00	Subdrainage	Product Data

END OF SECTION

SPECIAL PROVISIONS RELATING TO CONSTRUCTION ON SCHOOL PROPERTY

Special Provisions Relating to Construction on School District Property.

Contact with Students. “Unsupervised contact” with students means contact that provides the person opportunity and probability for personal communication or touch with students when not under direct District supervision. As required by ORS 326.603, Contractor shall ensure that Contractor, any subcontractors, and their officers, employees, and agents will have no direct, unsupervised contact with students while on District property. Contractor shall work with the District to ensure compliance with this requirement.

Work Performed on District Property. Contractors performing work on District property shall comply with District policies at all times. In all cases personnel on school property shall carry photo identification, acceptable to District, and shall present such identification to anyone on request. Contractor shall ensure that all Project personnel are in compliance with applicable identification, uniform, hardhat sticker, and badge requirements for all Project personnel at no cost to District.

1. As required by schools and other District locations, District may require personnel to sign in before entering District properties.
2. No Smoking. Smoking, vaping, or other use of tobacco is prohibited on all District property.
3. No Drugs or Alcohol. District’s property sites are all designated drug and alcohol-free zones, which designation is enforced by the City of Lake Oswego Police.
4. No Weapons or Firearms.
5. Any Conduct whether verbal or non-verbal that could be construed as inappropriate in any way. Including but not limited to cat calls, whistling, staring, winking, sexually suggestive signals or comments, profanity/vulgar language.

All Contractors and their employees whether full time or part time working at District sites must undergo a criminal history verification for disqualifying convictions per ORS 342.143 Criminal history verification checks will be conducted at the Contractor’s expense by an approved third-party vendor. Prior to entry of a Contractor’s employees onto a jobsite, the Contractor shall cause its employees and/or subcontractors, if any, to conduct these background checks. Results will be kept on file with the Contractor and copies submitted to the District. Contractor shall pay all fees for processing the background check, production of badging and hard hat sticker. Badge will identify the employee name, the general contractor, and project. The hard hat sticker shall include project name and verification of successful background check completion. Contractor is required to provide submittals to District for review and approval.

Approved background check provider:

<http://www.criminalinfo.com/index.php>

END OF SECTION

TESTING LABORATORY SERVICES

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. The Owner will select, employ, and pay for services of an independent testing laboratory to perform inspections, sampling, testing, and other services required by the local building code and the Project Manual.
- B. Specific quality control requirements are specified in individual Project Manual Sections.
- C. Inspection and testing services are intended to determine compliance of the Work with requirements specified.
- D. Comply with requirements of General Conditions Section 3.13 which take precedence over requirements of this Section.

1.2 SUBMITTALS

- A. Submit a certified written report of each inspection, test, or similar service to the Architect, Structural Engineer, Contractor, and the Owner. Include additional copies of each report to governing authorities when so directed.
- B. Report Data: Written inspection or test reports shall include:
 - 1. Name of testing agency or test laboratory.
 - 2. Date and location of samples, tests, or inspections.
 - 3. Names of individuals present.
 - 4. Complete inspection or test data.
 - 5. Test results.
 - 6. Interpretations.
 - 7. Recommendations.

PART 2 - PRODUCTS

2.1 SCOPE

- A. Nature and Scope of Testing Services: In accordance with the requirements of governing authorities having jurisdiction over the work and as otherwise specified and consistent with reasonable standards of engineering practice.

PART 3 - EXECUTION

3.1 TESTING LABORATORY'S RESPONSIBILITIES

- A. Conduct, interpret tests, and report deviations or conditions that may lead to deviations from the Contract Documents to the Architect immediately by telephone.
- B. State in each test report whether or not tests showed conformance with requirements of the Contract Documents and specifically note deviations, if any, from these requirements.

TESTING LABORATORY SERVICES

3.2 CONTRACTOR'S OBLIGATIONS

- A. Cooperate with any representative of the Owner or the Testing Laboratory. Furnish tools, materials, equipment, and assistance.
- B. Notify the Architect, Testing Laboratory, and Owner 48-hours prior to each expected placement, installation, or fabrication phase requiring inspection tests as indicated herein.
- C. Where tests reveal defects requiring replacement, retest as required under this Contract at no change in Contract amount and reimburse Owner, Architect, and Consultants costs for preparation and supervision.
- D. When the initial tests indicate non-compliance with the Contract Documents, any subsequent retesting occasioned by non-compliance shall be performed by the same agency and the cost thereof borne by the Contractor.
- E. Representatives of the testing agency shall have access to the work at all times. The Contractor shall provide facilities for such access in order that the agency may properly perform its functions.
- F. Any testing laboratory stand-by time due to the Contractor's delays shall be paid for by the Contractor.
- G. Inspection or testing performed exclusively for the Contractor's convenience shall be the sole responsibility of the Contractor.

3.3 TEST OBSERVATIONS

- A. If the Architect or Owner's Representative(s) wishes to observe the inspections, tests, or approvals required by this paragraph, he will do so promptly and, where practicable, at the source of supply.
- B. Neither the observations of the Architect in his Administration of the Construction Contract nor the observations of Owner Representative(s), nor inspections, tests, or approvals by persons other than the Contractor shall relieve the Contractor from his obligations to perform the Work in accordance with the Contract Documents.

3.4 EVALUATION OF TESTS AND INSPECTIONS

- A. Results of laboratory or field control tests and inspections shall be the principal basis upon which satisfactory completion of the Work shall be judged.
- B. If results of tests and inspections indicate the Work is below requirements of the Contract Documents, that portion of the Work is subject to condemnation.

3.5 ADJUSTMENTS

- A. Remove and replace Work so condemned at Contractor's expense including costs of subsequent tests and inspections until the Work meets requirements of the Contract Documents.

TESTING LABORATORY SERVICES

3.6 SCHEDULE OF REQUIRED TESTS

- A. Special Inspection shall be performed by an approved inspector employed by the Contractor's testing laboratory based on the requirements of the 2014 Oregon Structural Specialty Code and IBC Section 1704 as summarized in the Special Inspection Table on Sheet S0.2.
 - 1. Refer to the Special Inspection Table on Sheet [S0.02] for items requiring special inspection, testing, and structural observation.
- B. All welds shall be visually inspected. All completed penetration welds shall be tested ultrasonically or using another approved method.
- C. Window Testing: See Section 08 51 13 ALUMINUM WINDOWS.

3.7 STRUCTURAL OBSERVATION PROGRAM

- A. The Structural Engineer of Record (SER) shall perform structural observation based on the requirements of the International Building Code (IBC Section 1710). Refer to the Special Inspection Table on Drawing Sheet S0.02 for tabulation of structural observation items and additional requirements. Provide sufficient notice and access to the Structural Engineer of Record (SER) for the SER to perform required observations.
- B. Refer to the Special Inspection Table on Sheet [S0.02] for items requiring special inspection, testing, and structural observation.

END OF SECTION

TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide all temporary job site facilities and services as required for use and listed, but not limited to, the following articles. Superintend and coordinate temporary facilities normally furnished and maintained as part of subcontractor's work.
- B. Provide temporary services and facilities ready for use when first needed to avoid delay in the work. Maintain, expand, and modify as needed. Do not remove until no longer needed or replaced by authorized use of permanent facilities.
- C. Use Charges: Usage charges for temporary services or facilities are not chargeable to the Owner and are to be provided under the basic cost of the Work.

1.2 PERFORMANCE REQUIREMENTS

- A. Temporary facilities shall comply with building codes, ordinances, and regulations of public authorities and local industry standards in the installation and maintenance of temporary services and facilities.
- B. Inspect and test each service before placing temporary utilities in use. Arrange for inspections and tests by governing authorities and obtain certifications and permits for use.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- A. For the purpose of construction, the Owner will furnish reasonable quantities of water and electricity to the Contractor without charge. The Contractor shall be responsible for both temporary utility connections and disconnects, and shall obtain permission of the Owner's Designated Representative prior to accomplishing either.

2.2 SANITARY FACILITIES

- A. Workmen will not be permitted to use existing toilet facilities of the existing building. Provide portable facilities as required for workmen. Keep facilities clean and in sanitary condition. Remove from the site upon completion of the Work.
- B. Comply with governing regulations including safety and health codes for the type, number, location, operation, and maintenance of fixtures and facilities.
- C. Locate so that no one will need to walk more than 2 stories vertically or 200 feet horizontally to reach these facilities.
- D. Supply toilet tissue, hand sanitizer, and similar disposable materials as appropriate for each facility. Provide covered waste containers for used material.

TEMPORARY FACILITIES AND CONTROLS

2.3 TEMPORARY WATER

- A. Existing water services may be used. Make temporary connection, as required. Exercise control over usage to conserve water.

2.4 TEMPORARY ELECTRICAL POWER SERVICE

- A. Existing electrical services may be used. Make temporary connection, as required and as defined on Drawings or by approval of Owner's Representative. Exercise control over power usage to conserve energy.
- B. Provide temporary lighting throughout construction period as required by governing agencies.

2.5 TEMPORARY CONSTRUCTION AND SUPPORT FACILITIES INSTALLATION

- A. Provide a neat and uniform appearance in temporary construction and support facilities acceptable to the Architect and the Owner.
- B. Locate field offices, storage and fabrication sheds, and other support facilities for easy access to the Work.
- C. Make the change-over to use of permanent services and facilities at the earliest feasible date to minimize hazards and interferences with performance of the Work.
- D. Maintain field offices, storage and fabrication sheds, temporary sanitary facilities, waste collection and disposal systems, recycling bins, and project identification and temporary signs until near Substantial Completion. Immediately prior to Substantial Completion remove these facilities. Personnel remaining at the site after Substantial Completion will be permitted to use permanent facilities, under restricted use conditions.

2.6 TEMPORARY HEAT

- A. Provide temporary heat where needed for performance of the Work, for curing or drying of recently installed work, or for protection of work in place from adverse effects of low temperatures or high humidity.
- B. Provide UL or FM tested and labeled heating units known to be safe and without adverse effect upon work in place or being installed.
- C. Coordinate with ventilation requirements to produce the ambient condition and minimize fuel or energy consumption.
- D. Maintain a minimum temperature of 45°F in permanently enclosed portions of the building and areas where finished Work has been installed.
- E. Except where use of the permanent heating system is available and authorized, provide properly vented self-contained LP gas or fuel oil heaters with individual space thermostatic control for temporary heat.
- F. Do not use open burning or salamander type heating units.
- G. Minimum Interior Ventilation: Provide local exhaust ventilation to prevent harmful dispersal of

TEMPORARY FACILITIES AND CONTROLS

hazardous substances into the atmosphere at all times. Provide ventilation for materials being cured.

2.7 FIELD OFFICES

- A. Provide standard prefabricated or mobile units, or the equivalent job-built field offices of sufficient size to accommodate required office personnel at the site. Pay for temporary mobile unit permits as required by the local governing authorities.
 - 1. Provide insulated, weathertight units with lockable entrances, serviceable finishes, and foundations adequate for normal loading.
 - 2. Provide resilient floor covering and painted drywall wall and ceiling finishes.
 - 3. Provide operable windows equipped with adjustable blinds and insect screens.
 - 4. Provide mobile unit stair or ramp access acceptable to local governing authorities.
 - 5. Provide mobile unit tie-downs as required by local governing authorities.
- B. Provide vented space heater capable of maintaining an indoor temperature of 62°F and an air-conditioning unit capable of maintaining a maximum indoor temperature of 78°F.
- C. Provide switch controlled fluorescent light fixtures and 110-120 volt duplex outlets spaced at 12'-0" intervals with a minimum of one per wall in each room.
- D. Furnish as required for Contractor's operations.

2.8 STORAGE AND FABRICATION SHEDS

- A. Install storage and fabrication sheds as required to accommodate the Work. Maintain temperatures and ventilation as required for materials being stored.
- B. Sheds may be open shelters or fully enclosed spaces. Where fully enclosed, provide one ABC Type portable fire extinguisher in each shed.

2.9 FIRST AID SUPPLIES

- A. Provide required first aid facilities. Comply with governing regulations and recognized recommendations within the construction industry.

2.10 WASTE RECYCLING

- A. Provide a recycling program for the recycling of waste materials that are generated during a construction project. Provide waste recycling bins and containers for metal, glass, cardboard, gypsum, etc. Provide for pick-up on a regular basis so as not to cumbersome the site. Place bins away from any building structures to protect against fires.

2.11 TEMPORARY ENCLOSURE

- A. Provide temporary enclosure of materials, equipment, work in progress, and completed portions of the Work to provide protection from exposure, foul weather, other construction operations, and similar activities.

TEMPORARY FACILITIES AND CONTROLS

- B. Provide enclosures where temporary heat is needed and the permanent building enclosure is not completed, and there is no other provision for containment of heat.
- C. Coordinate with ventilating, material drying, or curing requirements to avoid dangerous conditions.
- D. Close openings through the floor or roof decks and other horizontal surfaces with substantial load-bearing wood-framed or similar construction.

2.12 HOISTS

- A. Provide facilities for hoisting materials and employees.
- B. Do not permit employees to ride hoists that comply only with requirements for hoisting materials.

2.13 COLLECTION AND DISPOSAL OF WASTES

- A. Establish a system for daily collection and disposal of waste materials.
- B. Enforce requirements strictly.
- C. Do not retain collected materials longer than 7 days during normal weather or 3 days when the daily temperature is expected to rise above 80°F.
- D. Handle waste materials that are hazardous, dangerous, or unsanitary separately from other waste by containerizing.
- E. Dispose of waste material in a lawful manner.
- F. Burying or burning of waste materials on the site or washing waste material down sewers will not be permitted.
- G. Provide silt bags in catch basins and bio-bags around the basins adjacent to construction work.
- H. Off-Site Disposal: Disposal of all waste materials caused by the construction will be off the site and will be the responsibility of the Contractor.
- I. Contractor shall not use Owner's waste containers.

2.14 MISCELLANEOUS SERVICES AND FACILITIES

- A. Design, construct, and maintain miscellaneous services and facilities as needed to accommodate performance of the work, including temporary stairs, ramps, ladders, staging, shoring, scaffolding, temporary partitions, waste chutes, and similar items.

2.15 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Provide a neat and uniform appearance in security and protection facilities acceptable to the Architect and the Owner.
- B. Maintain site in a safe, lawful, and publicly acceptable manner.

TEMPORARY FACILITIES AND CONTROLS

- C. Take necessary measures to prevent erosion.
- D. Except for utilization of permanent fire protection facilities, as soon as available, do not change over to use of permanent facilities until Substantial Completion.

2.16 TEMPORARY FIRE PROTECTION

- A. Until fire protection needs may be fulfilled by permanent facilities, install and maintain temporary fire protection of the types needed to protect against losses.
- B. Comply with recommendations of NFPA Standard 10.
- C. Locate fire extinguishers where most effective. Provide not less than one on each floor at or near each stairwell.
- D. Provide type "A" fire extinguishers for temporary offices and spaces where there is minimal danger of electrical or flammable liquid fires. Provide type "ABC" dry chemical extinguishers elsewhere.
- E. Store combustible materials in containers in fire-safe locations.
- F. Review fire prevention and protection needs with local fire department officials and establish procedures to be followed in the event of fire.
 - 1. Review inspection requirements and schedule inspections as required.
- G. At temporary water outlets, provide hoses of sufficient length to reach construction areas. Hang hoses with a warning sign indicating that hoses are for fire protection purposes and are not to be removed.
- H. At the earliest feasible date, complete installation of the permanent fire protection facility, including connected services, and place into operation and use. Instruct key personnel at the site on how to use facilities that may not be self-explanatory.

2.17 BARRICADES, WARNING SIGNS, AND LIGHTS

- A. Comply with recognized standards and code requirements for erection of substantial barricades where needed to prevent accidents.
- B. Paint with appropriate colors and provide warning signs to inform personnel at the site and the public of the hazard being protected against.
- C. Provide lighting where needed including flashing red lights where appropriate.

2.18 ENCLOSURE FENCE

- A. Install an enclosure fence with lockable entrance gates to enclose the entire site or portion sufficient to accommodate the construction operation.
 - 1. Provide keys to Owner's Representative.
- B. Install so as to prevent persons, dogs, and similar animals from entering the site except through the entrance gates.

TEMPORARY FACILITIES AND CONTROLS

- C. Provide No. 11 gage galvanized open-mesh, chain-link fabric fencing 6 feet high with galvanized barbed wire top strand and galvanized steel pipe posts, 1-1/2" for line posts and 2-1/2" for corner posts.
- D. Set posts in precast post blocks.

2.19 CONSTRUCTION AID AND BARRIERS

- A. Provide ramps, ladders, stairs, guardrails, chutes, and material hoists as required. Construct and maintain to requirements of governing agencies. Furnish for safety of public and construction personnel.
- B. Provide barriers to protect materials, equipment, new and existing work, construction personnel, and the public.
- C. Provide temporary dust barriers and other appropriate protection, as required, to prevent dust from entering the existing portions of the building.
- D. Completely remove temporary materials and equipment upon completion of construction.
- E. Repair damage caused by installation of temporary items and restore finishes to specified condition.

2.20 SECURITY ENCLOSURE AND LOCKUP

- A. Install substantial temporary enclosure of partially completed areas of construction.
- B. Provide locking entrances adequate to prevent unauthorized entrance, vandalism, theft, and similar violations of project security.
- C. Where materials and equipment must be temporarily stored, and are of substantial value or attractive for possible theft, provide a secure lockup.
- D. Enforce strict discipline in connection with the timing of installation, and release of materials to minimize the opportunity for theft and vandalism.

2.21 ENVIRONMENTAL PROTECTION

- A. Conduct construction activities, and by methods that comply with environmental regulations, minimize the possibility that air, waterways, and subsoil might be contaminated or polluted, or that other undesirable effects might result from the performance of work at the site.
- B. Avoid the use of tools and equipment that produce harmful noise.
- C. Restrict the use of noise making tools and equipment to hours of use that will minimize complaints.

TEMPORARY FACILITIES AND CONTROLS

2.22 ACCESS, PARKING, AND TRAFFIC

- A. Parking area for project visitors and construction personnel shall be at location designated by the Owner's Designated Representative.
- B. Provide barricades, warning signs, flagmen, or other traffic regulators that may become necessary for protection of the public, construction personnel, or property.
- C. Parking: Contractor may not park in student or faculty parking areas. Contractor may utilize project areas and laydown space for parking. Contractor may park on street where permitted.

2.23 CONSTRUCTION PHASING REQUIREMENTS

- A. Existing facilities will remain in operation during the Contract. Coordinate any temporary or permanent utility connections that will result in interruptions of utility service with the Owner's Designated Representative, prior to their accomplishment, and design temporary utility by-pass systems. Construct, maintain, and remove the temporary by-pass systems when the requirement no longer exists.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Use qualified tradesmen for installation.
- B. Locate temporary services and facilities where they will serve the project adequately and result in minimum interference with the Work.
- C. Temporary Utility Installation:
 - 1. Engage the local utility company to install temporary service or to make connections to existing service.
 - 2. Arrange with the companies and existing users for an acceptable time when service can be interrupted to make connections.
 - 3. Establish a service implementation and termination schedule. As early as possible change to use of permanent service, to enable removal of the temporary utility, and to eliminate any possible interference with completion of the Work.
 - 4. Provide adequate capacity at each stage of construction.
 - 5. Prior to availability at the site, provide trucked-in services for start up of construction operations.
 - 6. Obtain and pay for easements required to bring temporary utilities to the site where the Owner's easement cannot be utilized for that purpose.

3.2 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision:
 - 1. Limit availability of temporary services and facilities to essential and intended uses to minimize waste and abuse.
 - 2. Do not permit temporary installations to be abused or endangered.

TEMPORARY FACILITIES AND CONTROLS

- B. Maintenance:
 - 1. Operate and maintain temporary services and facilities in good operating condition and in a safe and efficient manner until removal is authorized.
 - 2. Do not overload services or facilities.
 - 3. Protect from damage by freezing temperatures and similar elements.
 - 4. Do not allow unsanitary conditions, public nuisances, or hazardous conditions to develop or persist on the site.
 - 5. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24 hour basis where required to achieve indicated results and avoid the possibility of damage to the Work or to temporary facilities.

3.3 PROTECTION

- A. Prevent water filled piping from freezing.
- B. Maintain markers for underground lines.
- C. Protect from damage during excavation.

3.4 TERMINATION AND REMOVAL

- A. Remove each temporary service and facility promptly when need has ended, or when replaced by use of a permanent facility, but no later than Substantial Completion.
- B. Complete, or if necessary, restore permanent work delayed because of interference with the temporary service or facility.
- C. Repair damaged work, clean exposed surfaces, and replace work that cannot be repaired.
- D. At Substantial Completion, clean and renovate permanent services and facilities that have been used to provide temporary services and facilities during the construction period.

END OF SECTION

TEMPORARY TREE PROTECTION

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Preserve, protect, and maintain existing plants and trees at the Project Site which have been designated to remain, as well as those adjacent to the Limits of Construction as indicated on Drawings and specified herein. The Owner shall employ an ISA certified consulting Arborist to be present during clearing, grading, excavation, arboricultural and other construction or demolition work which could significantly effect the health of trees which are to be preserved. Arborist shall make recommendations concerning proper procedures for mitigating impacts to trees to remain. Comply with arborist's recommendations.

1.2 REFERENCES

- A. International Society of Arboriculture (ISA)
- B. Council of Tree & Landscape Appraisers (CTLA) Guide to Tree and Plant Appraisals.

1.3 QUALITY CONTROL

- A. **Communication:** All subcontractors, job site superintendents, on-site workers and delivery personnel shall be made aware of the tree protection requirements prior to beginning work.
- B. **Work Limitations:** Do not conduct any work outside security fence as indicated on Plans. Vehicular traffic, storage of materials and all work outside of security fence is prohibited without prior authorization. Vehicular traffic between work and staging areas is permitted on existing paved areas subject to an approved plan.

1.4 INJURY

- A. The Contractor shall be liable for unauthorized injury to trees and shrubs on the work site that occurs as a result of construction activity including work by subcontractors and suppliers. The Owner may, at his discretion, employ an independent qualified and experienced appraiser to assess the monetary value of damages according to methods developed by the CTLA. The cost of such damages (plus the cost of the appraisal and other incidental expenses incurred to address damages) may be deducted from the Contract Price. Work conducted under the supervision of the Owner's Arborist, and according to recommendations, shall not be considered "unauthorized injury".
- B. The Owner, in consultation with the Arborist, and/or Appraiser may, at Owner discretion, delay the release of retainage up to the full value of any and all trees known or suspected to have been subjected to unauthorized injury for an evaluation period of up to one year from final acceptance of the Project. If, after one year, damage is not evident, the retainage shall be released. If damage becomes evident, the cost of such damages shall be deducted from the retainage.

PART 2 - PRODUCTS

2.1 PRODUCTS

- A. Protective Fence: 6' High Chain Link Fence

TEMPORARY TREE PROTECTION

PART 3 - EXECUTION

3.1 INSPECTION

- A. Conduct on-site inspection of trees and plants with Landscape Architect, Arborist and Owner's Representative prior to start of construction. Verify that canopies shown on the plans match actual site conditions. Note areas of work that must be conducted under tree canopies, note the type of work taking place, who will conduct the work and where it appears on the schedule.
- B. Place protective fencing at perimeter of tree protection zone (TPZ) where indicated on plans. The TPZ is an area based on the trunk diameter at breast height (DBH) wherein the diameter of the zone centered on the tree to be protected is one foot (1') for each inch (1") of DBH.

3.2 ABOVE GRADE PROTECTION

- A. Install protective fence where indicated on plans. The purpose of the fencing is not only to secure the site, but also to protect trees and plants, which are to remain, from damage due to construction operations. Do not deviate from location shown on plans without prior authorization. Do not proceed with any construction, or deliveries until fence is in place. Maintain fence without gaps for the duration of construction. Remove the fence only after all vehicular activity is completed.
- B. Protect existing plant material against cutting, breaking, skinning and bruising. Tie back all flexible limbs and overhead branches which may, in the opinion of the Landscape Architect, be damaged by the passage or activity of equipment. No tree limbs may be removed without the written approval of the Landscape Architect except as noted in the plans.
- C. Maintain existing grade within dripline unless otherwise indicated.

3.3 ROOT SYSTEM PROTECTION

- A. Do not store construction materials, debris, or excavated material within dripline.
- B. Do not permit vehicular traffic or parking within dripline except as required for construction and only as directed by Owner's Arborist.
- C. Restrict foot traffic to prevent excessive compaction of soil over root systems.
- D. Protect root system from damage due to run-off or spillage of noxious chemicals during storage or placement of construction materials.
- E. Protect root systems from excessive wetting, flooding or soil erosion.
- F. Excavate within the dripline of trees only where indicated and only in the presence of the Owner's Arborist. Do not cut roots larger than 2" in diameter unless approved by the Arborist. For installation of utilities, proceed around or tunnel under large roots by hand digging or boring.
- G. When excavating within the dripline of trees, work carefully to avoid damage of roots. Use narrow tine spading forks and comb soil to expose roots. Relocate roots within backfill area where possible.
- H. Prevent root systems from drying out. Provide temporary earth cover to maintain in moist condition and temporarily support. Protect from damage until permanently relocated and covered with backfill.

TEMPORARY TREE PROTECTION

3.4 TREE PRUNING

- A. Prune trees only if they are in direct conflict with the work and only as directed by the Owner's Arborist. Pruning work shall be executed by an ISA Certified Arborist. Extend pruning operation to restore natural shape of entire tree.
- B. Where root system of existing tree is reduced by construction, provide corresponding volume reduction in branches as directed by the Owner's Arborist.
- C. Branches and roots larger than 3 inches in diameter shall be removed by an ISA Certified Arborist.
- D. Cut branches and roots less than 3 inches with sharp pruning instrument or saw.

3.5 ADJUSTING AND CLEANING

- A. Replace or suitably repair, to the Arborist's satisfaction, trees and plants designated to remain which are damaged or destroyed due to construction operations.
- B. Remove agreed-upon roots and branches which interfere with construction.
- C. Remove cut material from the site.
- D. Remove fence from site after all other work has been completed just prior to final acceptance.

END OF SECTION

PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 MATERIAL AND EQUIPMENT SELECTION

- A. Comply with Standards and these Specifications including size, make, type, and quality specified, or as accepted in writing by the Architect.
- B. Manufactured and Fabricated Products:
 - 1. Design, fabricate, and assemble in accordance with the best engineering and shop practices.
 - 2. Manufacture like parts of duplicate units to standard sizes and gauges and to be interchangeable.
 - 3. Two or more items of the same kind shall be considered identical and by the same manufacturer.
 - 4. Provide products suitable for service conditions.
 - 5. Adhere to equipment capacities, sizes, and dimensions shown or specified unless variations are specifically approved in writing.
- C. Do not use material or equipment for any purpose other than that for which it is designed or is specified.
- D. Fabricate and install equipment to deliver its full rated capacity at the efficiency for which it was designed.
- E. Select and install equipment to operate at full capacity without excessive noise or vibration.
- F. Provide electrical products with Underwriter's Laboratories Label or as approved by the local inspection authority.

1.2 MANUFACTURER'S INSTRUCTIONS

- A. Perform work in accordance with manufacturer's printed installation instructions, obtain and distribute copies of such instructions to parties involved in the installation, including 3 copies to the Architect.
- B. Maintain one set of complete instructions at the job site during installation and until completion.
- C. Handle, install, connect, clean, condition, and adjust products in strict accordance with manufacturer's printed instructions and in conformity with specified requirements.
 - 1. Consult with the Architect for further instructions should job conditions or specified requirements conflict with manufacturer's instructions.
 - 2. Do not proceed with work without clear instructions.
- D. Do not omit any preparatory step or installation procedure unless specifically modified or exempted by the Contract Documents.

1.3 TRANSPORTATION AND HANDLING

- A. Arrange deliveries of products in accord with construction schedules; coordinate to avoid conflict with work and conditions at the site.
 - 1. Deliver products in undamaged condition and in manufacturer's original containers or packaging with identifying labels intact and legible.

PRODUCT REQUIREMENTS

2. Immediately upon delivery, inspect shipments to assure compliance with requirements of the Contract Documents and to assure products are properly protected and undamaged.
- B. Provide equipment and personnel to handle products by methods to prevent soiling or damage to products or packaging.

1.4 STORAGE AND PROTECTION

- A. Store products in accordance with manufacturer's instructions with their seals and labels intact and legible.
 1. Store products subject to damage by the elements in weathertight enclosures.
 2. Maintain temperature and humidity within the ranges required by the manufacturer's instructions.
 3. Protect equipment and systems from moisture, chemical, or mechanical damage before and after installation.
 4. Protect shafts and bearing housings from rust.
- B. Exterior Storage:
 1. Store fabricated products above the ground on blocking or skids to prevent soiling or staining. Cover products that are subject to deterioration with impervious sheet covering. Provide adequate ventilation to avoid condensation.
 2. Store loose granular materials in a well-drained area on solid surfaces to prevent mixing with foreign matter.
- C. Inspection: Arrange storage in a manner to provide easy access for inspection. Make periodic inspections of stored products to assure that products are maintained under specified conditions and free from damage or deterioration.
- D. Protection After Installation:
 1. Provide substantial coverings as necessary to protect installed products from damage by traffic or subsequent construction operations.
 2. Plug or cap pipe and conduit openings to prevent the entrance of foreign matter.
 3. Remove when no longer needed.

1.5 PRODUCT OPTIONS

- A. Compliance with Standards: Where the specifications require only compliance with an imposed standard, code, or regulation, select any product that complies with specified requirements provided no product names are indicated and meet the specified standard.
- B. Single Product Named: For products specified by naming one product or manufacturer and "or accepted substitute", the Contractor must submit a request for substitution for any product or manufacturer not specifically named. Submittal is to be in accordance with this Section.
- C. Two or More Products Named: For products specified by naming several products or manufacturers and "or accepted substitute", select any one of the products or manufacturers named, provided the product selected complies with the specifications. If another product or manufacturer not named is to be used, the Contractor must submit a request for substitution for that product or manufacturer in accordance with this Section.
- D. "Accepted Substitute" and "Or Equal" Provisions: Where products or manufacturers are specified by

PRODUCT REQUIREMENTS

name accompanied by the term "or equal", provide either the product named or comply with the requirements for gaining approval of "substitutions" for the use of an unnamed product.

- E. Performance Requirements: Where the specifications require compliance with indicated performance requirements, the Contractor has the option of selecting any product that complies with the specific performance requirements, provided no product names are indicated.
- F. Visual Requirements: Where the specifications indicate that a product is to be selected from the manufacturer's standard options, without naming the manufacturer, the Architect has the option of making the selection after the Contractor has determined or selected the manufacturer.
- G. Oregon Products: In the selection of equipment, products, and materials specified in the Contract Documents, preference shall be given to those items manufactured or produced in the State of Oregon, if price, fitness, availability, and quality are otherwise equal. Under the same conditions, next preference shall be given to items the major portion of which are manufactured or produced within the State of Oregon.
- H. No materials or products containing any hazardous materials are to be used in the construction of this Project. If any material or product specified in this Project Manual is known to contain hazardous materials, it shall be brought to the attention of the Architect before ordering or fabricating that material or product.

1.6 SUBSTITUTION PROCEDURES

- A. Format: Substitution requests will be considered only if they are prepared on a copy of the Portland Chapter Construction Specifications Institute "Substitution Request Form" included at the end of this Section. Additional copies may be obtained from the Architect.
- B. Supporting Data: Submit a separate request for each product, supported with complete data, drawings, and samples as appropriate. Include the following information, as appropriate, with each request for substitution:
 - 1. Provide complete product documentation, including product data and samples.
 - 2. Provide detailed performance comparisons and evaluation, including testing laboratory reports where applicable.
 - 3. Provide coordination information indicating the effect of the substitution on other work and the time schedule.
 - 4. Provide the Contractor's general certification of the recommended substitution.
- C. Engineering Substitution Requests: Mechanical and electrical substitution requests shall be sent directly to respective consulting engineers with a copy to the Architect.

1.7 PRE-BID REQUESTS

- A. Time Limitation: To obtain acceptance of unspecified products, the bidders shall submit requests at least 10 calendar days prior to opening of proposals. **FAXED SUBSTITUTION REQUESTS WILL NOT BE CONSIDERED WITHOUT PRIOR APPROVAL BY THE ARCHITECT.**

PRODUCT REQUIREMENTS

- B. Acceptance: If the bidder complies with the requirements of this Section, and in the Owner's and Architect's opinion the proposed product is acceptable in lieu of the one or more specified, the Architect will include it in an addendum which will be issued to all bidders.
- C. Last Addendum: The last Addendum will be issued no later than **5 calendar days** prior to the bid date. Any questions asked after the last Addendum has been issued will not be answered when it would have an effect on the Bids by giving any advantage to a Bidder. An Addendum may be issued during this 5 day period only for the extension of the Bid date and will be faxed to Plan Centers and the registered General Contractors holding plans.

1.8 AFTER AWARD OF CONTRACT REQUESTS

- A. Normally, requests for substitutions after the contract has been signed will not be allowed.
- B. Consideration: Requests for substitution of specified products after the construction contract is signed will be considered only when they are reasonable, timely, fully documented, and for any one of the following reasons:
 - 1. Owner's or Architect's request.
 - 2. Reduction in contract time or contract sum.
 - 3. Specified product is not available from any source.
 - 4. Specified product would cause significant delay in the Contract time.
- C. Submittal: Submit requests on Proposal Request (AIA G709) Form.
- D. Acceptance: If the Contractor complies with the requirements of this Section, and in the Owner's and Architect's opinion the proposed product is acceptable in lieu of one or more specified, the Architect will issue an Architect's Supplemental Instructions (AIA G710), where contract sum or time is not effected, or a Change Order (AIA G701) or Construction Change Directive (AIA G714), where contract sum or time is effected.

PART 2 - PRODUCTS

2.1 MATERIAL

- A. The Contractor warrants to the Owner that the materials and equipment furnished under the Contract will be of good quality and new unless otherwise required or permitted by the Contract Documents, that the Work will be free from defects not inherent in the quality required or permitted, and that the Work will conform to the requirements of the Contract Documents. Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

PRODUCT REQUIREMENTS

PART 3 - EXECUTION

3.1 NAMEPLATES

- A. Except as otherwise indicated for required labels and operation data, do not permanently attach or imprint manufacturer's or producer's nameplates or trademarks on exposed surfaces or products which will be exposed to view either in occupied spaces or on the exterior of the completed project.

END OF SECTION

SUBSTITUTION REQUEST

TO:

PROJECT:

SPECIFIED ITEM:

Section	Page	Paragraph	Description
---------	------	-----------	-------------

PROPOSED SUBSTITUTION:

Attached data includes product description, specifications, drawings, photographs, performance and test data adequate for evaluation of request including identification of applicable data portions.

Attached data also includes description of changes to Contract Documents and proposed substitution requires for proper installation.

Undersigned certifies following items, unless modified by attachments, are correct:

1. Proposed substitution does not affect dimensions shown on drawings.
2. Undersigned pays for changes to building design, including engineering design, detailing, and construction costs caused by proposed substitution.
3. Proposed substitution has no adverse effect on other trades, construction schedule, or specified warranty requirements.
4. Maintenance and service parts available locally or readily obtainable for proposed substitution.

Undersigned further certifies function, appearance, and quality of proposed substitution are equivalent or superior to specified item.

Undersigned agrees, if this page is reproduced, terms and conditions for substitutions found in Bidding Documents apply to this proposed substitution.

Submitted by:

Name (Printed or typed)	
Signature	
Firm Name	
Address	
City, State, Zip	
Date	
Tel:	Fax:

General Contractor (if after award of Contract)

For use by A/E

- | | |
|---------------------------------------|--|
| <input type="checkbox"/> Approved | <input type="checkbox"/> Approved as noted |
| <input type="checkbox"/> Not Approved | <input type="checkbox"/> Received too late |

By

Date

Remarks

The Construction Specifications Institute
Northwest Region

September 1997



EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provisions of this Section apply to the procedural requirements for the actual closeout of the Work, not to administrative matters such as Final Payment and the change over of insurance.
- B. Closeout requirements relate to both Substantial and Final Completion of the Work. They also apply to individual portions of completed work as well as the total Work.
- C. Specific requirements contained in other Sections have precedence over the general requirements contained in this Section.

1.2 CLOSE OUT AGENDA

- A. Required Procedures:
 - 1. Notify the Owner's Representative when project is ready for substantial completion inspection. Also applies to certain areas completed for use by the Owner prior to completion of the entire project. The first review copy of the O&M Manuals must be submitted prior to request for substantial completion inspection.
 - 2. The Owner's Representative will establish the substantial completion inspection date when the Owner's Representative determines that the project, or certain Owner requested areas, is ready for Substantial Completion review.
 - 3. The Architect, Contractor, and Owner's Representative make substantial completion inspection.
 - 4. The Architect issues written list of items to be completed or corrected. Substantial Completion date is established and noted on prepared form.
 - 5. The Contractor is normally given adequate time to correct deficiencies shown on correction list.
 - 6. The Contractor returns completed project record documents and final payment request including change order adjustments, and requests final inspection.
 - 7. The Architect reviews project record documents and schedules final inspection.
 - 8. Final inspection made when required submittals are delivered.
 - 9. Final payment forthcoming when work is completed and submittals have been received and approved.

1.3 SUBSTANTIAL COMPLETION

- A. Prerequisites: Comply with the General Conditions and commence the following before requesting Architect's inspection of the Work, or a designated portion of the Work, for certification of Substantial Completion.
 - 1. Submit executed warranties, workmanship bonds, maintenance agreements, inspection certificates, and similar required documentation for specific units of work enabling Owner's unrestricted occupancy and use.
 - 2. Submit record documentation, maintenance manuals, tools, spare parts, keys, and similar operational items.
 - 3. Commence instruction of Owner's operating personnel and start-up of systems.
 - 4. Commence final cleaning and remove temporary facilities and tools.

EXECUTION AND CLOSEOUT REQUIREMENTS

- B. Submit written notice to the Architect that Work, or designated portion thereof, is substantially complete. The Architect and Owner's Representative(s) will review the Work within 7 days.
- C. If the Architect determines that Work is not substantially complete, he will promptly notify Contractor in writing. The Contractor shall complete the Work and submit a second written notice of substantial completion to the Architect. The Architect will again observe the Work.
- D. When the Architect concurs that the Work is substantially complete, he will prepare a Certificate of Substantial Completion on AIA Form G704 with a tentative list of items to be completed or corrected. The Architect will submit the Certificate and tentative list to the Contractor for his written acceptance of responsibilities assigned to him in the Certificate.

1.4 FINAL COMPLETION

- A. Submit written certificate that Contract Documents have been reviewed, Project has been inspected, Work is completed in accordance with the Contract Documents, equipment and systems have been tested in the presence of the Owner's Designated Representative and are operational, and Work is ready for review. Owner's Representative will review Work within 7 days.
- B. Should the Owner's Representative determine that the Work is incomplete or defective, he will notify the Contractor in writing, listing the incomplete or defective Work. The Contractor shall remedy the deficiencies and send a second written certification to the Owner's Representative that the Work is complete. The Architect will review the Work.
- C. When the Owner's Representative finds that the Work is acceptable under the Contract Documents, he will request the Contractor to make closeout submittals.

1.5 REOBSERVATION FEES

- A. Should the Architect perform more than one reobservation due to failure of the Work to comply with the claims of status of completion made by the Contractor,
 - 1. Owner will compensate the Architect for such additional services, and
 - 2. Owner will deduct the amount of such compensation from the final payment to the Contractor.

PART 2 - PRODUCTS

2.1 PROJECT RECORD DOCUMENTS

- A. Maintain, at the site, 1 copy of the Bid Documents, Contract Forms, Project Manual, Contract Drawings, Construction Change Directives, Addenda, Change Orders, reviewed Shop Drawings, Product Data and Office Samples, Field Test Records, Architect's Supplemental Instructions, etc.
- B. Store documents and samples in the Contractor's field office separate from documents used for construction.
- C. Keep current record of documents and label "Project Record." Record location of concealed items and utility lines, field changes in dimension or detail, and changes in materials furnished on Project Record Documents. Record changes from the Architect's Supplemental Instructions, Change Orders, Construction Change Directives, and Details not on Contract Drawings.
- D. Project record documents will be reviewed monthly. The Contractor and his subcontractors are required

EXECUTION AND CLOSEOUT REQUIREMENTS

to update project record documents monthly. The Architect will review the updated project record documents on a monthly basis at the time of the Contractor's application for payment. Failure to have project record documents updated will delay payment. Deliver the project "Record Documents" to the Architect at the end of the project with the Closeout Manuals.

- E. Refer to Division 22, Plumbing, Division 23, Heating, Ventilating, and Air Conditioning (HVAC), Division 26, Electrical, and Division 27, Communications, specification sections for project record document requirements for mechanical and electrical work. Submit per those requirements.
- F. Comply with requirements of General Conditions Section 3.6.15.

2.2 CLOSEOUT MANUALS

- A. Format: Submit operations and maintenance manuals, including a complete operation and maintenance directory, in the following format:
 - 1. PDF electronic file. Assemble each manual into a composite electronically-indexed file. Submit on digital media acceptable to Owner. All documents shall be in the latest Adobe Acrobat format. If any file is not provided in one of these two file formats, the Contractor shall provide a license copy of the software for the files. Final submittals to be provided on USB thumb drive or CD.
 - a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically-linked operation and maintenance directory.
 - b. Enable inserted reviewer comments on draft submittals.
 - 2. One (1) paper copy. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves.
- B. Content of Manuals:
 - 1. List all products, equipment, and systems used in the Project. List project installers, maintenance program, and local source of supply for replacement parts.
 - a. Include all product data, shop drawings, and other submittals made during the course of the Project.
 - 2. Include product data with specific product clearly identified.
 - 3. Include drawings of control diagrams, flow diagrams, and system relationships.
- C. Materials and Finishes: Provide the following information for products to be included with the manuals.
 - 1. Include manufacturer's data, catalog number, color, and texture of finishes used.
 - 2. Include instructions for care and maintenance on finishes including cleaning agents, methods, and cleaning and maintenance schedule.
- D. Equipment and Systems: Provide the following information for products to be included with the manuals.
 - 1. Include the manufacturer's description, operating characteristics, performance data, testing and balancing data, and printed operating and maintenance instructions.
 - 2. Include the manufacturer's catalog number and replaceable parts list.
 - 3. Include start-up, break-in, operating instructions, control, stopping, emergency instructions, shut-down, and operating sequence.
 - 4. Include summer and winter operating instructions, maintenance procedures, servicing and lubrication schedule, sequence of operation, and control diagrams.
 - 5. Include as-installed color coded piping diagrams and list of piping identification markers.
 - 6. Include circuit directories of panel boards and as-installed color coded wiring diagrams.
 - 7. Include as-installed color coded duct and damper layouts with design air volumes air flow

EXECUTION AND CLOSEOUT REQUIREMENTS

- ratings and fan sizes.
- 8. Include valve tag directory listing tag number, location, service, size, manufacture, model number, and normal position.
- 9. Include name plate directory listing equipment designation, name plate data, location of equipment, location of switch, and normal position of switch.
- E. Warranties and Bonds: Provide the following information for products to be included within the manuals.
 - 1. Assemble warranties, bonds, service and maintenance contracts executed by each manufacturer, supplier, and subcontractor.
 - 2. Include table of contents, beginning date, and duration of warranty, bond, or service contract, and party to contact in case of claim against warranty.
- F. Spare Parts and Maintenance Materials: Tabulate list of spare parts and maintenance materials showing product description, paragraph in Project Manual listing product, and quantity delivered to the Owner and distribute with the manuals.

2.3 CLEANING PRODUCTS

- A. Use the following cleaning products when performing final cleaning of work areas:
 - 1. General Cleaner: Coastwide Laboratory #78 SE General Purpose Cleaner.
 - 2. Neutral Cleaner: Coastwide Laboratory #64 SE Neutral Cleaner.
 - 3. Disinfectant: Coastwide Laboratory #70 SE QM Washroom Cleaner.
 - 4. Floor finish: Coastwide Laboratory Diamond Floor Finish.
 - 5. Other products approved by the Owner in advance.

PART 3 - EXECUTION

3.1 INSTRUCTION OF OWNER'S PERSONNEL

- A. Prior to Final Completion or acceptance, fully instruct the Owner's Designated Representative and maintenance personnel in the operation, adjustment, and maintenance of all products, equipment, and systems.
- B. Operating and maintenance manual shall constitute the basis of instruction.
 - 1. Review contents of manual with Owner's personnel in full detail to explain all aspects of operations and maintenance.
 - 2. Review complete heating and cooling cycles with Owner's Designated Representative. Review location of dampers, valves, and control equipment.

3.2 MAINTENANCE MATERIAL HANDLING

- A. Label packages and deliver spare parts and maintenance materials to Owner's storage area. Submit quantity specified in each product section.

EXECUTION AND CLOSEOUT REQUIREMENTS

3.3 PAYMENTS AND RELEASE OF LIENS

- A. Submit 2 executed copies of the Contractor's Affidavit of Payment of Debts and Claims, AIA G706.
- B. Submit 2 executed copies of the Contractor's Affidavit of Release of Liens, AIA G706A including:
 - 1. "Consent of Surety to Final Payment", AIA G707.
 - 2. Contractor's release or waiver of liens.
 - 3. Subcontractors' and suppliers' release or waiver of liens, as requested by the Architect.

3.4 SCHEDULE OF CLOSEOUT SUBMITTALS

- A. Submit one (1) copy in final form of the Closeout Manuals 15 days prior to final review or acceptance.
- B. Obtain and submit the Certificate of Occupancy.

3.5 CLEANING PRIOR TO SUBSTANTIAL COMPLETION INSPECTION

- A. At the time of project close out, clean or reclean the Work to the condition expected from a normal, commercial building cleaning and maintenance program. See Section 01 74 23 FINAL CLEANING for additional requirements.
- B. Complete the following cleaning operations before requesting the Architect's inspection for certification of Substantial Completion.
 - 1. Remove grease, dust, dirt, stains, manufacturer's labels, fingerprints, etc., from sight exposed surfaces.
 - 2. Remove non-permanent protection and labels.
 - 3. Wash and polish all interior and exterior glazing and mirrors.
 - 4. Repair, patch, and touch up marred surfaces.
 - 5. Clean heating and cooling ducts, blowers, coils, fixtures, equipment, piping, and grilles.
 - 6. Replace disposable air filters and clean permanent filters.
 - 7. Remove construction debris.
 - 8. Flush water systems and disinfect domestic water lines. Sanitize plumbing and food service facilities.
 - 9. Broom clean new exterior paved surfaces and walks. Vacuum clean interior carpeted surfaces and wet mop hard floor surfaces.
 - 10. Clean light fixtures and replace burned-out lamps and replace damaged lenses.
 - 11. Police yards and grounds.
- C. Maintain in cleaned condition until Final Completion or the Owner's occupancy.

END OF SECTION

CUTTING AND PATCHING

PART 1 - GENERAL

1.1 SUMMARY

- A. Definition: "Cutting and patching" includes cutting into existing construction to provide for the installation or performance of other work and subsequent fitting and patching required to restore surfaces to their original condition.
- B. Refer to other sections of these specifications for specific cutting and patching requirements and limitations applicable to individual units of work.

1.2 PERFORMANCE REQUIREMENTS

- A. Structural Work:
 - 1. Do not cut-and-patch structural work in a manner resulting in a reduction of load-carrying capacity or load/deflection ratio.
 - 2. Submit proposal and request and obtain Engineer's approval before proceeding with cut-and-patch of structural work.
 - 3. Perform X-raying at reinforced concrete walls in Existing Building to locate existing reinforcing.
- B. Operational Limitations:
 - 1. Do not cut-and-patch operational elements components in a manner resulting in decreased performance, shortened useful life, or increased maintenance.
 - 2. Submit written requests and obtain the Engineer's approval before proceeding with cutting and patching.
- C. Visual/Quality Limitations:
 - 1. Do not cut-and-patch work exposed to view (exterior or interior) in a manner resulting in noticeable reduction of aesthetic qualities of existing or new work.
- D. Limitation on Approvals: The Architect's approval to proceed with cutting and patching does not waive the right to later require removal and replacement of work found to be cut-and-patched in an unsatisfactory manner, as judged by the Architect.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Use materials for cutting and patching that are identical to existing materials.
- B. If identical materials are not available or cannot be used, use materials that match existing adjacent surfaces to the fullest extent possible with regard to visual effect.
- C. Use materials for cutting and patching that will result in equal-or-better performance characteristics.

CUTTING AND PATCHING

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Before cutting, examine surfaces to be cut and patched and conditions under which the work is to be performed.
- B. If unsafe or otherwise unsatisfactory conditions are encountered, take corrective action before proceeding with the Work.

3.2 PROTECTION

- A. Temporary Support: To prevent failure, provide temporary support of work to be cut.
- B. Protect other work during cutting and patching to prevent damage.
- C. Provide protection from adverse weather conditions for that part of the project that may be exposed during cutting and patching operations.
- D. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- E. Take precautions not to cut existing pipe, conduit, or duct serving the building but scheduled to be relocated until provisions have been made to bypass them.

3.3 CUTTING

- A. Cut the work using methods that are least likely to damage work to be retained or adjoining work.
- B. Where possible review proposed procedures with the original installer. Comply with original installer's recommendations.
- C. Where cutting is required, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut through concrete and masonry using a cutting machine such as carborundum saw or core drill. Cut holes and slots neatly to size required with minimum disturbance of adjacent work. Do not over cut edges.
- D. To avoid marring existing finished surfaces, cut and drill from the exposed or finished side into concealed surfaces.
- E. Temporarily cover openings when not in use.

3.4 PATCHING

- A. Patch with seams that are durable and as invisible as possible.
- B. Comply with specified tolerances for the work.

CUTTING AND PATCHING

- C. Restore exposed finishes of patched areas. Where necessary extend finish restoration into retained adjoining work in a manner that will eliminate evidence of patching and refinishing.

END OF SECTION

SELECTIVE STRUCTURE DEMOLITION

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide all selective building demolition necessary and preparatory to construction. Refer to the Drawings for location of existing materials requiring removal. Verify existing conditions at the site of the work and include all work evident by inspection.
- B. Provide for the salvage of existing materials for the Owner or for reuse as indicated at the end of this Section.

1.2 REFERENCES

- A. Oregon Administrative Rules (OAR), Department of Human Services, Public Health Division: Chapter 333, Division 70 Renovation, Repair and Painting Activities Involving Lead-Based Paint.
- B. Code of Federal Regulations: 40 CFR: Protection of the Environment.

1.3 QUALITY ASSURANCE

- A. Regulatory Agency Requirements: Comply with applicable codes and ordinances concerning demolition operations and refuse removal.
- B. Pre-demolition Meeting: Meet at the Site with the Architect and Owner. Review location of service lines. The Contractor shall be responsible for protection from dust and water damage and flying aggregate. Establish location of interior dust barriers.

1.4 SITE CONDITIONS

- A. Traffic Control: Do not close or obstruct public streets, walks, or required exit passageways without written permission from authorities having jurisdiction.
- B. Exterior Dust Control: Keep exposed demolition debris damp to control dust.
- C. Interior Dust Control: Provide dust control barriers consisting of curtains or doors to limit the spread of demolition dust and debris in construction work. Use all precautions to confine dust to the work area. Maintain throughout the construction process.

PART 2 - PRODUCTS

2.1 EQUIPMENT

- A. Sawing Equipment: Use diamond edged saw blades of proper size for depth of cut.
- B. Drilling Equipment: Use non-impact rotary tool with diamond core drills.

SELECTIVE STRUCTURE DEMOLITION

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protection: Provide protection and conduct demolition operations to prevent personal injury or property damage.
- B. Service Disconnection: Disconnect existing service lines to be abandoned and cap exposed service lines to be maintained.
- C. Interior Demolition:
 - 1. Provide slurry control to protect all existing facilities from water damage during sawing and drilling.
 - 2. Provide dust barriers inside the existing building until completion of demolition work.
 - 3. Install bracing and shoring prior to sawing structural components.
 - 4. All floor materials indicated to be removed are to include the stripping of the adhesive to the concrete substrate.

3.2 HAZARDOUS MATERIALS

- A. Removal: Any hazardous removal work will be by separate Owner provided contract and not included in the demolition work of this contract. A licensed abatement contractor will remove all accessible hazardous-containing materials prior to the commencement of the building and site demolition work.
- B. Copies of the asbestos surveys and abatement specifications will be provided by the School District for reference by the demolition contractor.
- C. During the course of demolition work, additional hazardous materials may be encountered. If hazardous materials are encountered, this contractor shall immediately notify the School District Representative. A hazardous abatement contractor will be retained to complete any hazardous material removal as necessary. **THE DEMOLITION CONTRACTOR SHALL DO NO HAZARDOUS MATERIAL REMOVAL.**
- D. If any hazardous material is damaged during the course of the demolition work, immediately evacuate non-trained personnel. Clean up of the area and decontamination of personnel shall be at the direction of the Owner's hazardous material abatement consultant.
- E. Lead Base Paint: For renovations, repairs and painting (RRP) in "Child-Occupied Facilities" (where kids under the age of 6 regularly spend time and built before 1978), the General Contractor shall follow all Federal, State and local rules (including OSHA and US EPA rules and Oregon Administrative Rules Chapter 333, Division 70) associated with lead-based paints (LBP).
 - 1. The Contractor is responsible for the identification of LBP hazards and providing engineering controls for trigger activities that disturb LBP.
 - 2. Any time painted surfaces are disturbed, the work must be performed by a certified firm with a trained and certified "renovator" in accordance with *40 CFR (including Part 745.82 Lead)*.
 - 3. Post the areas of the building that will be affected with appropriate signage warning of the potential hazard.

3.3 DEMOLITION

- A. Remove existing materials as indicated on the Drawings.
- B. Remove abandoned plumbing and electrical lines to concealed spaces and cap.

SELECTIVE STRUCTURE DEMOLITION

- C. Sprinkle and dampen debris and rubbish with water to control dust. Remove debris from the site as demolition progresses and do not allow accumulation on the premises.
- D. Save and protect existing utilities shown to remain. Notify the Architect at once if unknown utilities are found in the work.
- E. Execute the demolition in an orderly and careful manner with due consideration for the Owner and the public. Provide mufflers for compressors and other noisy motors.
- F. Provide shoring and bracing as required at saw cutting areas. Do not over cut corners.
- G. Recycle as much of the demolition waste as possible.
- H. Mechanical Demolition:
 - 1. Remove and dispose of unused piping. Any utilities that serve equipment in operation or that is required for building use are to be kept in operation. Exercise care in removing used piping and ducts.
 - 2. Avoid damage to piping and ductwork that will remain installed to keep the fans and other systems in operation.
 - 3. If during demolition, any pipe, duct, or equipment is found that is not noted to remain or to be removed, or may require review by the Architect or the Owner to determine service, the Contractor will immediately notify the Architect. The Owner and the Architect will then review the pipe, duct, or equipment and direct Contractor on its disposition.
- I. Electrical Demolition:
 - 1. Remove and dispose of all electrical devices, conduits, and conductors that are not shown as remaining. Refer to the Electrical Drawings for locations.
 - 2. Take necessary precautions while removing electrical devices, conduits, and conductors so that power, fire alarms, and the communication system are maintained while work is being accomplished.
 - 3. Provide all required temporary lighting during demolition.
 - 4. Do not remove any electrical conduits, conductors, or cabling that penetrates the construction area en route to any other area or floor unless shown on the Drawings.
 - 5. The demolition of all electrical devices including light fixtures, wiring devices, alarm equipment, mechanical, equipment, telephone equipment, wiring, etc., must be performed by a licensed electrician.
 - 6. If during demolition, any electrical items or equipment are found that are not noted to remain or be removed, or may require review by the Architect or the Owner to determine service, the Contractor will immediately notify the Owner. The Owner and the Architect will then review the electrical item or equipment and direct Contractor on its disposition.

3.4 ADJUSTING AND CLEANING

- A. Clean-up: Remove all demolition debris, including broken concrete and masonry, from the building as soon as selective demolition has been completed.
- B. Disposal:
 - 1. Do not store, sell, or burn demolished or salvaged materials on the Site.
 - 2. Transport debris to an approved and licensed land fill area.
- C. Repairs: Repair damage to existing facilities and adjacent property to meet conditions existing prior to demolition operations.

SELECTIVE STRUCTURE DEMOLITION

- D. Cleaning: Broom clean interior surfaces, exterior slabs, and paving that have been soiled by demolition activities. Vacuum ducts and replace air filters at the end of demolition work.

3.6 SALVAGE SCHEDULE

- A. Items to be Stockpiled for Owner's Use:
 - 1. Speaker poles.
 - 2. All wiring and fiber optic cable.
- B. Items to be Salvaged for Reuse:
 - 1. Speakers.

END OF SECTION

CONCRETE FORMING AND ACCESSORIES

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide concrete formwork for cast-in-place concrete work where shown on the Drawings and as specified herein.
- B. Include formwork for placement of built-in anchors, wood blocking, inserts, bolts for connection of other materials, built-in sleeves, thimbles, dovetail slots, and reglets.

1.2 REFERENCES

- A. American Concrete Institute (ACI):
 - 1. ACI 301: Specifications for Structural Concrete.
 - 2. ACI 347R: Guide to Formwork for Concrete.
- B. ASTM International (ASTM):
 - 1. ASTM A53: Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 - 2. ASTM D1751: Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
 - 3. ASTM E154: Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.

1.3 SYSTEM DESCRIPTION

- A. Structural Requirements:
 - 1. Design formwork to support vertical and lateral loads.
 - 2. Design formwork to be removable without damaging cast-in-place concrete or adjacent materials.
 - 3. Design formwork to hold concrete in correct size, shape, alignment, elevation, and position.
- B. Deflection Tolerances: Design formwork to prevent deflection beyond limits specified in ACI 347R.

1.5 SUBMITTALS

- A. Product Data: Submit specifications and installation instructions for proprietary materials and items as required, including form coatings, manufacturer form systems, ties, and accessories.

1.6 QUALITY ASSURANCE

- A. Design Criteria: Conform to ACI 347R, Chapter 1 - Design.
- B. Codes and Standards:
 - 1. Unless otherwise shown or specified, design, construct, erect, maintain, and remove forms and related structures for cast-in-place concrete work in compliance with the American Concrete Institute Standard ACI 347R.

CONCRETE FORMING AND ACCESSORIES

2. Construct formwork to provide completed concrete surfaces complying with the tolerances specified in ACI 347R after removal of forms and prior to patching and finishing of cast-in-place formed surfaces.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Forms for Exposed Finish Concrete Surfaces:
 1. Unless otherwise indicated, construct formwork for exposed concrete surfaces with plywood, metal, metal-framed plywood faced, or other acceptable panel-type materials to provide continuous, straight, smooth, exposed surfaces.
 2. Furnish in largest practicable sizes to minimize the number of joints or to conform to joint system if shown on the Drawings.
 3. Provide form material with sufficient thickness to withstand pressure of newly-placed concrete without bow or deflection.
 4. Use one of the following:
 - a. Overlaid plywood complying with US Product Standard PS-1, A-C or B-B High Density Overlaid Concrete Form, Class I.
 - b. Plywood complying with US Product Standard PS-1, B-B (Concrete Form) Plywood, Class I, Exterior Grade or better, mill-oiled and edge-sealed, with each piece bearing legible inspection trademark
- B. Forms for Unexposed Finish Concrete Surfaces: Form concrete surfaces which will be unexposed in finished structure with plywood, lumber, metal, or other acceptable material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Form Ties: Provide factory-fabricated, adjustable length, removable or snap-off metal form ties designed to prevent form deflection and to prevent spalling concrete surfaces upon removal.
- D. Form Coatings and Form Releases: Provide commercial formulation form coating and form release compounds that will not bond with, stain, nor adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
- E. Sealant: One part silicone as recommended by the form manufacturer.

2.2 RELATED MATERIALS

- A. Chamfer Strip: 1" radius or 45° bevel by Greenstreak, Vinylex, Vulcan, Burke, or accepted substitute.
- B. Form Joint Tape: Closed cell PVC foam with pressure sensitive adhesive on one side. "Vinyl Foam Tape" by Burke, "V-770" by Norton, or accepted substitute.
- C. Vinyl Reglets: Extruded vinyl with covered face or filled to prevent intrusion of concrete or debris.
- D. Preformed Expansion and Isolation Joint Fillers: ASTM D1751, asphalt saturated cane fiber or asphalt bond granulated cork with felt face, 1/2" thick, full depth of slab except depress 3/8" at sealant joints. "Horn Cork Expansion Joint" or "Fiber Expansion Joint Filler" by A.C. Horn, "Corkcore" by J & P Petroleum, "Fiber Expansion Joint" by Burke, or accepted substitute.

CONCRETE FORMING AND ACCESSORIES

- E. Metal Keyed Construction Joints: Burke Keyed Kold, Greenstreak Screed Joint, Vulcan Vulco Joint, or accepted substitute.
- F. Crack Control Joint Forms: "Zip Strip" by Burke, "Zipcap" by Greenstreak, "Sure-Joint" by Vulcan, or accepted substitute.
- G. Steel Pipe Sleeves: ASTM A53, Schedule 40, standard steel pipe with inside diameter 1" larger than outside diameter of penetrating pipe and four #4 reinforcing bars 18" long welded to pipe sleeve.

PART 3 - EXECUTION

3.1 FORMWORK CONSTRUCTION

- A. Standard Specifications: Construct formwork to comply with ACI 301 and ACI 347R, Chapter 3, Construction.
- B. Design, erect, support, brace, and maintain formwork to safely support vertical and lateral loads that might be applied until structural loads can be supported by the concrete.
- C. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation, and position.
- D. Provide for construction live loads, formwork dead load, assumed soil pressures, wind loads, seismic loads, and thermal movement caused by changing temperatures.
- E. Provide keyed construction joints at center of concrete walls and floor slabs on grade.
- F. Construct formwork to be readily removable without impact, shock, or damage to cast-in-place concrete surfaces and adjacent materials.
- G. Form all concrete surfaces. Do not use earth cuts as forms for vertical surfaces unless approved by the Architect.
- H. Construct forms to sizes, shapes, lines, and dimensions shown and to obtain accurate alignment, location, grades, level, and plumb work in finished structures. Verify field dimensions and elevations with survey equipment.
 - 1. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in work.
 - 2. Use selected materials to obtain required finishes.
 - 3. Solidly butt joints and provide back-up at joints to prevent leakage of cement paste.
- I. Fabricate forms for easy removal without hammering or prying against concrete surfaces.
 - 1. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces.
 - 2. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only.
 - 3. Kerf wood inserts for forming keyways, reglets, recesses, and the like, to prevent swelling and for easy removal.

CONCRETE FORMING AND ACCESSORIES

- J. Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection prior to concrete placement, and for placement of concrete.
 - 1. Securely brace temporary openings and set tightly to forms to prevent loss of concrete mortar.
 - 2. Locate cleanouts in areas where concrete will be concealed.
- K. Where indicated, chamfer exposed corners and edges using wood, metal, PVC, or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.
- L. Do not use rust stained forms.
- M. Form Ties: Unless otherwise indicated, provide ties so portion remaining within concrete after removal is 1" inside concrete and will not leave holes larger than 1" diameter in concrete surface.
- N. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades.
 - 1. Determine size and location of openings, recesses, and chases from trades providing such items.
 - 2. Accurately place and securely support items built into forms.
- O. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete.
 - 1. Remove chips, wood, sawdust, dirt, or other debris just before concrete is placed.
 - 2. If required, retighten forms and bracing after concrete placement to eliminate mortar leaks and maintain proper alignment.

3.2 FORMWORK CONSTRUCTION FOR EXPOSED ARCHITECTURAL CONCRETE

- A. Drill forms and place ties to prevent mortar leakage around tie holes.
- B. Do not use patched form facing material for exposed concrete surfaces.
- C. Set corners and intersections flush without visible offsets. Solid block behind intersections and seal form joints with form joint tape installed at panel edges and penetrations.
- D. Use extra studs, walers, and bracing to prevent bowing of forms.
- E. Do not use end grain of wood or plywood as form surfaces.

3.3 JOINTS

- A. Construction Joints:
 - 1. Locate and install construction joints as indicated or, if not indicated, locate so as not to impair strength and appearance of the structure, as acceptable to the Architect.
 - 2. Provide keyways at least 1-1/2" deep in construction joints in walls, slabs, and between walls and footings. Accepted bulkheads designed for this purpose may be used for slabs.
 - 3. Space construction joints in interior floor slabs on grade at 25 feet on center each way.
 - 4. Place construction joints perpendicular to main reinforcement.
 - 5. Continue reinforcement across construction joints.
- B. Isolation, Expansion, and Control Joints:
 - 1. Place isolation, expansion, and control joints in slabs on grade to stabilize differential settlement and prevent random cracking.
 - 2. Space control joints in exterior concrete walks at 5 feet on center.

CONCRETE FORMING AND ACCESSORIES

3. Provide saw cut and scored control joints in exterior concrete paving where detailed.
4. Provide expansion joint filler where exterior slabs abut walls, columns, steps, curbs, and similar vertical elements except where other compressive elements are specified.
5. Expansion joints in slabs on grade not to exceed a spacing of 30 times the slab thickness. The length and width of concrete slab panels between joints shall not to exceed 2:1. Joints to be placed so that there are no reentrant corners in slab panels.

3.4 INSTALLATION OF EMBEDDED ITEMS

- A. General:
 1. Set and build into Work the anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete.
 2. Use setting drawings, diagrams, instructions, and directions provided by suppliers of items to be attached thereto.
 3. Carefully align adjoining sections and miter corners.
- B. Build-in sleeves, thimbles, dovetail slots, reglets, and other items furnished under other sections of the specifications.
- C. Edge Forms and Screed Strips for Slabs:
 1. Set edge forms of bulkheads and intermediate screed strips for slabs to obtain required elevations and contours in finished slab surface.
 2. Provide and secure units sufficiently strong to support types of screed strips by use of strike-off templates or accepted compacting type screeds.

3.5 SHORES AND SUPPORTS

- A. Comply with ACI 347R for shoring and reshoring in multistory construction, and as herein specified.
- B. Install shoring to safely support concrete forms without excessive stress or deflection. Install wedges or jacks to allow for adjustment of shoring before and during concrete placement.
- C. Provide camber in formwork as required for anticipated deflections due to weight and pressures of fresh concrete and construction loads for long span members without intermediate supports.
- D. Extend shoring from the ground to the roof for structures of 4 stories or less, unless otherwise permitted.

3.6 PREPARATION OF FORM SURFACES

- A. Clean re-used forms of concrete matrix residue. Repair and patch forms as required to return to acceptable surface condition.
- B. Coat formwork concrete contact surfaces with nonstaining form release agent before reinforcement is placed.
 1. Thin form-coating compounds with thinning agent of type, amount, and under conditions as directed by the form-coating compound manufacturer.
 2. Do not allow excess form release agent to accumulate in the forms, come into contact with reinforcement, coat surfaces designed for bonding to fresh concrete, or in which fresh concrete will be placed against.
 3. Apply in compliance with coating manufacturer's printed instructions.

3.7 REMOVAL OF FORMS

CONCRETE FORMING AND ACCESSORIES

- A. Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50°F for 24-hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operations and provided curing and protection operations and maintained.
- B. Formwork supporting weight of concrete, such as beam soffits, joists, slabs, and other structural elements, may not be removed in less than 14-days or until concrete has attained design minimum compressive strength at 28-days or until sufficient prestressing has been applied to carry dead loads and construction loads.
 - 1. Determine potential compressive strength of in place concrete by testing field-cured specimens representative of concrete location or members.
 - 2. Form facing material may be removed 4-days after placement if concrete has attained enough strength to support designed loads and if shores and other vertical supports have been arranged to permit removal of form facing material without loosening or disturbing shores and supports.
- C. Do not pry against concrete surface during formwork removal.

3.8 RE-USE OF FORMS

- A. Clean and repair surfaces of forms to be re-used in work.
 - 1. Split, frayed, delaminated, or otherwise damaged form facing material will not be acceptable for exposed surfaces.
 - 2. Apply new form coating compound as specified for new formwork.
- B. When forms are intended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints.
 - 1. Align and secure joints to avoid offsets and mortar leaks.
 - 2. Do not use "patched" forms for exposed concrete surfaces, except as acceptable to the Architect.

3.9 ADJUSTING

- A. Before concrete placement, check the lines and levels of erected formwork. Adjust forms to obtain required size, location, and alignment within allowable tolerances.
- B. Retighten forms immediately after concrete placement where required to eliminate mortar leaks and prevent excessive deflection.
- C. Inspect formwork during and after concrete placement to check for abnormal deflection or signs of structural failure. Reinforce and adjust formwork to meet required concrete dimensions.

END OF SECTION

CONCRETE REINFORCING STEEL

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide reinforcing steel for cast-in-place concrete at locations indicated on the Drawings and as herein specified.

1.2 REFERENCES

- A. American Concrete Institute (ACI):
 - 1. ACI 301: Specifications for Structural Concrete.
 - 2. ACI 315: Manual of Standard Practice for Detailing Reinforced Concrete Structures.
 - 3. ACI 318: Building Code Requirements for Structural Concrete and Commentary.
 - 4. SP-66(04): ACI Detailing Manual – 2004.
- B. ASTM International (ASTM):
 - 1. ASTM A82: Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
 - 2. ASTM A185: Standard Specification for Steel Welded Wire Reinforcing, Plain, for Concrete.
 - 3. ASTM A496: Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement.
 - 4. ASTM A497: Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete.
 - 5. ASTM A615: Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
 - 6. ASTM A706: Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete.
 - 7. ASTM A767: Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement.
 - 8. ASTM A775: Standard Specification for Epoxy-Coated Steel Reinforcing Bars.
- C. American Welding Society:
 - 1. AWS A5.1, Specification for Carbon Steel Electrodes for Shielded Metal Arc Welding.
 - 2. AWS D1.4, Structural Welding Code – Reinforcing Steel.
- D. Federal Specifications: FS QQ-W-461, (Rev. H) Wire, Steel, Carbon (Round, Bare and Coated).

1.4 SHOP DRAWINGS

- A. Submit product data including specifications and installation instructions for all proprietary materials and reinforcement accessories.
- B. Submit steel reinforcing drawings of fabrication details, bending, and placement for the Architect's review prior to fabrication.
- C. Submit bar schedules, stirrup spacing, diagrams of bent bars, and arrangement of concrete reinforcement. Include special reinforcement required and openings through concrete structures.
- D. Mill Certificates: For information and record, submit steel producer's certificates of mill tests for reinforcing steel.

CONCRETE REINFORCING STEEL

1.6 QUALITY ASSURANCE

- A. Codes and Standards: Comply with requirements of the following codes and standards, except where more stringent requirements are specified:
 - 1. American Welding Society, AWS D1.4.
 - 2. Concrete Reinforcing Steel Institute (CRSI) "Manual of Standard Practice".

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store reinforcing steel blocked up off the ground and in orderly stacks. Do not store directly on dirt.
- B. Each stack shall contain only bars with the same identifying label.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Reinforcing Bars: ASTM A615 or A706, Grade 60, deformed.
- B. Galvanized Reinforcing Bars: ASTM A767, Class II (2.0 ounce zinc psf) hot-dipped galvanized, after fabrication and bending.
- C. Epoxy Coated Reinforcing Bars: ASTM A775.
- D. Steel Wire: ASTM A82, plain, cold-drawn, steel.
- E. Deformed Steel Wire: ASTM A496.
- F. Weldable Reinforcing Bars: ASTM A706.
- G. Welded Electrodes: AWS A5.1, low hydrogen, E70 series.
- H. Tie Wire: FS QQ-W-461, annealed steel, black, 16-gage minimum.
- I. Supports for Reinforcement: Provide supports for reinforcement including bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place.
 - 1. Use wire bar type supports complying with CRSI Manual of Standard Practice, MSP-1, unless otherwise acceptable.
 - 2. For slabs-on-grade, use supports with sand plates, horizontal runners, or cinder bricks where base materials will not support chair legs.
 - 3. For exposed-to-view concrete surfaces where legs of supports are in contact with forms, provide supports with legs which are plastic protected (CRSI, Class 1) or stainless steel protected (CRSI, Class 2).
- J. Concrete Accessories:
 - 1. Headed Stud Anchors (HSA): Conform to the requirements of AWS D1.1, Type B, and ASTM A108.
 - 2. Deformed bar anchors (DBA): Conform to ASTM A496.

CONCRETE REINFORCING STEEL

3. Post installed concrete anchors shall consist of the following unless noted otherwise:
 - a. Expansion Bolts: Hilti Kwik Bolt TZ.
 - b. Screw Anchors: Hilti Kwik HUS-EZ.
 - c. Adhesive Anchors: Hilti HIT-RE 500-SD.
4. Formsaver threaded mechanical splice couples shall consist of the following:
 - a. Dayton Superior Taper-lock Rebar Splices.

2.2 FABRICATION

- A. Cut and bend bars at room temperature. Do not heat bars prior to cutting or bending.
- B. Field fabrication will be allowed only if the Contractor has equipment to properly fabricate steel.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Construct steel reinforcement in accordance with ACI 301 and ACI SP-66(04). Comply with CRSI's recommended practice for "Placing Reinforcing Bars", for details and methods of reinforcement placement and supports, and as herein specified.
- B. Detail reinforcing steel in accordance with the "ACI Manual of Standard Practice for Detailing Reinforced Concrete Structures", ACI 315.
- C. Accurately position, support, and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing with metal chairs, runners, bolsters, spacers, and hangers as required.
- D. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.
- E. Lap all reinforcing bars per the Typical Lap Splice Length Schedule in the General Structural Notes on the Structural Drawings, unless otherwise noted. Mechanical splices noted on the Drawings shall be Dayton Bar-Grip splices or approved with a current ICC Approval Report.
- F. Provide and place concrete wall reinforcing as indicated in the General Structural Notes on the Drawings unless otherwise noted on the Drawings.
- G. Continue horizontal wall bars through columns and intersecting walls.
- H. At slab and wall openings, provide a minimum of two #5 bars over, under, and at the sides of the openings. Extend these bars lap distance or a minimum of 24" past the opening. Provide one #5 for single-layer reinforcing and two #5 for double-layer reinforcing, 4 foot long, diagonally at each corner of all openings.
- I. Refer to typical details for disposition of corner bars and bars in small wall sections.
- J. Slab bars shall be hooked into walls, or hooked dowels shall be provided to match slab reinforcing. Provide two #4, 4 foot long, diagonally at each re-entrant corner in slabs.
- K. Provide hooked dowels from footings to match vertical wall reinforcing.

CONCRETE REINFORCING STEEL

- L. Stagger splices 36" minimum. Construct hooked reinforcing to comply with ACI 318.
- M. Minimum Concrete Cover: As indicated on the Drawings and as indicated in the Structural Notes on the Drawings.
- N. Mechanical and Electrical Penetrations: Splay reinforcing around openings not more than 1" in 10".
- O. Place electrical conduit in center of floor slabs.
- P. Concrete Anchors:
 - 1. All cast in place anchor bolts shall be securely tied in their final position prior to placing concrete (wet-setting of anchor bolts is not permitted).
 - 2. All HSA and DBA shall be welded with automatic stud welding equipment per the recommendations of the stud and equipment manufacturer, unless otherwise specified.
 - 3. All post installed concrete anchors shall be installed in conformance with the manufacturer's installation criteria and per the current ICC Evaluation Report.
- Q. Refer to Sheet S0.1 STRUCTURAL NOTES for additional placement and installation requirements.

3.2 ADJUSTING AND CLEANING

- A. Adjust reinforcing placement as required by Architect.
- B. Clean reinforcing to remove earth, ice, oil, grease, paint, rust, mill scale, form release agent, or other materials that may reduce or destroy the bond of the concrete to the reinforcing steel.

END OF SECTION

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide cast-in-place concrete materials, mixes, placing, finishing, curing and sealing, surface repairs, isolation and contraction joints, and quality control testing during construction where indicated on the Drawings and as herein specified.

1.2 REFERENCES

- A. American Concrete Institute (ACI):
 - 1. ACI 211.1: Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete.
 - 2. ACI 301: Specifications for Structural Concrete.
 - 3. ACI 302.1R: Guide for Concrete Floor and Slab Construction.
 - 4. ACI 304R: Guide for Measuring, Mixing, Transporting, and Placing Concrete.
 - 5. ACI 305R: Hot Weather Concreting.
 - 6. ACI 306R: Cold Weather Concreting.
 - 7. ACI 309R: Guide for Consolidation of Concrete.
 - 8. ACI 318: Building Code Requirements for Structural Concrete & Commentary.
- B. ASTM International (ASTM):
 - 1. ASTM C31: Standard Practice for Making and Curing Concrete Test Specimens in the Field.
 - 2. ASTM C33: Standard Specification for Concrete Aggregates.
 - 3. ASTM C39: Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
 - 4. ASTM C94: Standard Specification for Ready-Mix Concrete.
 - 5. ASTM C143: Standard Test Method for Slump of Hydraulic Cement Concrete.
 - 6. ASTM C150: Standard Specification for Portland Cement.
 - 7. ASTM C171: Standard Specification for Sheet Materials for Curing Concrete.
 - 8. ASTM C172: Standard Practice for Sampling Freshly Mixed Concrete.
 - 9. ASTM C231: Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
 - 10. ASTM C260: Standard Specification for Air-Entraining Admixtures for Concrete.
 - 11. ASTM C309: Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
 - 12. ASTM C330: Standard Specification for Lightweight Aggregates for Structural Concrete.
 - 13. ASTM C494: Standard Specification for Chemical Admixtures for Concrete.
 - 14. ASTM C618: Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
 - 15. ASTM C631: Standard Specification for Bonding Compounds for Interior Gypsum Plastering.
 - 16. ASTM C932: Standard Specification for Surface-Applied Bonding Compounds for Exterior Plastering.
 - 17. ASTM C1017: Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
 - 18. ASTM C1107: Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-shrink).

CAST-IN-PLACE CONCRETE

1.3 SYSTEM DESCRIPTION

- A. Dimensional Tolerances: Provide interior concrete with Class "A" tolerance and exterior concrete with Class "B" tolerance in accordance with ACI 301.

1.4 QUALITY ASSURANCE

- A. Concrete shall conform to Chapter 19 of the latest version of the Oregon 2010 Structural Specialty Code (OSSC).
- B. Mixing, placing and curing of concrete shall be in accordance with the American Concrete Institute, ACI 318 and IBC chapter 19.

1.6 SUBMITTALS

- A. Product Data: Submit manufacturer's product information on all concrete accessory materials, curing compounds, and sealers.
- B. Test Reports: Submit laboratory and field test reports for concrete work.
- C. Certificates: Submit letter, from concrete supplier, that concrete delivered meets the requirements of this Specification.
- D. Mix Design:
 - 1. Submit mix design to Architect for review prior to placement of any concrete. Clearly label all mix designs as to proposed area of use (e.g. footings, slabs, etc.)
 - 2. Submit mix designs with test data compliant with 2010 OSSC Section 1905 a minimum of 2 weeks prior to placing concrete. No water may be added to concrete in the field unless specifically approved in writing by the concrete supplier in conjunction with the concrete mix design.

1.7 SITE CONDITIONS

- A. Temperature and Weather Requirements: Do not place concrete when temperature or weather will affect the performance or appearance of the concrete.

1.8 SEQUENCING AND SCHEDULEING

- A. Sequence concrete floor slab pours to coordinate with installation of plumbing and electrical rough-ins.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Portland Cement: ASTM C150, Type I/II.
- B. Pozzolan: ASTM C618, Class N, or silica fume.
- C. Fly Ash: ASTM C618 (including Table 2A), Type F or Type C, may be used to replace up to 20% of the cement content, provided that the mix strength is substantiated by test data.
- D. Aggregates: ASTM C33 fine aggregate and size No. 67 (3/4" to No. 4) coarse aggregate.

CAST-IN-PLACE CONCRETE

- E. Lightweight Aggregates: ASTM C330, course aggregate 3/4" to No. 4 size.
- F. Water: Clean, free of oils, acids, or organic material.
- G. Air-Entraining Admixture: ASTM C260; use in concrete mixes for exterior horizontal surfaces exposed to weather. Amount of entrained air shall be 5% \pm 1% by volume.
- H. Water Reducing Admixture: ASTM C494, used in strict accordance with manufacturer's recommendations.
- I. A High-Range Water-Reducing (HRWR) Admixture conforming to ASTM C494, Type F or G, may be used in concrete mixes providing a slump that does not exceed 10".
- K. Superplasticizer: ASTM C1017 and ASTM C494, Type F.
- L. Curing Paper and Sheet Covering: Waterproof paper, polyethylene film, or burlap-polyethylene sheet conforming to ASTM C171.
- M. Curing Compound: ASTM C309, Type 1. Unitex "Uni-Res 150" or accepted substitute.
- N. Bonding Agent: ASTM C932 and ASTM C631. "Weld-crete" by Larsen, "Acryl 60" by Standard Dry Wall, "Sonocrete" or "Sonobond" by Sonneborn, or accepted substitute.
- O. Patching Compound Manufacturers: "Epolith Patcher" or "Sonopatch" by Sonneborn or accepted substitute.
- P. Non-Slip Aggregate: Not less than 95% pure aluminum oxide, nonslip aggregate by Gifford-Hill, "Alundum" by Norton Company, "Frictex" N.S. by Sonneborn, or accepted substitute.
- Q. Non-metallic Non-shrink Grout: Prepackaged, non-metallic, and non-gaseous. To be non-shrink when tested in accordance with ASTM C1107, Grade B, or Grade C, at a fluid consistency (flow cone) of 20 to 30 seconds. Thirty-minute-old grout shall flow through flow cone after slight agitation, in temperatures of 40°F to 90°F. Provide bleed free and attain 5,000-psi compressive strength in 28-days at fluid consistency. Certified independent test data required.
- R. Epoxy Grout Manufacturers: "Five Star Epoxy Grout" by U.S. Grout, "Sikadur Grout-Pack", or "Hi-Mod Systems" by Sika, or accepted substitute.
- S. Anchoring Cement Manufacturers: "Fast Setting Cement" by Edcoc Burke, "Anker Tite" by Concrete Products, "Embeco 153" by Master Builders, "Thorogrip" by Standard Dry Wall, or accepted substitute.

2.3 MIXING

- A. Proportioning: Comply with ACI 211.1. Proportion concrete per ACI 301, Article 3.8, Method 3 with maximum water/cement ratio as noted in the General Structural Notes.
- B. Proportion Adjustments: Mix designs may be adjusted when material characteristics, job conditions, weather, test results, or other circumstances warrant. Do not use revised concrete mixes until submitted to and accepted by the Architect.
- C. Entrained Air: Add air-entraining admixture in all concrete exposed to freezing, providing 5% \pm 1% entrained air.

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- D. Ready Mixed Concrete: ASTM C94.
- E. Pozzolan or Silica Fume: 10% to 15% by weight of cement.
- F. Fly Ash: Up to 20% of the cement content, provided that the mix strength is substantiated by test data.
- G. Site Mixing: Use drum type, batch machine mixer.
- H. Minimum 28-Day Compressive Strength: $f'_c = 3,000$ -psi per ACI 301, with minimum cement of 564 pounds per cubic yard and maximum water/cement ratio of 0.45, except footings shall be a maximum of 0.50. All concrete with reinforcement shall have no chlorine or chlorides.
- I. Superplasticizer: Comply with the manufacturer's printed recommendations. Do not exceed maximum slumps.
- J. Maximum Slump: 5" for footings, pedestrian walks, and floor slabs on grade. 3" slump for all other concrete.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Notify the Architect and the Independent Testing Laboratory 24 hours prior to concrete placement.
- B. Clean and adjust forms, joints, and embedded items. Check placement and adjust reinforcing.
 - 1. The Structural Engineer shall approve sleeves, openings, conduit, and other embedded items not shown on the Structural Drawings prior to pouring. Conduits embedded in slabs shall not be larger in outside dimension than one third of the thickness of the slab and shall not be spaced closer than 3 diameters on center.
 - 2. Where new concrete is placed against existing concrete, the existing concrete surface shall be cleaned and roughened to a minimum 1/4" amplitude.
- C. Coat aluminum embedded in concrete prior to concrete placement.
- D. Verify that steel reinforcing (specified in Section 03 20 00, CONCRETE REINFORCEMENT) has been installed in slabs on grade prior to placement of cast-in-place concrete.
- E. Remove water from vapor barrier with portable high-speed air blowers just prior to slab-on-grade pour.

3.2 PLACEMENT

- A. Comply with ACI 301 and ACI 304R for the placement of concrete in a continuous operation within planned joints or sections.
- B. Consolidate placed concrete using mechanical vibrating equipment with hand rodding and tamping. Work concrete around reinforcement, embedded items, and forms.

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- C. Protect concrete from physical damage or reduced strength due to weather extremes. In cold weather comply with ACI 306R. In hot weather comply with ACI 305R.
- D. All interior slabs-on-grade shall contain water-reducing admixture.
- E. Slab concrete shall be of a flowable consistency (5" slump with admixture), pumped and well tamped into place, with finishes compressed and compacted by troweling. Finish slab free from small hollows or bumps, graded to the elevations called for and with depressions in floors between high spots not greater than 1/8" below a 10-foot straightedge in accordance with ACI 302.1R and not vary more than 1/4" between opposite exterior walls, unless otherwise called for on the Drawings.
- F. Backfill pipe trenches below footings with 2,000-psi concrete.

3.3 COMPACTION

- A. Vibrate all concrete or work by hand where vibration cannot be used to assure close contact with all surfaces of the forms and reinforcement. Vibrate for sufficient duration to accomplish thorough compaction and complete embedment of reinforcement but not long enough to cause separation of the mix.
- B. Thorough and effective consolidation of the concrete is most important to produce the intended results. Surface discontinuities normally acceptable for structural concrete are not tolerable for architectural type of work. Small bug holes and other discontinuities must be minimized.
- C. Provide either motor-in-head type vibrator with 180-cycle generators or 2-1/2 horsepower motor-on-shaft type vibrator of length required for the purpose. Motor-in-head units with 60-cycle power or similar sources will not be allowed. The vibrator shall be subject to the approval of the Architect. Minimum frequency shall be 10,000 impulses per minute. The Contractor shall thoroughly familiarize himself with all requirements and discussion of the vibrator selection included in ACI 309R. General use of vibrators for this construction shall have heads from 2-1/4" to 2-5/8" diameter and length of 16".

3.4 FINISHING

- A. Architectural Concrete Wall Surfaces Exposed to View:
 - 1. Remove fins and projections and patch defective areas with patching compound.
 - 2. Provide a smooth finish.
- B. Concrete Wall Surfaces Covered by Furring: Remove fins and projections.
- C. Interior Floor Slabs:
 - 1. Apply smooth trowel finish. Finish floor slab free from small hollows or bumps and graded to the indicated elevations. Consolidate concrete surface by hand troweling to provide surface free of trowel marks and level to Class A, 1/8" in 10'-0" maximum variation.
 - 2. Concrete floor slabs receiving carpeting, resilient floor covering, or other applied finishes shall be free of defects that will show through the covering. However, should such defects occur, correct by grinding or with an overlay of latex mastic leveling the floor to meet the above requirements.
- D. Exterior Walks, Stair Treads, Ramps, and Slabs: Specified in Section 32 13 13 CONCRETE PAVING.
- E. Exterior Formed Curbs: Specified in Section 32 13 13 CONCRETE PAVING.
- G. Stairs: Hand trowel and form for even and true surfaces. Provide 3 each 1/4" deep scoring with 1/8"

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radii full length of each tread starting 2" back from nosing and spaced 1" apart. Broom treads lengthwise with medium broom finish texture approved by the Architect. Clean out score lines after brooming.

3.5 CONCRETE CURING

- A. Begin initial curing as soon as all of the free water has disappeared from exposed surfaces.
- B. Where possible, keep continuously moist for not less than 72 hours. Keep forms moist until removed.
- C. Apply moisture-retaining cover to interior floor slabs scheduled to receive resilient flooring or ceramic tile.
- D. Liquid Membrane Forming Curing Compound: Apply moisture-retaining cover to exterior curbs, walks, stairs, and ramps.
- F. Curing Compound: Apply when all free water has disappeared and surface cannot be marred. Use low pressure sprayer, roller, or brush. Do not dilute material. Apply uniformly without puddles. Apply as soon as possible to fresh concrete.
- I. Sealer and Liquid Penetrating Hardener:
 - 1. Apply when temperatures are above 40°F. Avoid contact with glass, aluminum, and polished metal surfaces.
 - 2. All surfaces to be treated must be clean and sound. Remove all membrane forming curing compounds, sealers, oil, grease, dirt, and other contaminants. For best results, also remove any concrete laitance and patch or fix all cracks and damaged areas. Apply onto the surface by sprayer, roller, brush, or pouring. Work in by using a mechanical buffer until the product begins to gel, then dampen with water and work for another 5-10 minutes. Rinse and then squeegee or brush off excess material until dry. Apply a second coat to porous or rough surfaces as required by the Architect.

3.6 CONCRETE TESTING

- A. When required by the 2009 International Building Code (IBC) and the Oregon 2010 Structural Specialty Code Amendments, Chapter 17, Structural Tests and Special Inspections, the Owner will employ an independent testing laboratory to evaluate concrete delivered to and placed at the Site. Concrete strength tests for quantities less than 10-cubic yards will not be required when waived by the Building Official and the Architect.
 - 1. Special Inspection Program (Established Per the 2009 International Building Code (IBC) and the Oregon 2010 Structural Specialty Code Amendments, Section 109 and Chapter 17): Refer to Structural Notes on Structural Drawings for Special Inspection Requirements.
 - 2. Provide sufficient notice and access for the special inspector to perform inspections.
- B. Inspection includes checking of formwork, placement of reinforcing steel, and placing and finishing of concrete work to insure workmanship, control of materials, and compliance with the Specifications.
- C. Comply with the 2009 International Building Code (IBC) and the Oregon 2010 Structural Specialty Code Amendments, Section 1903, Specifications for Tests and Materials and Section 1904, Durability Requirements for evaluation and acceptance of concrete.

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- D. Contractor shall coordinate with the independent testing laboratory and provide storage for shipping boxes, cylinder molds, and assist in storage and shipping of cylinders.
- E. Test 1 field cured cylinder prior to removing shoring under structural slabs, joists, or beams.
- F. When required, perform tests as follows:
 - 1. Sampling: ASTM C172.
 - 2. Slump: ASTM C143, 1 test for each truck load at point of discharge for ready mixed concrete and each batch of Site mixed concrete.
 - 3. Compression Test Specimens: ASTM C31, 1 set for day set of structural concrete pour or each 50-cubic yards or fraction thereof of each class of concrete.
 - 4. Air Content: Make tests at the site in accordance with ASTM C231 pressure method.
 - 5. Compressive Strength Tests: ASTM C39, 1 specimen tested at 7 days, 2 specimens tested at 28 days, and 1 retained for later testing, if required.
- G. Written reports by the independent testing laboratory shall be submitted on all tests and inspections made to the Architect, Contractor, ready-mix producer, Structural Engineer, Owner, and other offices as directed by the Architect. Such reports shall be completely filled out before submittal.
- H. If the results of testing shows that any part of the structure contains material which is below the requirements called for by these Specifications, that portion of the Work shall be subject to condemnation by the Architect. Any work so condemned shall be removed and replaced as directed by the Architect at the Contractor's expense including the Architect's extra supervision costs.

3.7 ADJUSTING AND CLEANING

- A. Surface Repairs: Thoroughly clean, dampen with water, and brush-coat the area to be patched with Bonding Agent.
- B. Fill honeycomb voids and rock pockets with Patching Compound.
- C. Compact in place and screed flush, or slightly higher than surrounding surface. Finish to match adjoining work. Strike off excess mortar at surface.
- D. If defects in color or texture of surface cannot be repaired, remove and replace the concrete.

3.8 PROTECTION

- A. Barricade fresh concrete slabs, stairs, ramps, and walks for 24-hours minimum.
- B. Cover fresh concrete with plywood where exposed to public, pedestrian, or animal traffic.

END OF SECTION

PRECAST ARCHITECTURAL CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. Work Included:
 - 1. Pre-cast concrete wall caps as indicated on Drawings and as specified herein.
- B. Testing: Provided by Owner.

1.2 REFERENCES

- A. The following specifications, standards, and codes shall govern the fabrication unless modified by this specification.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM C33: Standard Specification for Concrete Aggregates.
 - 2. ASTM C150: Standard Specification for Portland Cement.
 - 3. ASTM C185: Standard Test Method for Air Content of Hydraulic Cement Mortar.
 - 4. ASTM C260: Standard Specification for Air-Entraining Admixtures for Concrete.
 - 5. ASTM C494: Standard Specification for Chemical Admixtures for Concrete.
- C. Precast/Prestressed Concrete Institute:
 - 1. PCI MNL-117: Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products.
 - 2. The following documents, while not a part of these specifications except for sections specifically referred to herein, describe recognized acceptable practices.
 - a. PCI MNL-116: Manual for Quality Control for Plants and Production of Structural Precast Concrete Products.
 - b. PCI MNL-119: PCI Drafting Handbook - Precast and Prestressed Concrete.
 - c. PCI MNL-120: PCI Design Handbook - Precast and Prestressed Concrete.
 - d. PCI MNL-127: Erector's Standards and Guidelines for the Erection of Precast Concrete Products.

1.3 SUBMITTALS

- A. Shop Drawings:
 - 1. Expedite submittals, with the Architect, to conform with shop drawing approval time shown on the precast concrete supplier's order acknowledgement.
 - 2. Content:
 - a. Unit shapes (elevations and sections) and dimensions.
 - b. Finishes.
 - c. Joint and connection details.
 - d. Lifting and erection inserts.
 - e. Location, dimensional tolerances, and details of anchorage devices that are embedded in, or attached to, structure or other constructions.
 - f. Other items cast into panels.
 - g. Handling procedures, plans, and elevations showing panel location and sequence of erection for special conditions.
 - h. Relationship to adjacent material.
 - 3. Show location of unit by same identification marker placed on panel.
- B. Test Reports: Submit the following upon request:
 - 1. Reports on materials.

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2. Compressive strength tests on concrete.
 3. Water absorption tests on units.
- C. Design Calculations: Submit structural design calculations for both gravity and lateral loading stamped by a licensed structural engineer registered in the State of Oregon.
- D. Design Modifications:
1. Submit design modifications necessary to meet performance requirements and field coordination.
 2. Variations in details or materials shall not adversely affect the appearance, durability, or strength of units.
 3. Maintain general design concept without altering size of members, profiles, and alignment.
- 1.4 QUALITY ASSURANCE
- A. Manufacturer Qualifications:
1. The precast concrete manufacturing plant shall be certified by the Precast/Prestressed Concrete Institute, Plant Certification Program, prior to the start of production, or:
- B. Allowable Tolerances: Manufacture wall caps so that dimensional tolerances meet the following:
1. 10 ft or Under: $\pm 1/8"$.
 2. 10 to 20 ft: $\pm 1/8"$, $-3/16"$.
 3. Total Thickness or Flange Thickness: $-1/8"$, $+1/16"$.
 4. Angular Variation of Plane of Side Mold: $\pm 1/32"$ per 3" of depth or $\pm 1/16"$, in whichever is greater.
 5. Variation From Square or Designated Skew (difference in length of the two diagonal measurements): $\pm 1/8"$ per 6 ft of diagonal or $\pm 1/2"$ whichever is greater.
 6. Warping: $1/16"$ per ft of distance from nearest adjacent corner.
- C. Position Tolerances: For cast-in items measured from datum line location as shown on approved erection drawings:
1. Inserts: $\pm 1/2"$.
 2. Handling Devices: $\pm 3"$.
 3. Reinforcing Steel and Welded Wire Fabric: $\pm 1/4"$.
- 1.5 DELIVERY, STORAGE, AND HANDLING
- A. Deliver all architectural precast concrete units to project site in such quantities and at such times to assure continuity of erection.
- B. Handle and transport units in a position consistent with their shape and design in order to avoid stresses which would cause cracking or damage.
- C. Lift or support units only at the points shown on the shop drawings.
- D. Place nonstaining resilient spacers of even thickness between each unit.
- E. Support units during shipment on non-staining shock-absorbing material.
- F. Do not place units directly on ground.
- G. Store and protect units to prevent contact with soil, staining, and physical damage.

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- H. Store units, unless otherwise specified, with non-staining, resilient supports located in same positions as when transported.
- I. Store units on firm, level, and smooth surfaces to prevent cracking, distortion, warping, or other physical damage.
- J. Place stored units so that identification marks are discernible and so that product can be inspected.

1.6 JOB CONDITIONS

- A. Erector shall examine all parts of the supporting structure and the conditions under which the precast concrete work is to be erected and notify Contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the installation until unsatisfactory conditions have been corrected in a manner acceptable to the Erector.
- B. Verify dimensions of supporting structures at the Project Site and adjust final shop drawings to reflect actual filed dimensions.

1.7 WARRANTY

- A. Guarantee the precast concrete products against defects in materials and workmanship for a period of 1-year after acceptance of the units by the Owner.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: All materials shall comply with the specifications, standards, and codes given for each material covered in this Section. Furnish satisfactory certification reports that all materials incorporated in the architectural precast concrete products comply with the requirements herein specified.
- B. Formwork/Molds:
 - 1. Provide forms of metal, plastic, or other acceptable material that are non-reactive with concrete and will produce the required smooth, flat finish surfaces.
 - 2. Accurately construct forms, mortar-tight, and of sufficient strength. Maintain formwork to provide completed precast concrete units of the shapes, lines, and dimensions indicated.
- C. Portland Cement:
 - 1. ASTM C150: Type I or II.
 - 2. Use same brand, type, and source of supply throughout.
- D. Air-Entraining Agent: ASTM C260.
- E. Water Reducing, Retarding, Accelerating, High Range Water Reducing Admixtures: ASTM C494.

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- F. Facing Aggregates: Material and color to match existing.
 - 1. Provide fine and coarse aggregates for each type of exposed finish from a single source (pit or quarry) for entire job. They shall be clean, hard, strong, durable, and inert, free of staining or deleterious material.
 - 2. Coarse Aggregate: ASTM C33; hard, durable, carefully selected and graded, free of material causing staining or reacting with cement.
 - 3. Fine Aggregate: ASTM C33; manufactured sand of same material as coarse aggregate, unless acceptable to Architect.
- G. Backup Concrete Aggregates: Provide fine and coarse aggregates from a single source (pit or quarry) for entire job. They shall be clean, hard, strong, durable and inert, free of staining or deleterious material.
- H. Water: Potable or free from deleterious matter that may interfere with the color, setting, or strength of the concrete. Free from foreign materials in amounts harmful to concrete and embedded steel.
- I. Calcium Chloride: Do not use calcium chloride.
- J. Cement Grout: Portland cement, sand, and water sufficient for placement and hydration.
- K. Stainless Steel Rods: 3/8" diameter stainless steel rods cast into wall caps as indicated on Drawings.
- L. Epoxy Adhesive: Hilti Hit-Hy 150 Max, or accepted substitute.

2.2 MIXES

- A. Prepare design mixes for each type of concrete required. Design mixes may be prepared by an independent testing facility or by qualified precast manufacturing personnel, at precast manufacturer's option.
- B. Proportion mixes by either laboratory trial batch or field experience methods, using materials to be employed on the Project for each type of concrete required, complying with ACI 211.1.
 - 1. 28 Day Compressive Strength: Minimum of 3000-psi.
 - 2. Maximum Aggregate Size: 3/4".
 - 3. Minimum Cement Content: 658 lbs. per cubic yard of concrete.
 - 4. Slump at Point of Discharge: 3" maximum.
- C. Adjustment to Concrete Mixes: Mix design adjustments may be requested when characteristics of materials, job conditions, weather, test results, or other circumstances warrant. Laboratory test data of revised mix designs and strength results must be submitted to and accepted by Architect before using in the work.
- D. Admixtures:
 - 1. Air Entrainment: Amount produced by adding dosage of air entraining agent that will provide 19% \pm 3% of entrained air in standard 1:4 sand mortar as tested according to ASTM C185; or minimum 3%, maximum 6%.
 - 2. Use air-entrainment admixtures in strict accordance with manufacturer's directions. Admixtures to increase cement dispersion, or provide increased workability for low-slump concrete, may be used subject to Architect's acceptance.
 - 3. Use amounts as recommended by admixture manufacturer for climatic conditions prevailing at time of placing. Adjust quantities of admixtures as required to maintain quality control.

2.3 FABRICATION

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- A. Manufacturing procedures shall be in general compliance with PCI MNL-117.
- B. Fabricate units straight, smooth, and true to size and shape, with exposed edges and corners precise and square unless otherwise indicated.
- C. Concrete: Comply with the requirements of ASTM C94, and as herein specified.
 - 1. Delete the references for allowing additional water to be added to the batch for material with insufficient slump. Addition of water to the batch will not be permitted.
 - 2. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mix time than specified in ASTM C94 may be required.
- D. Cover:
 - 1. Provide at least 3/4" cover for reinforcing steel.
 - 2. Do not use metal chairs, with or without coating, in the finished face.
 - 3. Provide embedded anchors, inserts, plates, angles, and other cast-in items, as indicated on shop drawings, with sufficient anchorage and embedment for design requirements.
- E. Molds/Formwork:
 - 1. Use rigid molds to maintain units within specified tolerances conforming to the shape, lines, and dimensions shown on the approved shop drawings.
 - 2. Construct molds to withstand vibration method selected.
- F. Coat surfaces of forms with a bond-breaking compound before reinforcement is placed. Provide commercial formulation form-coating compounds that will not bond with, stain nor adversely affect precast surfaces, and will not impair subsequent treatments of concrete surfaces requiring bond or adhesion. Apply in compliance with manufacturer's instructions.
- G. Concreting: Place concrete in a continuous operation to prevent formation of seams or planes of weakness in precast units, complying with ACI 304. Thoroughly consolidate placed concrete by internal and external vibration without dislocation or damage to built-in items.
 - 1. Convey concrete from the mixer to place of final deposit by methods that will prevent separation, segregation or loss of material.
 - 2. Consolidate all concrete in the mold by high frequency vibration, either internal or external or a combination of both, to eliminate unintentional cold joints, honeycomb, and to minimize entrapped air on vertical surfaces.
- H. Curing: Cure precast concrete units until the compressive strength is high enough to ensure that stripping does not have an effect on the performance or appearance of the final product.
- I. Unit Identification: Provide permanent markings in precast units to identify pick-up points and orientation in the structure.
 - 1. Mark each precast concrete unit to correspond to identification mark on shop drawings for unit location.
 - 2. Mark each precast concrete unit with date cast on a surface which will not show in finished structure.

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- J. Surface Finish: Fabricate precast units and provide exposed fine aggregate finish, using chemical etching agents applied to concrete, with washing, brushing and other procedures as required to match existing.
- K. Acceptance: Architectural precast concrete units which do not meet the color and texture range of the dimensional tolerances will be rejected at the option of the Architect if they cannot be satisfactorily corrected.

PART 3 - EXECUTION

3.1 INSPECTION

- A. The Contractor shall verify that structure and anchorage inserts not within tolerances required to install precast units have been corrected before installing architectural precast concrete.
- B. Determine field conditions by actual measurements.

3.2 PREPARATION

- A. Deliver anchorage items which are to be embedded on other construction before the start of such work. Provide setting diagrams, templates, instructions and directions as required for installation.
- B. Do not install precast units until concrete has attained its design ultimate compressive strength.

3.3 ERECTION

- A. Erect adequate barricades, warning lights, or signs to safeguard traffic in the immediate area of hoisting and handling operations.
- B. Set precast concrete units level, plumb, square, and true within the allowable tolerances. Provide true and level bearing surfaces on all field placed walls which are to receive precast concrete units. Provide lines, center, and grades in sufficient detail to allow installation.
- C. Provide temporary supports and bracing to maintain position, stability, and alignment as units are being permanently connected.
- D. Install precast units without exceeding the following tolerance limits:
 - 1. Variations from Plumb: ¼” in any 20 foot run or story height; ½” total in any 40 foot or longer run.
 - 2. Variations from Level or Elevation: ¼” in any 20 foot run; ½” in any 40 foot run; total plus or minus ½” at any location.
 - 3. Offset in Alignment of Adjacent Members at Any Joint: 1/8” in any 10 foot run; ¼” maximum.
 - 4. Provide temporary supports and bracing as required to maintain position, stability, and alignment as members are being permanently connected.
 - 5. Maintain horizontal and vertical joint alignment and uniform joint width as erection progresses.
- E. Accessories: Install clips, hangers, and other accessories required for erection of precast units to supporting members and back-up materials.

PRECAST ARCHITECTURAL CONCRETE

3.4 REPAIR

- A. Replace unsatisfactory precast units as required. Repair exposed exterior surface to match color and texture of surrounding concrete and to minimize shrinkage.
- B. In-place precast units may be rejected for any of the following:
 - 1. Exceeding the specified installation tolerances.
 - 2. Damaged during construction operations.
 - 3. Exposed-to-view surfaces which develop surface finish deficiencies.
 - 4. Other defects as listed in PCI MNL-117.

3.5 CLEANING

- A. After installation and joint treatment, clean soiled precast concrete surfaces with detergent and water, using fiber brush and sponge, and rinse then thoroughly with clean water in accordance with precast concrete manufacturer's recommendation. Use cleaning materials or processes that will not change the character of exposed concrete finish.

3.6 PROTECTION

- A. Adequately protect all work and materials of other trades at all times.
- B. The erector shall be responsible for any chipping, spalling, cracking, or other damage to the units after delivery to the jobsite, unless damaged in the site storage area by others. After installation is completed, any further damage shall be the responsibility of Contractor.

END OF SECTION

CONCRETE UNIT MASONRY

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide concrete masonry unit work as indicated on the Drawings and as specified herein.

1.2 REFERENCES

- A. American Concrete Institute (ACI):
 - 1. ACI 530.1 - Specification for Masonry Structures.
- B. ASTM International (ASTM):
 - 1. ASTM A615: Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
 - 2. ASTM C90: Standard Specification for Hollow Load-Bearing Concrete Masonry Units.
 - 3. ASTM C91: Standard Specification for Masonry Cement.
 - 4. ASTM C144: Standard Specification for Aggregate for Masonry Mortar.
 - 5. ASTM C150: Standard Specification for Portland Cement.
 - 6. ASTM C207: Standard Specification for Hydrated Lime for Masonry Purposes.
 - 7. ASTM C270: Standard Specification for Mortar for Unit Masonry.
 - 8. ASTM C476: Standard Specification for Grout for Masonry.
 - 9. ASTM C979: Standard Specification for Pigments for Integrally Colored Concrete.
 - 10. ASTM E72: Standard Test Methods of Conducting Strength Tests of Panels for Building Construction.
 - 11. ASTM E119: Standard Test Methods for Fire Tests of Building Construction and Materials.
 - 12. ASTM E514: Standard Test Method for Water Penetration and Leakage Through Masonry.
- C. International Masonry Industry All-Weather Council (IMIAC):
 - 1. IMIAC - International Masonry Industry All-Weather Council (IMIAC): Recommended Practices and Guide Specifications for Cold Weather Masonry Construction.
 - 2. IMIAC - International Masonry Industry All-Weather Council (IMIAC): Recommended Practices and Guide Specifications for Hot Weather Masonry Construction.
- D. National Concrete Masonry Association (NCMA):
 - 1. NCMA TEK Bulletin #8-2A - Removal of Stains from Concrete Masonry.
 - 2. NCMA TEK Bulletin #8-3A - Control and Removal of Efflorescence.
 - 3. NCMA TEK Bulletin #10-1 - Design of Concrete Masonry for Crack Control.
 - 4. NCMA TEK Bulletin #19-2 - Details for Building Dry Concrete Masonry Walls.
 - 5. NCMA TEK Bulletin #19-4 - Flashing - Concrete Masonry.
- E. 2010 Oregon Structural Specialty Code (based on 2009 International Building Code).
 - 1. Chapter 21 Masonry.
- F. The Masonry Society (TMS):
 - 1. TMS 602: Building Code Requirements and Specification for Masonry Structures.

1.4 SUBMITTALS

- A. Product Data: Manufacturer's product data for each type of masonry unit, accessory and other manufactured products.
- B. Compliance: Certifications that each type of product and material complies with specified requirements.

CONCRETE UNIT MASONRY

- C. Color Selection: For initial selection submit:
 - 1. Unit masonry samples showing full extent of colors and textures available for each type of exposed unit masonry required.
 - 2. Colored mortar samples showing full extent of colors available.
- D. Samples: For verification purposes submit:
 - 1. Samples for each type of exposed masonry unit specified, including full range of color and texture to be expected in completed work.
 - 2. Colored masonry mortar samples for each color required. Show full range of color which can be expected in finished work; label samples to indicate type and amount of colorant used.
- E. Submit warranties.

1.5 QUALITY ASSURANCE

- A. Fire Performance Characteristics: Where indicated, provide materials and construction that are identical to those of assemblies, equivalent thicknesses, and whose fire endurance has been determined in compliance with ASTM E119 by means acceptable to authorities having jurisdiction.
- B. Mock-Ups:
 - 1. Before installation of masonry work, erect mock-ups:
 - a. To further verify selections made for color and texture characteristics under sample submittals of masonry units and mortar.
 - b. To represent completed masonry work for qualities of appearance, materials, construction and workmanship.
 - 2. Erect mock-ups approximately 6 feet (1829 mm) long by 4 feet (1219 mm) high by full thickness, for the following types of masonry, including face and back-up wythes as well as accessories:
 - a. Each type of exposed unit masonry work.
 - b. Typical exterior wall.
 - c. Acceptable samples may be incorporated in the Work.
 - d. The sample will be used to demonstrate the cleaning of and application of water repellent on the masonry veneer.
- B. Pre-Installation Conference: Notify the Architect, masonry manufacturer's representative, installer, and Owner at least 48-hours before starting the masonry veneer installation. Arrange a mutually acceptable time for meeting at the job with all notified parties to review the specifications and job conditions. Obtain the acceptance and approval of all parties on materials, details, and methods before beginning the masonry veneer work.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver masonry materials to Project in undamaged condition.
- B. Deliver concrete masonry veneer on covered pallets, stored above grade, and protected from moisture.
- C. Store and handle materials to prevent their deterioration or damage due to moisture, freezing, contaminants, corrosion or other causes.
- D. Store cementitious materials off the ground, under cover, and in a dry location.
 - 1. Keep bagged materials dry, protected from weather damage, and with complete labels and identification on wrappings. Store aggregates sheltered from weather. Remove and discard all damaged and contaminated materials.

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- E. Do not bend or deform reinforcing during handling and storage. Maintain clean and free of rust and contamination detrimental to bond.
- F. Store masonry accessories, including metal items, to prevent deterioration by corrosion and accumulation of dirt.

1.7 SITE CONDITIONS

- A. Temperature and Moisture Requirements: Protect concrete masonry veneer units from excessive moisture during installation.
- B. Do not install concrete masonry units when the outside temperature falls below 40°F or rises above 90°F.

PART 2 – PRODUCTS

2.1 MANUFACTURER

- A. Concrete Masonry Veneer: Basalite Concrete Products, LLC.
 - 1. Obtain products from a single manufacturer.
- B. Integral Water-Repellent: Dry-Block as manufactured by Grace Construction Products, or accepted substitute.
- C. Mortar Color:
 - 1. "DesignMix" (as supplied by Mutual Materials).
 - 2. "True Tone" Cement Color by Davis Colors.
 - 3. Laticrete, "Polyblend" by Custom Building Products.
 - 4. "Flextile" by Thompson Tile.
 - 5. "Top" by Trym-Tex, Inc.
 - 6. "Hydroment" by Bostik.
 - 7. Scofield.
 - 8. Or accepted substitute.
- D. Masonry Cleaner: As approved.
- E. Water Repellent: Specified in Section 07 19 00 WATER REPELLENTS / GRAFFITI BARRIERS.

2.2 CONCRETE MASONRY UNITS

- A. Standard Concrete Masonry Units:
 - 1. Product: Basalite Precision Concrete Masonry Units.
 - 2. Applicable Standards: ASTM C90-06A, Lightweight Classification.
 - 3. Concrete block masonry units (CMU) shall be medium weight sand units and 115 lbs per cubic foot conforming to ASTM C90 with linear drying shrinkage limited to 0.065% and rate of absorption not exceeding 0.035 ounces of water per sq. in. of surface at the time of placement.
 - 4. Face: Smooth uniform texture.
 - 5. Size: 8" high x 16" long x 8" deep and 8" high x 16" long x 10" deep (nominal face dimensions) as indicated on Drawings.
 - 6. Colors: Provide units in the following colors at locations as indicated on Drawings.
 - a. Charcoal.

CONCRETE UNIT MASONRY

- b. Natural.
 - 7. Shapes: Provide special shapes where required for lintels, jambs, corners, sash, control joints, headers, bonding and other special conditions.
 - 8. All units to have integral water-repellent (Dry-Block as manufactured by Grace Construction Products).
- B. Split Face Concrete Masonry Units:
- 1. Product: Basalite Splitface Concrete Masonry Units.
 - 2. Applicable Standards: ASTM C90-06A, Lightweight Classification.
 - 3. Concrete block masonry units (CMU) shall be medium weight sand units and 115 lbs per cubic foot conforming to ASTM C90 with linear drying shrinkage limited to 0.065% and rate of absorption not exceeding 0.035 ounces of water per sq. in. of surface at the time of placement.
 - 4. Face: Unevenly textured appearance. Dry
 - 5. Size: 8" high x 16" long x 8" deep (nominal face dimensions) unless otherwise indicated on Drawings.
 - 6. Colors: Provide units in the following colors at locations as indicated on Drawings.
 - a. Charcoal.
 - 7. Shapes: Provide special shapes where required for lintels, jambs, corners, sash, control joints, headers, bonding and other special conditions.
 - 8. All units to have integral water-repellent (Dry-Block as manufactured by Grace Construction Products, or accepted substitute).

2.3 MASONRY ACCESSORIES

- A. Steel Bar Reinforcement: ASTM A615, Grade 60.
- B. Masonry Bar Positioner: As manufactured by A.A. Wire or accepted substitute.
- C. Steel Jamb Anchors: Type A and Web-Tie Flex-O-Lock by A.A. Wire or accepted substitute.
- D. Masonry Anchors: As indicated on Sheet S0.1 STRUCTURAL NOTES.
- E. Control Joints: Rubber or vinyl with shear strength of not less than 450-psi. "Wide Flange Blok-Joint" by Carter-Waters; "Blok-Tite" by A.A. Wire; "PVC Compound" by Dur-O-Wal; Rapid Poly-Joint; or accepted substitute. Modify length as required and indicated on the Drawings.
- F. Masonry Vents: Greenheck BVF Extruded Aluminum Brick Vents, or accepted substitute.
 - 1. Frame: Heavy gauge extruded 6063T5 aluminum. 1 ½" inch x 0.125 inch nominal wall thickness.
 - 2. Blades: Heavy gauge extruded 6063T5 aluminum, 0.125 inch nominal wall thickness, positioned at 45° angles.
 - 3. Construction: Mechanically fastened.
 - 4. Insect Screen: 18 inch x 14 inch aluminum mesh, inside mount (rear).
 - 5. Size: 15 5/8" wide x 7 ¾" high.
 - 6. Finish: 204-R1 Clear Anodize.

CONCRETE UNIT MASONRY

2.4 WATER REPELLENT ADMIXTURE

- A. Product: Dry-Block as manufactured by Grace Construction Products, or accepted substitute.
 - 1. Applicable Standards:
 - a. Admixture shall provide wind driven rain resistance as measure by ASTM E514-74 Class E, extended to 72 hours.
 - b. Bond strength as determined by ASTM E72 shall not be reduced by the use of water repellent admixture.
 - 2. Performance Requirements:
 - a. Admixture provided in both the masonry unit and the mortar shall constitute a complete integral water repellent system for exterior above grade walls.
 - b. Admixture shall leave the finished surfaces water repellent and shall not alter the natural texture or color of the masonry units or mortar.
 - 3. System:
 - a. Block Admixture: An integral liquid polymeric admixture mixed with concrete during production of concrete masonry units which cross links and becomes permanently locked into the CMU, bond, beam or CMU lintel to provide resistance to water penetration.
 - b. Mortar Admixture: An integral liquid polymeric admixture for use in mortar mix, which cross links and becomes permanently locked into mortar to provide resistance to water penetration.
 - c. Certification: Water Repellent Admixture Dry Block by Grace Construction Products (or equal) concrete masonry units shall be manufactured by a Qualified Producer.
 - d. Concrete masonry units, precast lintels, CMU lintels, bond beams and special shapes shall meet the requirements of ASTM C90-06A.
 - 4. No other admixtures shall be used in conjunction with the water-repellent admixture unless approved in writing by the water repellent admixture manufacturer.

2.5 PRE-BLENDED MORTAR

- A. Manufacturer: Basalite Concrete Products, LLC, www.basalite.com.
- B. Proprietary Products and Systems: Basalite Pre-Blended Mortar Mix, including the following:
 - 1. Material: Pre-blended factory mix of Portland cement, hydrated lime, and fine sand aggregate mixtures. Color pigment may also apply.
 - a. Color: Match existing.
 - 2. Mortar Type:
 - a. Property Mixture: ASTM C270; Type S, 2,800-psi at 28-days.
 - 3. Material Standard for Aggregate: ASTM C144.
 - 4. Material Standard for Portland Cement: ASTM C150.
 - 5. Material Standard for Hydrated Lime: ASTM C207.
 - 6. Material Standard for Pre-Blended Mortar: ASTM C270.
 - 7. Material Standard for Pigments: ASTM C979.
 - 8. All grout to be fine grout conforming to ASTM C476.
- C. Water: Clean and potable.
- D. Integral Water Repellent Admixture: Dry-Block as manufactured by Grace Construction Products, or accepted substitute.

2.9 MASONRY CLEANER AND WATER REPELLENT

CONCRETE UNIT MASONRY

- A. Cleaner: Hot water.
- B. Water Repellent: Specified in Section 07 19 00 WATER REPELLENTS / GRAFFITI BARRIERS.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine areas and conditions under which concrete masonry unit work is to be installed. Correct conditions detrimental to proper and timely completion of work.
- B. Starting work constitutes acceptance of existing conditions.
- C. Examine reinforcing steel prior to placement and replace reinforcing with reduced cross section or bends not indicated on shop drawings.

3.2 PREPARATION

- A. Install field sample of exposed masonry units with tooled joints. Architect will review for appearance and joint finishing only.
- B. Clean existing adjacent masonry surfaces of loose mortar.
- C. Protect existing adjacent surfaces from mortar stains.
- D. Wet concrete masonry units that have a suction rate in excess of 20-grams per minute to reduce the unit suction rate to 20-grams per minute (surface dry condition).

3.3 INSTALLATION

- A. Standards: Comply with the International Building Code or State of Oregon 20010 Structural Specialty Code Amendments, Chapter 21, Masonry and with TMS 602.
- B. Installation of concrete masonry units shall be as specified under this Section and in accordance with ACI/ASCE-530.
- C. Hot and cold weather construction requirements per ACI 530.1/ASCE6/TMS 602 specifications shall apply. Provide temporary bracing of masonry walls as required.
- C. Unit Cutting: Cut as required for openings and joints. Avoid use of less than half size units.
- D. Unit Placement: Install units plumb, true and level in half running or stack bond. Use special units where required. Set units flush on exposed side of wall and allow variation in unit thickness to run on concealed face of wall.
 - 1. Completely cover the bedding area of the units at all bed, head and web joints with mortar (100% mortar filling is required).

CONCRETE UNIT MASONRY

- E. Joint Size and Profile:
 - 1. Concrete Masonry Units: 3/8" thick, tooled concave except flush at concealed surfaces. Double strike all exterior joints.
- F. Temporary Support: Provide temporary support until masonry walls develop required strength.
- G. Grouting: Place grout in concrete masonry units concrete masonry units with low-lift or high-lift grouting techniques.
 - 1. Grout lifts shall not exceed 5 ft in height. Consolidation must be performed in each grouted cell immediately after grout placement with a mechanical vibrator. Rodding is not an acceptable means of grout consolidation. Grout pours shall be reconsolidated by mechanical vibration after initial water loss and settlement has occurred. All procedures for high lift grouting are optional and are to be reviewed and accepted by the engineer of record prior to grouting.
 - 2. Clean outs shall be provided in the bottom course of masonry for each grout pour when the grout pour height exceeds 5 ft. Where required, cleanouts shall be provided at every vertical bar but shall not be spaced more than 32 inches on center for solid grouted masonry.
 - 3. Construct cleanouts with an opening of sufficient size to permit removal of debris, with a minimum opening dimension of 3 inches. Cleanouts shall be adequately sealed after inspection and before grouting to resist grout pressure.
- H. Mortar:
 - 1. Mortar Placement: Provide full face shell mortar beds for hollow masonry units. Double butter to fill vertical head joints solid with mortar.
 - 2. Mortar Setting: Do not use mortar that has begun to set or is beyond the recommended elapsed time since initial mixing (2-hours). Retemper mortar during the recommended elapsed time period only to restore workability.
- I. Reinforcing Steel: Provide as indicated on Drawings.
 - 1. Position reinforcing bars at spacing indicated. Secure vertical bars with bar positioners at 48" on center.
 - 2. Splice bars where indicated with not less than 48 bar diameters for #4 and smaller, 60 bar diameters for #5, and 96 bar diameters for #6 bar diameters or 2'-0" minimum. Stagger splices.
 - 3. Extend all reinforcing steel a minimum of 38 inches beyond edges of opening. Provide matching corner bars for all bond beams. Vertical reinforcing steel in masonry walls to be at center line of wall unless indicated otherwise. Reinforcement must be restrained to prevent movement from construction loads and during placement of mortar and grout. Wire-tying or prefabricated positioners are methods of providing the necessary restraint for reinforcement. Wet-setting of reinforcement is not permitted.
- J. Masonry Accessories:
 - 1. Install anchor bolts and pipe sleeves where detailed. Install reglets in mortar joints where exposed flashing meets masonry.
 - 2. Install vertical control joints as indicated or required to control cracking.
- K. Flashing System:
 - 1. Lay the course(s) of block below the desired flashing level until above finish grade.
 - 2. Install the flashing system by spacing two units on each block or evenly along a formed concrete foundation or slab. The drip edge weep spout should extend slightly beyond the exterior face of the block unit it is resting on a minimum 4" above finish grade.

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3. Span the continuous row of flashing with the flashing system bridge units. This will serve to divert descending water into adjoining flashing units.
4. If the walls are reinforced, simply eliminate the flashing system unit and adjoining bridges at the grouted core. Cross-bed the webs adjacent to the core to be grouted making sure to overlap the flashing system flange. This will prevent grout from spreading beyond the intended core.
5. Utilize standard mortar spreading techniques with mortar lapped, first over the inner and second over the outer flanges of the flashing system units.
6. Reduce clogging from mortar and grout droppings by installing a 2" to 3" layer of pea stone into the core cavity above the flashing system.
7. Tool all head and bed joints and remove any obstruction from the weep spouts.

L. Masonry Vents: Install as indicated on Drawings.

3.4 FIELD QUALITY CONTROL

- A. The field quality control will be verified by an independent testing laboratory retained by the Owner as per Section 01 45 23, Testing Laboratory Services.
- B. Test Requirements: ASTM C270.
- C. Water Retention: ASTM C91, flow after suction 70% of initial flow.
- D. Compressive Strength: ASTM C91, 2,000-psi in 28-days.
- E. Prism Tests: Provide one mortar prism test for each 5,000 square feet of concrete masonry unit work.

3.5 ADJUSTING AND CLEANING

- A. Adjusting: Remove mortar from concrete masonry unit cavities where solid grout is required. Remove and reinstall concrete masonry units not in alignment or not bonded by mortar. Remove misplaced, broken or unbonded concrete masonry units. Adjust reinforcing steel and accessory placement prior to placing concrete grout.
- B. Joint Repair: Rake and re-point defective masonry joints where directed.
- C. Cleaning:
 1. Remove excess material from the Site. Clean adjacent surfaces where damaged by masonry work as directed.

3.5 MASONRY CLEANING

- A. Comply with applicable environmental laws and restrictions.
- B. Comply with cleaning procedures and recommendations of the manufacturers of both the cleaning solution and the unit masonry.
 1. Utilize the same approved cleaning procedure as used on the mock-up.
- C. Remove efflorescence from masonry wall exposed in the finished work in accordance with manufacturer's recommendation and NCMA TEK Bulletin #8-3A.
- D. Remove dirt or stains from masonry walls exposed in the finished work in accordance with the manufacturer's recommendations and NCMA TEK Bulletin #8-2A.

CONCRETE UNIT MASONRY

- E. Masonry with Integral Water Repellent Admixtures:
 - 1. Promptly remove excess wet mortar containing integral water repellent mortar admixture from the face of the masonry as work progresses.
 - 2. Do not power wash masonry with water repellent admixtures.
- F. Cleaning Procedures:
 - 1. Scrape off any large mortar deposits prior to cleaning.
 - 2. Steam clean masonry surfaces prior to installation of Water Repellents / Graffiti Barriers.
 - 3. Citric Cleaners: Where steam cleaning is inadequate, Contractor may elect to use citric cleaners when such cleaners are acceptable to Architect, Owner's Representative and Jurisdiction Having Authority. Comply with cleaner's written instructions.
 - a. Collect, contain and dispose of masonry cleaners, in compliance with DEQ and local jurisdiction rules and regulations. Do not allow into storm drainage/sewer systems.

3.6. WATER REPELLENTS/GRAFFITI BARRIERS

- A. Water Repellent Application: Specified in Section 07 19 00 WATER REPELLENTS / GRAFFITI BARRIERS.

3.6 PROTECTION

- A. Protect mortar from rain and freezing temperatures until the end of the curing period.
- B. Protection: During installation, cover the top of unfinished masonry work to protect it from the weather and to prevent accumulation of water in the cores of the masonry units.
- C. Protect installed work from damage due to subsequent construction activity on the Site.

END OF SECTION

CONCRETE UNIT VENEER MASONRY

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide concrete masonry veneer work as indicated on the Drawings and as specified herein. Include glazed concrete masonry units as indicated and specified herein.

1.2 REFERENCES

- A. American Concrete Institute (ACI):
 - 1. ACI 530.1 - Specification for Masonry Structures.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM A36: Standard Specification for Carbon Structural Steel.
 - 4. ASTM C90-06A - Standard Specification for Load-Bearing Concrete Masonry Units.
 - 5. ASTM C129 - Standard Specification for Non-Load-Bearing Concrete Masonry Units.
 - 6. ASTM C140: Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.
 - 4. ASTM C144: Standard Specification for Aggregate for Masonry Mortar.
 - 5. ASTM C150: Standard Specification for Portland Cement.
 - 6. ASTM C207: Standard Specification for Hydrated Lime for Masonry Purposes.
 - 7. ASTM C270 - Standard Specification for Mortar for Unit Masonry.
 - 8. ASTM C331 - Standard Specification for Lightweight Aggregates for Concrete Masonry Units.
 - 9. ASTM C744: Standard Specification for Prefaced Concrete and Calcium Silicate Masonry Units.
- C. International Masonry Industry All-Weather Council (IMIAC):
 - 1. IMIAC - International Masonry Industry All-Weather Council (IMIAC): Recommended Practices and Guide Specifications for Cold Weather Masonry Construction.
 - 2. IMIAC - International Masonry Industry All-Weather Council (IMIAC): Recommended Practices and Guide Specifications for Hot Weather Masonry Construction.
- D. National Concrete Masonry Association (NCMA):
 - 1. NCMA TEK Bulletin #8-2A - Removal of Stains from Concrete Masonry.
 - 2. NCMA TEK Bulletin #8-3A - Control and Removal of Efflorescence.
 - 3. NCMA TEK Bulletin #10-1 - Design of Concrete Masonry for Crack Control.
 - 4. NCMA TEK Bulletin #19-2 - Details for Building Dry Concrete Masonry Walls.
 - 5. NCMA TEK Bulletin #19-4 - Flashing - Concrete Masonry.
- E. 2010 Oregon Structural Specialty Code (based on 2009 International Building Code).
 - 1. Chapter 21 Masonry.

1.3 SUBMITTALS

- A. Product Data: Manufacturer's product data for each type of masonry unit, accessory and other manufactured products.
- B. Compliance: Certifications that each type of product and material complies with specified requirements.

CONCRETE UNIT VENEER MASONRY

- C. Color Selection: For initial selection submit:
 - 1. Unit masonry samples showing full extent of colors and textures available for each type of exposed unit masonry required.
 - 2. Colored mortar samples showing full extent of colors available.
- D. Samples: For verification purposes submit:
 - 1. Samples for each type of exposed masonry unit specified, including full range of color and texture to be expected in completed work.
 - 2. Colored masonry mortar samples for each color required. Show full range of color which can be expected in finished work; label samples to indicate type and amount of colorant used.
- E. Submit warranties.

1.4 QUALITY ASSURANCE

- A. Fire Performance Characteristics: Where indicated, provide materials and construction that are identical to those of assemblies, equivalent thicknesses, and whose fire endurance has been determined in compliance with ASTM E 119 by means acceptable to authorities having jurisdiction.
- B. Mock-Ups:
 - 1. Before installation of masonry work, erect mock-ups:
 - a. To further verify selections made for color and texture characteristics under sample submittals of masonry units and mortar.
 - b. To represent completed masonry work for qualities of appearance, materials, construction and workmanship.
 - 2. Erect mock-ups approximately 6 feet (1829 mm) long by 4 feet (1219 mm) high by full thickness, for the following types of masonry, including face and back-up wythes as well as accessories:
 - a. Each type of exposed unit masonry work.
 - b. Typical exterior wall.
 - c. Acceptable samples may be incorporated in the Work.
 - d. The sample will be used to demonstrate the cleaning of and application of water repellent on the masonry veneer.
- B. Pre-Installation Conference: Notify the Architect, masonry manufacturer's representative, installer, and Owner at least 48-hours before starting the masonry veneer installation. Arrange a mutually acceptable time for meeting at the job with all notified parties to review the specifications and job conditions. Obtain the acceptance and approval of all parties on materials, details, and methods before beginning the masonry veneer work.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver masonry materials to Project in undamaged condition.
- B. Deliver concrete masonry veneer on covered pallets, stored above grade, and protected from moisture.

CONCRETE UNIT VENEER MASONRY

- C. Store and handle materials to prevent their deterioration or damage due to moisture, freezing, contaminants, corrosion or other causes.
- D. Store cementitious materials off the ground, under cover, and in a dry location.
 - 1. Keep bagged materials dry, protected from weather damage, and with complete labels and identification on wrappings. Store aggregates sheltered from weather. Remove and discard all damaged and contaminated materials.
- E. Do not bend or deform reinforcing during handling and storage. Maintain clean and free of rust and contamination detrimental to bond.
- F. Store masonry accessories, including metal items, to prevent deterioration by corrosion and accumulation of dirt.

1.6 SITE CONDITIONS

- A. Temperature and Moisture Requirements: Protect concrete masonry veneer units from excessive moisture during installation.
- B. Do not install concrete masonry veneer when the outside temperature falls below 40°F or rises above 90°F.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Concrete Masonry Veneer: Basalite Concrete Products, LLC.
 - 1. Obtain products from a single manufacturer.
- B. Integral Water-Repellent: Dry-Block as manufactured by Grace Construction Products, or accepted substitute.
- C. Mortar Color:
 - 1. "DesignMix" (as supplied by Mutual Materials).
 - 2. "True Tone" Cement Color by Davis Colors.
 - 3. Laticrete, "Polyblend" by Custom Building Products.
 - 4. "Flextile" by Thompson Tile.
 - 5. "Top" by Trym-Tex, Inc.
 - 6. "Hydroment" by Bostik.
 - 7. Scofield.
 - 8. Or accepted substitute.
- D. Veneer Anchors: Hohmann & Barnard DW-10HS Seismiclip Veneer Anchor or accepted substitute.
- E. Wall Flashing: As specified in Section 07 65 26 SELF-ADHERING SHEET FLASHING.
- F. Drainage Net: Mortar Net USA, or accepted substitute.
- G. Cell Vent Weep-Hole Ventilators: Dur-O-Wall, or accepted substitute.
- H. Masonry Cleaner: As approved.

CONCRETE UNIT VENEER MASONRY

- I. Water Repellent: Specified in Section 07 19 00 WATER REPELLENTS / GRAFFITI BARRIERS.

2.2 CONCRETE MASONRY VENEER

- A. Standard Concrete Masonry Units:
1. Product: Basalite Precision Concrete Masonry Units.
 2. Applicable Standards: ASTM C 90-06A, Lightweight Classification.
 3. Face: Smooth uniform texture.
 4. Size: 8" high x 16" long x 4" deep (nominal face dimensions) unless otherwise indicated on Drawings.
 5. Colors: Provide units in the following colors at locations as indicated on Drawings.
 - a. Charcoal.
 6. Shapes: Provide special shapes where required for lintels, jambs, corners, sash, control joints, headers, bonding and other special conditions.
 7. All units to have integral water-repellent (Dry-Block as manufactured by Grace Construction Products, or accepted substitute.).
- B. Split Face Concrete Masonry Units:
1. Product: Basalite Splitface Veneer.
 2. Applicable Standards: ASTM C90-06A, Lightweight Classification.
 3. Face: Unevenly textured appearance.
 4. Size: 8" high x 16" long x 4" deep (nominal face dimensions) unless otherwise indicated on Drawings.
 5. Colors: Provide units in the following colors at locations as indicated on Drawings.
 - a. Charcoal.
 6. Shapes: Provide special shapes where required for lintels, jambs, corners, sash, control joints, headers, bonding and other special conditions.
 7. All units to have integral water-repellent (Dry-Block as manufactured by Grace Construction Products, or accepted substitute.).
- C. Glazed Concrete Masonry Units: Grade N-I, Lightweight Units.
1. Product: Trenwyth Astra-Glaze SW+ as manufactured by Trenwyth Industries, or accepted substitute.
 2. Face: Glazed.
 - a. Standard: ASTM C744.
 - b. Thickness: 1/8" on face, 1/16" on return at edges for 1/4" distance.
 - c. Glazed surface of the concrete masonry unit shall have a smooth satin-gloss finish, externally heat-polymerized cast-on facing conforming to ASTM C744.
 - d. Color: "Pacer Blue".
 3. Size: 8" high x 16" long x 4" deep (nominal face dimensions) unless otherwise indicated on Drawings.
 4. All units to have integral water-repellent (Dry-Block as manufactured by Grace Construction Products, or accepted substitute.).

CONCRETE UNIT VENEER MASONRY

2.3 WATER REPELLENT ADMIXTURE

- A. Product: Dry-Block as manufactured by Grace Construction Products, or accepted substitute.
 - 1. Applicable Standards:
 - a. Admixture shall provide wind driven rain resistance as measure by ASTM E514-74 Class E, extended to 72 hours.
 - b. Bond strength as determined by ASTM E 72 shall not be reduced by the use of water repellent admixture.
 - 2. Performance Requirements:
 - a. Admixture provided in both the masonry unit and the mortar shall constitute a complete integral water repellent system for exterior above grade walls.
 - b. Admixture shall leave the finished surfaces water repellent and shall not alter the natural texture or color of the masonry units or mortar.
 - 3. System:
 - a. Block Admixture: An integral liquid polymeric admixture mixed with concrete during production of concrete masonry units which cross links and becomes permanently locked into the CMU, bond, beam or CMU lintel to provide resistance to water penetration.
 - b. Mortar Admixture: An integral liquid polymeric admixture for use in mortar mix, which cross links and becomes permanently locked into mortar to provide resistance to water penetration.
 - c. Certification: Water Relellent Admixture Dry Block Dry-Block as manufactured by Grace Construction Products (or accepted substitute) concrete masonry units shall be manufactured by a Qualified Producer.
 - d. Concrete masonry units, precast lintels, CMU lintels, bond beams and special shapes shall meet the requirements of ASTM C90-06A.
 - 4. No other admixtures shall be used in conjunction with the water-repellent admixture unless approved in writing by the water repellent admixture manufacturer.

2.5 PRE-BLENDED MORTAR

- A. Manufacturer: Basalite Concrete Products, LLC, www.basalite.com.
- B. Proprietary Products and Systems: Basalite Pre-Blended Mortar Mix, including the following:
 - 1. Material: Pre-blended factory mix of Portland cement, hydrated lime, and fine sand aggregate mixtures. Color pigment may also apply.
 - a. Color: Match existing.
 - 2. Mortar Type:
 - a. Property Mixture: ASTM C270; Type S, 1,800-psi at 28-days.
 - 3. Material Standard for Aggregate: ASTM C 144.
 - 4. Material Standard for Portland Cement: ASTM C 150.
 - 5. Material Standard for Hydrated Lime: ASTM C 207.
 - 6. Material Standard for Pre-Blended Mortar: ASTM C 270.
 - 7. Material Standard for Pigments: ASTM C 979.
- C. Water: Clean and potable.

CONCRETE UNIT VENEER MASONRY

- D. Integral Water Repellent Admixture: Dry-Block as manufactured by Grace Construction Products, or accepted substitute.

2.6 JOINT REINFORCEMENT, TIES AND ANCHORS

- A. Manufacturers:
1. Hohmann & Barnard, Inc.
 2. Or accepted substitute.
- B. General: Comply with requirements indicated below for basic materials, as well as requirements for each form of joint reinforcement, tie, and anchor for size and other characteristics.
- C. Hot-Dip Galvanized Steel Wire: Uncoated wire in accordance with ASTM A 82, with zinc coating applied after prefabrication into units in accordance with ASTM A 123, 1.5 oz. per sq. ft. (0.46 kg/sq m) of wire surface.
- D. Joint Reinforcement: Welded-wire units prefabricated with deformed continuous side rods and plain cross rods into straight lengths of not less than 10 feet (3 m), with prefabricated corner and tee units.
1. Width: Approximately 2 inches (51 mm) less than nominal width of walls and partitions, providing mortar cover of not less than 5/8 inch (16 mm) on joint faces exposed to exterior and 1/2 inch (13 mm) elsewhere.
 2. Wire Size, Side Rods: 9 gauge, 0.15 inches (4 mm).
 3. Wire Size, Cross Rods: 9 gauge, 0.15 inches (4 mm).
 4. Wire Size, Two-Piece Adjustable: 9 gauge (6 mm) diameter in exterior walls.
 5. Single-Wythe Configuration: Truss design, continuous diagonal cross rods spaced not more than 16 inches (406 mm) on center.
 6. Multi-Wythe Configuration, Non-Aligned Bed Joints in Cavity or Composite Masonry Walls:
 - a. Adjustable wall tie pintle section fitting into eye section of rectangular box-type cross ties spaced not more than 16 inches (406 mm) on center.
 - b. Truss type units with side rods spaced for embedment within each face shell of back-up wythe, ties extended to within 1 inch (25 mm) (25 mm) of exterior face of facing wythe.
- E. Flexible Anchors, Masonry to Structural Framework: Two-piece anchors permitting vertical or horizontal differential movement between wall and framework parallel to, but resisting tension and compression forces perpendicular to, plane of wall.
1. Anchorage to Steel Framework: Manufacturer's standard anchors with crimped ¼ inch (6 mm) diameter wire anchor section for welding to steel 3/16", triangular-shaped wire tie section sized to extend within 1 inch (25 mm) (25 mm) of exterior face of facing wythe.
- F. Anchor Bolts: Steel bolts with hex nuts and flat washers, complying with ASTM A 307, Grade A, hot dip galvanized complying with ASTM A 153, Class C; sizes and configurations indicated.
- G. Reinforcing Bars: Deformed steel, ASTM A 615, Grade 60 for bars No. 3 to No. 18. See Drawings for reinforcement bar size and configurations.

CONCRETE UNIT VENEER MASONRY

2.7 MISCELLANEOUS MASONRY ACCESSORIES

- A. Non-Metallic Expansion Joint Strips: Premolded, flexible cellular neoprene rubber filler strips, complying with ASTM D 1056, Grade RE41E1, capable of compression up to 35 percent; width and thickness indicated.
- B. Weepholes:
 - 1. Round plastic tubing.
 - 2. Cotton wick or rope.
 - 3. Pre-manufactured weeps.
 - 4. Open head joints.

2.8 VENEER ACCESSORIES

- A. Horizontal Pencil Rods: 3/16" diameter galvanized wire or accepted substitute.
- B. Veneer Anchors: Dur-O-Wall D/A 213S Seismic Veneer Anchor or accepted substitute. Provide each anchor with two D/A 808 screws.
- C. Pea Gravel: Maximum 1/4" diameter clean washed pea gravel.
- D. Mortar Dropping Control Device: Dur-O-Wall Mor-Control or accepted substitute, constructed of corrugated plastic, 16" long by 1" wide with 2 projecting tabs.
- E. Wall Flashing: Perm-A-Barrier Wall Flashing by Grace Construction Products, as specified in Section 07 65 26 SELF-ADHERING SHEET FLASHING.
 - 1. Surface Conditioner: As required by flashing manufacturer.
 - 2. Primer: As required by flashing manufacturer.
 - 3. Termination Mastic: Provide as specified in Section 07 65 26.
- F. Steel Lintels: Structural Steel lintels and anchors of standard rolled section in size and weight as detailed; conform to ASTM A36. Provide with hot-dipped galvanized (G90) coating.
- G. Drainage Net: 1" thick x 16" high of High Density Polyethylene or Nylon mesh in trapezoidal configuration. Mortar Net USA, model No. MN16-1 "Jumbo", Tel. 800) 664-6638.
- H. Cell vent weep-hole ventilator manufactured from flexible ultra violet resistant polypropylene co-polymer. DA 1006 Cell Vent by Dur-O-Wall, or accepted substitute. Color as selected by Architect.

2.9 MASONRY CLEANER AND WATER REPELLENT

- A. Cleaner: Hot water.
- B. Water Repellent: Specified in Section 07 19 00 WATER REPELLENTS / GRAFFITI BARRIERS.

CONCRETE UNIT VENEER MASONRY

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine areas and conditions under which concrete masonry veneer work is to be installed. Correct conditions detrimental to proper and timely completion of work.
 - 1. Confirm that air infiltration barrier and insulation board have been properly installed over wall sheathing at walls where masonry veneer is to be installed.
- B. Starting work constitutes acceptance of existing conditions.

3.2 PREPARATION

- A. Install field sample of exposed concrete masonry veneer with tooled joints. Architect will review for appearance and joint finishing only.
- B. Clean existing adjacent masonry surfaces of loose mortar.
- C. Protect existing adjacent surfaces from mortar stains.
- D. Wet concrete masonry veneer units that have a suction rate in excess of 20-grams per minute to reduce the unit suction rate to 20-grams per minute.

3.3 CONCRETE MASONRY VENEER INSTALLATION

- A. Standards: Comply with the International Building Code or State of Oregon 20010 Structural Specialty Code Amendments, Chapter 21, Masonry.
- B. Installation of concrete masonry units shall be as specified under this Section and in accordance with ACI/ASCE-530.
- C. Flashing: Build in all flashing required to waterproof the wall.
 - 1. Apply through-wall flashing membrane along the base of masonry veneer walls and over shelf angles as detailed.
 - a. Prime surfaces and allow to dry, press membrane firmly into place, over lap minimum 2 inches at all end and side laps. Promptly roll all laps and membrane to ensure the seal.
 - b. Applications shall form a continuous flashing membrane and shall extend up a minimum of 8 inches up the back-up wall.
 - c. Seal the top edge of the membrane where it meets the substrate using termination sealant. Trowel-apply a feathered edge to seal termination to shed water.
 - d. Install through-wall flashing membrane and "end dam" flashing as detailed on Drawings.
- D. Veneer Anchors: Provide approved anchors at not less than one per each 2 square feet of wall area and at not over 24" on center spacing. Provide additional ties as required and spaced not over 3 feet apart and within 12" of the edge around all openings and at each third course at jambs. Install anchors in second course above and below the ledger angles.
- E. Mortar Dropping Control Devices: Place into the wall air space at 12" on center horizontally, aligned

CONCRETE UNIT VENEER MASONRY

with the 2nd and 4th bed joint above the foundation walls or lintel angles in a staggered pattern so as to overlap each other by about 2" on each side. Fix in place by the tabs that are mortared into the masonry veneer work.

- F. Unit Cutting: Cut as required for openings and joints. Avoid use of less than half size units.
- G. Unit Placement:
 - 1. Install units plumb, true, and level using standard running bond. Maintain regular modular dimensions horizontally and vertically with coursing as detailed. Cut all units where required to maintain regular pattern except no units less than 1/2 unit long without approval from Architect. Use corner and other special units where required. Set units flush on exposed side of wall and allow variation in unit thickness to run on concealed face of wall.
 - 2. Install pencil rods at every veneer anchor row and interconnected with the anchors.
 - 3. Provide full face shell mortar beds for masonry veneer units. Double butter to fill vertical head joints solid with mortar. Tool and compact exposed face joints to give concave rodded finish. Do not use mortar that has begun to set or is beyond the recommended elapsed time since initial mixing. Retemper mortar during the recommended elapsed time period only to restore workability.
 - 4. Control Joints: Provide control joints. Coordinate control joints locations to align with the control joints in the existing block.
 - 5. Joint Size and Profile: 1/2" thick, tooled concave except flush at concealed surfaces. Double strike all exterior joints.
 - 6. Rake out weep holes in each second vertical joint along bottom course just above any sill or head flashing. Fill bottom 12" of cavity spaces above sill and head flashing with washed pea gravel. Keep cavity spaces clean of mortar droppings by using control device as previously specified. Install cell vent weep-hole ventilators at each weep hole.
 - 7. Remove mortar stains with clean water as work progresses. Protect all sills, ledges, offsets, and other projections from mortar droppings.
 - 8. In lieu of using mortar dropping control devices and pea gravel, the Contractor may use the drainage net material. After the first one or two courses of veneer are laid, place one continuous row of drainage net in the collar joint or cavity on the flashing against the inside of the outer wythe at the base of the wall, zig-zag side up. For cavities larger than 1", install several thicknesses to fill the cavity.
- H. Reinforcing Steel:
 - 1. Position reinforcing bars at spacing indicated. Secure vertical bars with bar positioners at 48" on center.
 - 2. Splice bars where indicated with not less than 36 bar diameters or 2'-0" minimum. Stagger splices.

3.4 **ADJUSTING AND CLEANING**

- A. Adjusting: Remove mortar from concrete masonry veneer cavities. Remove and reinstall concrete masonry units not in alignment or not bonded by mortar. Remove misplaced, broken, or unbonded concrete masonry veneer units.
- B. Joint Repair: Rake and re-point defective masonry joints where directed.
- C. Cleaning:
 - 1. Remove excess material from the Site. Clean adjacent surfaces where damaged by masonry

CONCRETE UNIT VENEER MASONRY

work as directed.

3.5 MASONRY CLEANING

- A. Comply with applicable environmental laws and restrictions.
- B. Comply with cleaning procedures and recommendations of the manufacturers of both the cleaning solution and the unit masonry.
 - 1. Utilize the same approved cleaning procedure as used on the mock-up.
- C. Remove efflorescence from masonry wall exposed in the finished work in accordance with manufacturer's recommendation and NCMA TEK Bulletin #8-3A.
- D. Remove dirt or stains from masonry walls exposed in the finished work in accordance with the manufacturer's recommendations and NCMA TEK Bulletin #8-2A.
- E. Masonry with Integral Water Repellent Admixtures:
 - 1. Promptly remove excess wet mortar containing integral water repellent mortar admixture from the face of the masonry as work progresses.
 - 2. Do not power wash masonry with water repellent admixtures.
- F. Cleaning Procedures:
 - 1. Scrape off any large mortar deposits prior to cleaning.
 - 2. Steam clean masonry surfaces prior to installation of Water Repellents / Graffiti Barriers.
 - 3. Citric Cleaners: Where steam cleaning is inadequate, Contractor may elect to use citric cleaners when such cleaners are acceptable to Architect, Owner's Representative and Jurisdiction Having Authority. Comply with cleaner's written instructions.
 - a. Collect, contain and dispose of masonry cleaners, in compliance with DEQ and local jurisdiction rules and regulations. Do not allow into storm drainage/sewer systems.

3.6. WATER REPELLENTS/GRAFFITI BARRIERS

- A. Water Repellent Application: Specified in Section 07 19 00 WATER REPELLENTS / GRAFFITI BARRIERS.

3.5 PROTECTION

- A. Protect mortar from rain and freezing temperatures until the end of the curing period.
- B. Protection: During installation, cover the top of unfinished masonry work to protect it from the weather and to prevent accumulation of water in the cores of the masonry units.
- C. Protect installed work from damage due to subsequent construction activity on the Site.

END OF SECTION

STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide structural steel framing systems as indicated on the Drawings and as specified herein.

1.2 REFERENCES

- A. Codes and Standards:
 - 1. AISC "Code of Standard Practice for Steel Buildings and Bridges".
 - 2. AISC "Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings" including "Commentary".
 - 3. AISC "Code of Structural Steel", Section 10 "Specifications for Architecturally Exposed Structural Steel".
 - 4. AWS "Structural Welding Code".
 - 5. Comply with applicable provisions except as otherwise indicated.
- B. ASTM International (ASTM):
 - 1. ASTM A36: Standard Specification for Carbon Structural Steel.
 - 2. ASTM A53: Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
 - 3. ASTM A123: Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - 4. ASTM A153: Standard Specifications for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - 5. ASTM A325: Standard Specification for Structural Bolts, Steel Heat Treated, 120/105-ksi Minimum Tensile Strength.
 - 6. ASTM A500: Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
 - 7. ASTM A780: Standard Practice for Installation Methods for Adhered Manufactured Stone Masonry Veneer.
 - 8. ASTM A992: Standard Specification for Structural Steel Shapes.
 - 9. ASTM D6386: Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting.
 - 10. ASTM F1554: Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength
- C. Research Council on Structural Connections (RCSC) Specification for Structural Joints; Sections 8.1 and 8.2.

1.4 SUBMITTALS

- A. Shop Drawings: Show complete details and instructions for fabrication, assembly and erection. Furnish anchor bolts required for installation in other work. Furnish templates for bolt installation.
- B. Test Reports: Do not cover structural welds until acceptable weld test reports have been received from the Owner's testing agency.

1.5 QUALITY ASSURANCE

- A. Design, fabrication, and erection of structural steel shall conform to the Specification for Structural Steel Buildings (AISC 360-05).
- B. Welder Qualifications: Use only certified welders.

STRUCTURAL STEEL FRAMING

- C. Requirements of Regulatory Agencies: Comply with local building code requirements and obtain required permits.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. W-Sections: ASTM A992, fy=50 ksi.
- B. Rectangular HSS: ASTM A500, Grade B, fy=46 ksi.
- C. Round HSS: ASTM A500, Grade B, fy=42 ksi.
- D. Pipe: ASTM A53, Grade B, Type E or S, fy=35 ksi.
- E. All Other Sections and Plates: ASTM A36.
- F. Bolts: Unless noted otherwise, all bolts to be ASTM A325 and all anchor rods to be ASTM F1554, Grade 36, with matching nuts.
- G. Electrodes: E70 Series, 70-ksi filler metal unless otherwise noted.

2.2 FABRICATION

- A. Comply with the following Standards:
 - 1. AWS "Code for Welding in Building Construction".
 - 2. AISC "Specification for the Design, Fabrication and Erection of Structural Steel for Buildings".
 - 3. AISC "Specifications for Architecturally Exposed Structural Steel".
 - 4. Items Exposed to View: AISC "Specifications for Architecturally Exposed Structural Steel" (Section 10 of the AISC "Code of Standard Practice").
- B. Fabrication Requirements: Fabricate in accordance with shop drawings and referenced standards. Use materials of size and thickness indicated. Fabricate of welded construction, drill and tap as required to receive connections. Include anchor bolts for connecting to other work. Make bolt holes 1/16" larger than nominal bolt diameter. Do not include thread bolts at shear plane. Mark and match-mark units for field assembly.
- C. Connections:
 - 1. As shown on final shop drawings. Use high-strength bolts for field connections, except as otherwise indicated.
 - 2. Comply with AWS Code for procedures, appearance, and quality of welds.
- D. Bent Steel Plates and Steel Angles Supporting Masonry:
 - 1. Provide structural steel bent plates and angles of sizes indicated for attachment to steel framing. Weld or otherwise fasten to steel framing as shown on the Drawings.
 - 2. Galvanize bent plates and angles installed on exterior framing and exterior substrates.

STRUCTURAL STEEL FRAMING

3. Furnish wedge-type concrete inserts, complete with fasteners, for attachment of bent plates and angles to cast-in-place concrete or framing.
- E. Provisions for Other Work: Fabricate structural steel members to provide holes for securing other work and for passage of other work through steel framing as indicated.
- F. All welding shall conform to American Welding Society (AWS) D1.1 using E70xx electrodes. Weld lengths shown are effective as specified per the specifications of the American Institute of Steel Construction (AISC). Welding shall be performed by AWS certified welders for weld types specified. Where weld lengths are not shown, the weld shall be full length of members being joined. All butt welds shall be full penetration welds unless noted otherwise on Structural Drawings. All welds shall receive the same finish coat as the member being welded. All welds denoted as 'demand critical' shall be made with a filler metal capable of providing a minimum charpy v-notch toughness as indicated in Section 7.3b of AISC 341.
- G. Shop Finish:
 1. Steel Columns shall be galvanized and shall have one shop coat of primer.
 2. All other structural steel shall have one shop coat of primer, except surfaces to be embedded in concrete or masonry, or steel to be galvanized. Embedded surfaces shall be free of contaminants. All exposed structural steel to have one finish coat of rust inhibiting paint, color by Architect all zinc (galv.)
 3. Coatings on iron and steel products shall conform to ASTM A123.
 4. Repairs of galvanized coatings are to conform to ASTM A780.
 5. Hot dip galvanized coatings on ASTM A325 fastener assemblies shall conform to ASTM A153.
 6. Surface preparation of galvanized steel to receive a finish coat of paint shall conform to ASTM D6386.

PART 3 - EXECUTION

3.1 ERECTION

- A. Comply with AISC Code and Specifications, and maintain work in safe and stable condition during erection.
- B. Provide temporary bracing and shoring as required; remove when final connections placed.
- C. Perform cutting, drilling, and fitting required for installation. Set work accurately in location, alignment and elevation, measured from established lines and levels. Align members to tolerance of one in 500.
- D. Set bearing plates on cleaned bearing surfaces, using wedges or other adjustments as required. Solidly pack below bearing plates with nonmetallic, non-shrink grout. Use metallic, non-shrink grout for bearing plates supporting vibrating mechanical equipment.
- E. Splice members only where shown on final shop drawings.
- F. Erect steel in accordance with the Drawings, reviewed shop drawings and pertinent standards and codes.
- G. Set anchor bolts in anchoring cement. Install fasteners as required.
- H. Welds to metal deck, metal studs or other light gage metals shall conform to AWS D1.3.

STRUCTURAL STEEL FRAMING

- I. Headed Studs: Install and inspect in accordance with Chapter 7 (Stud Welds) of AWS D1.
- J. Expansion Anchors: Install in accordance with the manufacturer's recommendations.
- K. Adhesive Anchors: Install in accordance with the manufacturer's recommendations.
- L. Equip bolt heads and nuts bearing on sloping flanges with beveled washers.
- M. Bolting: Unless connection is noted as slip-critical or pretensioned, tighten nuts to a snug tight condition per Research Council on Structural Connections (RCSC) Specification for Structural Joints, Section 8.1. For slip-critical and pretensioned connections, installation of fasteners shall be per RCSC Section 8.2.

3.2 ADJUSTING AND CLEANING

- A. Shop Finish: Touch up shop paint after installation. Clean field welds, bolted connections and abraded areas, and apply same type primer paint as used in shop.
- B. Structural Adjustments: Repair rejected field welds. Replace or correct defective members and adjust alignment to meet 1 in 500 tolerances.
- C. Repair field welds to galvanized steel and areas damaged by welding, flame cutting, or handling with an organic galvanizing compound having a minimum of 94% zinc dust in the dry film. Apply multiple coats as required to achieve 8-mil minimum thickness. Surfaces to receive galvanizing compound to be clean, dry, free of oil, grease, salt and corrosion.

3.3 PROTECTION

- A. Galvanic Covering: Apply protecting material to face of metal in areas of potential galvanic activity between contacting dissimilar metal materials.

END OF SECTION

STEEL FLOOR DECKING

PART 1 - GENERAL

1.1 SUMMARY

- A. Furnish all materials and labor necessary to complete metal decking installation per the Contract Documents.

1.2 REFERENCE STANDARD FOR QUALITY ASSURANCE

- A. Codes/Standards- The work and materials of this section shall comply with:
 - 1. Metal Decking is to be attached to the structural frame in conformance with AWS D1.1 "Structural Welding Code – Steel" and D1.3 "Structural Welding Code – Sheet Steel."
 - 2. IAPMO ES Evaluation Report ER-217
 - 5. ASTM A653, "Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process."

1.3 SUBMITTALS

- A. Product Data for each type of decking specified, including dimensions of individual components, profiles, and finishes.
- B. Shop Drawings:
 - 1. Prior to fabrication; prepare shop drawings for work under this section and submit to Architect. Shop drawings are to include deck layout, framing and support of openings, layout and quality of studs on beams, dimensions and sections, details of accessories and type and location of welds.
 - 2. Manufacturer's product literature and relevant approvals are to be submitted with the shop where metal decking is part of a fire rated assembly, the metal deck manufacturer shall provide all data to insure compliance with the UL design number and with ICC.

1.4 PRODUCT HANDLING

- A. Metal Deck:
 - 1. Transport, store, and erect metal deck and its accessories in a manner that will prevent corrosion, deformation, or other damage. Store deck clear of the ground with one end elevated to promote drainage; protect metal deck from water and the elements with a water resistant material. Do not use as a storage platform.

PART 2 - PRODUCTS

2.1 MATERIALS AND FINISHES

- A. Steel Floor Decking:
 - 1. ASTM A653, Designation SS, Grade 33 with a minimum yield stress of 38 ksi.
 - 2. Steel floor decking shall have a minimum G6.
 - 3. Provide all accessories (opening reinforcing angles, closures, etc.) to provide a complete diaphragm.
 - 4. Steel Floor Deckin: 1.5" deep Verco PLB, 20 ga .composite decking with the following minimum properties:
 - a. $S = 0.230 \text{ in}^3/\text{ft.}$
 - b. $I = 0.219 \text{ in}^4/\text{ft.}$

2.2 FABRICATION

STEEL FLOOR DECKING

- A. Metal Deck: Manufacture deck units to lengths as indicated on shop drawings. Panel end conditions are to be butted. Sidelaps are to be male/female interlocking type, suitable for Verco Punchlok type attachment.
- B. Accessories: Fabricate steel deck accessories from the same gauge and material as adjacent steel deck.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions under which the work of this Section is to be performed. Correct any conditions which are detrimental to the timely and proper completion of the work of this Section. Do not proceed with work until unsatisfactory conditions are corrected.

3.2 INSTALLATION

- A. General: Install the metal deck and accessories in compliance with the manufacturer's written recommendations and approved shop drawings.
- B. Placing Metal Deck Units: Place metal deck units on supporting members and adjust to proper position. Ensure proper bearing on supporting members and accurate alignment of endlaps and sidelaps prior to permanently attaching units.
- C. Attachment of Metal Deck Units to Supports:
 - 1. Welded attachment of metal deck units to the supporting members shall conform to AWS D1.1 and D1.3. Welders shall be certified prior to commencing work. Attach metal deck units to supporting members with 1/2" effective diameter puddle welds.
 - a. Welders shall be AWS certified for Light Gauge Steel Welding.
- D. Floor decking shall be connected to transverse and perimeter supports with welds at 12" o.c. and welded to longitudinal supports at 12" o.c.
- E. Side lap connections shall be Verco sidelap connections using the Verco Punchlok tool at 24 inches on center.

3.3 REPAIRS

- A. Before concrete placement, inspect deck for tears, dents, or other damages that may prevent the deck from acting as a tight and substantial form. The need for repair of the damaged deck shall be determined by the Architect or Engineer of Record.

END OF SECTION

STEEL ROOF DECKING

PART 1 - GENERAL

1.1 SUMMARY

- A. Furnish all materials and labor necessary to complete metal decking installation per the Contract Documents.

1.2 REFERENCE STANDARDS FOR QUALITY ASSURANCE

- A. Codes/Standards– The work and materials of this section shall comply with:
 - 1. ASCE 7: Minimum Design Loads for Building and Other Structures.
 - 2. Section properties shall be derived in accordance with AISI "North American Specification for the Design of Cold-Formed Steel Structural Members", latest edition.
 - 3. Metal Decking is to be attached to the structural frame in conformance with AWS D1.1 "Structural Welding Code – Steel" and D1.3 "Structural Welding Code – Sheet Steel."
 - 4. ICC Research Report No. ESR-1414.
 - 5. IAPMO Research Report No. IAPMO ES-0161
 - 6. ASTM A653, "Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process".
 - 7. Steel Deck Institute (SDI) – Metal roof deck profiles shall be in conformance with ANSI/SDI standard RD1.0 "Standard for Steel Roof Deck".
 - 8. Factory Mutual (FM) – Metal roof deck profiles shall be in conformance with FM where applicable.

1.3 SUBMITTALS

- A. Product Data for each type of decking specified, including dimensions of individual components, profiles, and finishes.
- B. Shop Drawings: Prior to fabrication, prepare shop drawings for work under this section and submit to Architect. Shop drawings are to include deck layout, deck type and gauge, framing and support of openings, dimensions and sections, details of accessories and type and location of welds. Manufacturer's product literature and relevant approvals are to be submitted with the shop drawings.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Metal Deck:
 - 1. Transport, store and erect metal deck and accessories in a manner that will prevent corrosion, deformation or other damage. Store deck clear of the ground with one end elevated to promote drainage; protect metal deck from water and the elements with a water resistant material.

PART 2 - PRODUCTS

2.1 MATERIAL AND FINISHES

- A. Steel Roof Decking: 3" deep Verco PLN-24, 20 gauge (ga) with the following minimum properties:
 - a. $+S_{eff} = 0.464 \text{ in } 4/\text{ft.}$
 - b. $-S = 0.542 \text{ in } 3/\text{ft.}$
 - c. $I_d = 0.1.032 \text{ in } 4/\text{ft (multiple spans).}$

STEEL ROOF DECKING

- B. Roof decking shall conform to ASTM A653, or A1063, Designation SS, with a minimum yield stress of 40 ksi and shall have a minimum G630 galvanized coating.
- C. Roof Decking Side Lap Fasteners: Verco sidelap connections made with Verco Punchlok tool at 12 inches on center minimum unless noted otherwise.
- D. Fasteners:
 - 1. Decking shall be fastened to supports with min. (3) Hilti X-ENP-19,
 - 2. Decking to be fastened to parallel supports and drag struts with Hilti X-ENP-19 L15 powder actuated fasteners.

2.2 FABRICATION

- A. Metal Deck: Manufacture deck units to lengths as indicated on shop drawings. Panel end conditions are to be butted or end-lapped, 2" minimum. Sidelaps are to be male/female interlocking type allowing connection with Verco Punchlok tool.
- B. Accessories: Fabricate steel deck accessories from the same gauge and materials as adjacent steel deck.

PART 3 – EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions under which the work of this Section is to be performed. Correct any conditions which are detrimental to the timely and proper completion of the work of this Section. Do not proceed with work until unsatisfactory conditions are corrected.

3.2 INSTALLATION

- A. General: Install the metal deck and accessories in compliance with the manufacturer's written recommendations and approved shop drawings.
- B. Placing Metal Deck Units: Place metal deck units on supporting members and adjust to proper position. Ensure proper bearing on supporting members and accurate alignment of endlaps and sidelaps prior to permanently attaching units.
- C. Attachment of Metal Deck Units to Supports:
 - 1. Decking shall be fastened to supports with min. (3) Hilti X-ENP-19, per sheet per support.
 - 2. Decking to be fastened to parallel supports and drag struts with Hilti X-ENP-19 L15 powder actuated fasteners at 12 inches on center. \
 - 3. At locations where beam flange thickness exceeds the fastener manufacturers recommended steel depth puddle welds may be used.
 - 4. Puddle welds to have a minimum 1/2 inch effective diameter.
 - a. Welders to be AWS certified for Light Gauge Steel Welding.

STEEL ROOF DECKING

3.3 PROTECTION

- A. Do not use deck units for storage or working platforms until permanently secured in position.
- B. Construction loads must not exceed carrying capacity of deck.

END OF SECTION

ACOUSTICAL METAL DECKING

PART 1 - GENERAL

1.1 SUMMARY

- A. Provide acoustical metal decking at finished canopy soffit as indicated on Drawings and as specified herein.

1.2 SUBMITTALS

- A. Product Data for each type of decking specified, including dimensions of individual components, profiles, and finishes.
- B. Shop Drawings: Prior to fabrication, prepare shop drawings for work under this Section and submit to Architect. Shop drawings are to include deck layout, deck type and gauge, framing and support of openings, dimensions and sections, details of accessories and type and location of welds. Manufacturer's product literature and relevant approvals are to be submitted with the shop drawings.

1.3 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Metal Deck: Transport, store and erect metal deck and accessories in a manner that will prevent corrosion, deformation or other damage. Store deck clear of the ground with one end elevated to promote drainage; protect metal deck from water and the elements with a water resistant material.
 - 1. Deck to be the exposed finish at underside of canopy. Decking shall be handled and delivered as required to avoid damage. Damaged units will not be permitted to be installed.
- B. Acustadek Sound Absorption Batts: Store batts in an enclosed area, protected from the elements.

PART 2 - PRODUCTS

2.1 MATERIALS AND FINISHES

- A. Metal roof deck to be:
 - 1. ASC Steel Deck B36-AW Web Perforated Acustadek 22 gauge; 1 1/2 inches deep by 36 inches wide.
 - 2. Verco HSB-36 Web Perforated Deck,
 - 3. Vulcraft.
 - 4. Or accepted substitute.
- B. Acustadek perforations are 1/8" or 5/32" diameter holes on staggered centers. The noise reduction Coefficient is to be **0.70 Min.** The NRC values were developed in accordance with ANSI C423, as performed by Riverbank Laboratory.
- C. Acoustical Insulation:
 - 1. At ASC Steel Deck: Fiberglass batt insulation encapsulated in 0.75 mil clear pvc plastic furnished by deck manufacturer, cut to size to match deck profile; or accepted substitute.
 - 2. At Verco or Vulcraft Steel Deck: Insulation as standard with deck manufacturer.

ACOUSTICAL METAL DECKING

2.2 FABRICATION

- A. Metal Deck: Manufacture deck units to lengths as indicated on shop drawings. Panel end conditions are to be butted or end-lapped, 2" minimum. Sidelaps are to be male/female interlocking type allowing connection with DeltaGrip® tool. Sidelaps are to be nestable or interlocking when using screw-type fasteners.
- B. Accessories: Fabricate steel deck accessories (not including cell closures) from the same gauge and materials as adjacent steel deck.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions under which the work of this Section is to be performed. Correct any conditions which are detrimental to the timely and proper completion of the work of this Section. Do not proceed with work until unsatisfactory conditions are corrected.
- B. Examine units prior to installation. Damaged or defective units are to be replaced with undamaged units.

3.2 INSTALLATION

- A. General: Install the metal deck and accessories in compliance with the manufacturer's written recommendations and approved shop drawings.
- B. Placing Metal Deck Units: Place metal deck units on underside of supporting members and adjust to proper position. Ensure proper bearing on supporting members and accurate alignment of endlaps and sidelaps prior to permanently attaching units.
- C. Attachment of Metal Deck Units to Supports: Secure with approved fasteners and as indicated on Drawings.

END OF SECTION

COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Definition: Cold-formed steel framing includes axially or wind-loaded studs, track, bridging, bracing and related accessories, specified herein and indicated on the drawings by terminology of this Section or by the term "structural studs" or "metal studs".
- B. Section includes, but is not limited to:
 - 1. Stud framing at exterior walls of Press Box.
 - 2. Floor framing at Press Box.
 - 3. Ceiling framing (Z-purlins) to support acoustical metal decking at underside of canopies.

1.2 REFERENCES

- A. ASTM International (ASTM):
 - 1. ASTM A307: Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.
 - 2. ASTM A325: Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
 - 3. ASTM A653: Specification Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 4. ASTM C754: Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel.
 - 5. ASTM C954: 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.
 - 6. ASTM C1002: Standard Test Method for Time of Setting of Portland-Cement Pastes Containing Quick-Setting Accelerating Admixtures for Shotcrete by the Use of Gillmore Needles.

1.3 SYSTEM DESCRIPTION

- A. Structural Requirements: Structural properties of studs and joists shall comply with AISI, "Specification for the Design of Cold-Formed Steel Structural Members", latest edition.

1.5 SUBMITTALS

- A. Product Data:
 - 1. Submit manufacturer's product information and installation instructions for each item of light gage framing and accessories.
- B. Shop Drawings: Submit fabrication and erection shop drawings, indicating the following:
 - 1. Prefabricated framing with individual panel drawings for each condition including configuration, dimensions, materials, attachments and panel location.
 - 2. All member gages, spacing and sizes.
 - 3. Shop and field assembly details including cut and connections.
 - 4. Type and location of welds, bolts and fastening devices.
 - 5. Supplemental strapping, bracing, splices, bridging, accessories, and details required for proper installation.
 - 6. Coordination details for related, supported or adjoining work.

COLD-FORMED METAL FRAMING

1.6 QUALITY ASSURANCE

- A. Inspection and Quality Control:
 - 1. Provide effective full time quality control over all fabrication and erection activities.
 - 2. As directed by Architect, Owner's testing agency may inspect the maintenance of a quality control program including spot checking weldments and welding procedures in accordance with AWS standards.
 - 3. Inspection by Owner's testing agency is not intended to be comprehensive or complete.
 - 4. Full responsibility for quality control shall remain with contractor.

1.7 DELIVERY AND STORAGE

- A. Protect metal framing units from rusting and damage.
- B. Deliver to project site in the manufacturer's unopened containers or bundles, fully identified with name, brand, type and grade.
- C. Store off ground in a dry ventilated space or protect with suitable waterproof coverings.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. California Expanded Metal Products Co. (CEMCO).
- B. Clark Western Building Systems.
- C. Dietrich Metal Framing.
- D. SCAFCO Corporation.
- E. Steeler, Inc.
- F. Or accepted substitute.

2.2 MATERIALS

- A. All cold-formed steel framing shall conform to the AISI "Specification for the Design of Cold Formed Steel Framing Members." Member types and sizes shown on the Drawings refer to members as defined by the Steel Stud Manufacturers Association (SSMA). See Table 1 on Drawing Sheet [S0.02] for required thicknesses and joist/beam designations.
- B. System Components: With each type of metal framing required, provide manufacturer's standard steel runners (tracks), blocking lintels, clip angles, shoes, reinforcements, fasteners, and accessories as recommended by manufacturer for applications indicated, as needed to provide a complete metal framing system.

COLD-FORMED METAL FRAMING

- C. Cold-Formed Structural Material:
 - 1. All structural light-gage steel members shall be mill certified prime steel meeting ASTM A653 Structural quality; Grade 33 for steels thinner than 16 gage (54 mils) and grade 50 for steels 16 gage (54 mils) and thicker. Grade 33 steel shall have a $f_y = 33000$ psi and $f_u = 45000$ psi. Grade 50 steel shall have a $f_y = 50000$ psi and $f_u = 60000$ psi.
 - 2. All light-gage steel shall be galvanized per ASTM A653 with minimum coating of G60 for exterior and/or load bearing members and G40 for interior non-load bearing members.
- D. Metal Studs: Steel studs shall be a minimum 1 5/8" x width noted. Studs shall have a minimum uncoated base metal thickness of 0.033" (20 gage). Studs shall be of adequate size, gage and spacing to sustain applied structural loading.
- E. Tracks: Stud width track shall be the same gauge as studs unless noted otherwise and shall be unpunched type at the top and bottom of wall. Track shall be of adequate size to develop full stud bearing at load-bearing walls and shall be sized to fit studs.
- F. Bridging: Minimum lateral support shall be per the manufacturer's recommendations in order to develop the full strength of the structural material. Sheathing on the wall shall not be considered effective in bracing studs unless sheathing is applied on both faces of the wall.
- G. Connections:
 - 1. Bolted connections are to use as a minimum either ASTM A307(type A) or ASTM A325, structural bolts. All screws shall be a #10 minimum size and conform to ASTM C-1002 and ASTM C-954 type S and/or Type S-12. Length of screw should be approximately 3/8" to 1/2" longer than the total material thickness and a minimum of 3 exposed threads should extend through the steel. All screws shall be thread-forming or thread-cutting, with or without a self-drilling point.
 - 2. All fasteners that fasten dissimilar metals (such as aluminum and steel) are to be stainless steel or zinc-plated corrosion resistant screws.
- H. Prefabricated Metal Connectors: Prefabricated metal connectors are to be manufactured by the steel network or Simpson Strong-Tie, and shall be installed as noted on the Drawings. Other types of metal connectors require prior review.
- I. Framing Fasteners: Unless otherwise noted on Drawings, provide fasteners per LIGHT GAUGE STEEL FASTENING SCHEDULE on Sheet S0.1 STRUCTURAL NOTES. Screws shall not be overdriven. Alternate fastening of pins must be reviewed and accepted by the registered design Professional.
- J. Ceiling Framing to Support Acoustical Metal Decking at Underside of Canopies: 6" Z-purlins as indicated on Drawings.

PART 3 - EXECUTION

3.1 PREFABRICATION

- A. Structural framing components may be prefabricated into panels prior to erection. Fabricate panels plumb, square, true to line and braced against racking with joints welded.
- B. Perform lifting of prefabricated panels in a manner to prevent damage or distortion in any members of the assembly.

COLD-FORMED METAL FRAMING

3.2 INSTALLATION

- A. Manufacturer's Instructions: Install metal framing systems in accordance with manufacturer's printed or written instructions and recommendations, unless otherwise indicated.
- B. Comply with ASTM C754 for installation of studs, runners, and furring channels.
- C. Screws shall be installed and tightened in accordance with the manufacturer's recommendations.
- D. Runner Tracks:
 - 1. Install continuous tracks sized to match studs. Align tracks accurately to layout at base and tops of studs.
 - 2. Secure tracks as recommended by stud manufacturer for type of construction involved, except do not exceed 24" on center spacing for nail or powder-driven fasteners, or 16" on center for other types of attachments.
 - 3. Provide fasteners at corners and ends of tracks.
 - 4. Provide complete, uniform, and level support for the bottom track at each stud. Verify that load bearing studs are properly seated in tracks prior to fastening.
- E. Set studs plumb, except as needed for diagonal bracing or required for non-plumb walls or warped surfaces and similar requirements.
- F. Where stud system abuts structural columns or walls, including masonry walls, anchor ends of stiffeners to supporting structure.
- G. Supplementary Framing:
 - 1. Install blocking and bracing in metal framing system wherever walls or partitions are indicated to support fixtures, equipment, services, casework, heavy trim and furnishings, and similar work requiring attachment to the wall or partition.
 - 2. Where type of supplementary support is not otherwise indicated, comply with the stud manufacturer's recommendations and industry standards in each case, considering weight or loading resulting from item supported.
- F. Installation of Wall Stud System:
 - 1. Secure studs to top and bottom runner tracks at both inside and outside flanges.
 - 2. Frame wall openings larger than 2'-0" square with double stud at each jamb of frame except where more than 2 are either shown or indicated in the manufacturer's instructions.
 - a. Install runner tracks and jack studs above and below wall openings.
 - b. Anchor tracks to jamb studs with stud shoes or by welding, and space jack studs same as full-height studs of wall.
 - c. Secure stud system wall opening frame in manner indicated.
 - 3. Frame both sides of expansion and control joints, with separate studs; do not bridge the joint with components of stud system.
 - 4. Install horizontal stiffeners in stud system, spaced (vertical distance) at not more than 4'-6" on center. Weld studs at each wall or partition intersection.
- G. Installation of Joists:
 - 1. Install level and plumb, complete with bracing and reinforcing as indicated on the Drawings.
 - 2. Provide not less than 1-1/2" end bearing.
 - 3. Reinforce ends with end clips, steel hangers, steel angle clips, steel stud section, end grain wood block, or as otherwise recommended by the joist manufacturer.
 - 4. Where required, reinforce joists as interior supports with single short length of joist section

COLD-FORMED METAL FRAMING

located directly over interior support, snap-on-shoe, 30% side-piece lapped reinforcement, or other method recommended by joist manufacturer.

5. Secure joists to interior support systems to prevent lateral movement of bottom flange.

- G. Ceiling Framing to Support Acoustical Metal Decking at Underside of Canopies: Install Z-purlins as indicated on Drawings and at spacings indicated.
- H. Make provisions for structures vertical movement where indicated on the Drawings. Provide in accordance with the manufacturer's recommendations.

3.2 ADJUSTING AND CLEANING

- A. Adjust stud and joist framing to provide not more than 1/4" variation in 10'-0" from plumb, level and true lines in framing system.
- B. Remove excess materials from the Site.

END OF SECTION

METAL FABRICATIONS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Provide items made from iron and steel shapes, plates, bars, strips, tubes, pipes and castings which are not a part of structural steel or other metal systems specified elsewhere as indicated on the Drawings and as specified herein.
- B. Provide:
 - 1. Metal handrails.
 - 2. Metal guardrails and gates.
 - 3. Roof level walkway components.
 - 4. Fall protection anchors.
 - 5. Countertop brackets.
- C. Structural Support Steel: Provide steel plates, angles, and channels to provide structural support for the following items:
 - 1. Metal wall and soffit framing members.
 - 3. Mechanical and electrical equipment.
 - 4. Steel handrails and railings.
 - 5. Fall protection anchors at roof.
 - 6. Miscellaneous framing and supports.

1.2 REFERENCES

- A. ASTM International (ASTM):
 - 1. ASTM A27: Standard Specification for Steel Castings, Carbon, for General Application.
 - 2. ASTM A36: Standard Specification for Carbon Structural Steel.
 - 3. ASTM A47: Standard Specification for Ferritic Malleable Iron Castings.
 - 4. ASTM A48: Standard Specification for Gray Iron Castings.
 - 5. ASTM A53: Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
 - 6. ASTM A123: Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - 7. ASTM A153: Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - 8. ASTM A167: Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
 - 9. ASTM A269: Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
 - 10. ASTM A276: Standard Specification for Stainless Steel Bars and Shapes.
 - 11. ASTM A307: Standard Specification for Carbon Steel Bolts and Studs, 60,000-psi Tensile Strength.
 - 12. ASTM A325: Standard Specification for Structural Bolts, Steel Heat Treated, 120/105-ksi Minimum Tensile Strength.
 - 13. ASTM A500: Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
 - 14. ASTM A501: Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
 - 15. ASTM A606: Standard Specification for Steel, Sheet and Strip, High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, With Improved Atmospheric Corrosion Resistance.

METAL FABRICATIONS

16. ASTM A653: Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
17. ASTM A780: Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
18. ASTM A1008: 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.
19. ASTM A1011: Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, High-Strength Low-Alloy and High Strength Low-Alloy with Improved Formability.
20. ASTM C827: Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures.
21. ASTM C1107: Standard Specification for Packaged Dry, Hydraulic-Cement (Non-Shrink).
22. ASTM E935: Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings.

B. Army Corps of Engineers: CRD C621 - Post Hardening Volume Adjusting.

1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performances: Provide assemblies which, when installed, comply with the following minimum requirements for structural performance, unless otherwise indicated.
1. Treads and Platforms of Steel Stairs: Capable of withstanding a uniform load of 100-pounds per square foot or a concentrated load of 300-pounds so located as to produce maximum stress conditions.
 2. Handrails and Toprails: Capable of withstanding the following loads applied as indicated when tested per ASTM E935.
 - a. Concentrated loads of 200-pounds applied at any point in any direction on the railing without excessive deflection or permanent member deformation.
 - b. Uniform load of 50-pounds per linear foot applied simultaneously in both vertical and horizontal directions.
 - c. Concentrated and uniform loads above need not be assumed to act concurrently.
 3. Guards:
 - a. Intermediate rails, balusters and panel fillers capable of withstanding a uniform load of 25-pounds per square foot of gross area of guard, including any open areas, of which they are a part.
 - b. Above load need not be assumed to be acting concurrently with uniform horizontal loads on top rails of railing assembly in determining stress on guard supporting members.
 4. Fall Protection Anchors: As details on Drawings.

1.4 SUBMITTALS

- A. Product Data:
1. Submit manufacturer's specifications, anchor details and installation instructions for products used in miscellaneous metal fabrications, including paint products and grout.
 2. Submit manufacturer's information indicating the location where metal fabrications were manufactured and where the primary raw materials were extracted, if known. If the product contains recycled materials, submit manufacturer's data indicating the percentage by weight of post-consumer recycled content and post-industrial recycled content.

METAL FABRICATIONS

- B. Shop Drawings:
 - 1. Submit shop drawings for fabrication and erection of miscellaneous metal fabrications. Include plans, elevations and details of sections and connections. Show anchorage and accessory items. Provide templates for anchor and bolt installation by others.
 - 2. Where materials or fabrications are indicated to comply with certain requirements for design loadings include structural computations, material properties and other information needed for structural analysis.

1.5 QUALITY ASSURANCE

- A. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- B. Welder Qualifications: Use only AWS certified welders and shielded arc process.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General Metal Surfaces: For fabrication of miscellaneous metal work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness.
- B. Steel Plates, Shapes and Bars: ASTM A36.
- C. Steel Tubing: Round, square and rectangular; cold-rolled, ASTM A500; or hot rolled, ASTM A501.
- D. Structural Steel Sheet: Hot-rolled, ASTM A1011; or cold-rolled ASTM A1008, Class 1, of grade required for design loading.
- E. Galvanized Structural Steel Sheet: ASTM A653, of grade required for design loading. Coating designation G90.
- F. Steel Pipe: ASTM A53; Type and grade (if applicable) as selected by fabricator and as required for design loading; black finish unless galvanizing is indicated; standard weight Schedule 40, unless otherwise indicated.
- G. Gray Iron Castings: ASTM A48, Class 30.
- H. Malleable Iron Castings: ASTM A47, grade as selected by fabricator.
- I. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.
- J. Concrete Inserts: Wedge type; galvanized ferrous castings, either malleable iron, ASTM A47, or cast steel, ASTM A27. Provide bolts, washers and shims as required, hot-dip galvanized, ASTM A153. Kwik-Bolt by Hilti, Red Head Trubolt Wedge Anchors by ITW/Ramset, Rawl-Stud by Rawlplug Co. Inc., Sup-R-Stud by U.S.E. Diamond, or accepted substitute.
- K. Standard Bolts: ASTM A307, Grade A, regular hexagon head type.

METAL FABRICATIONS

- L. High Strength Bolts: ASTM A325, Friction type with load indicator washers.
- M. Electrodes: AWS A5.1, E60XX or AWS A5.1, or AWS A5.5, E70XX.
- N. Submerged Electrodes: AWS A5.17.
- O. Shop Primer: Manufacturer's standard rust inhibitive primer. All exterior metal shall be primed and painted for protection from oxidation and corrosion.
- Q. Gate Hardware: Provide each gate with the following:
 - 1. Gate Hinges: Provide hinge mechanisms to carry weight of gates and to operate smoothly.
 - 2. Gate Fork Latch:

2.2 GROUTS

- A. Non-Metallic Non-Shrink Grout: Prepackaged, non-metallic, and non-gaseous. To be non-shrink when tested in accordance with ASTM C1107 Grade B or Grade C at a fluid consistency (flow cone) of 20 to 30 seconds. Thirty-minute-old grout shall flow through flow cone after slight agitation, in temperatures of 40°F to 90°F. Provide bleed free and attain 51 700 kPa (7,500 psi) compressive strength in 28 days at fluid consistency. Certified independent test data required.
- B. Metallic Non-Shrink Grout: ASTM C827, Corps of Engineers CRD-C621, Metallic by Burke, Embeco 636 by Master Builders, Ferrolith G by Sonneborn, Kemox C by Sika, Vibra-Foil by W.R. Grace or accepted substitute.
- C. Epoxy Grout: Five Star Epoxy Grout by U.S. Grout or accepted substitute.
- D. Anchoring Cement: Fast Setting Cement by Burke, Anker Tite by Concrete Products, Embeco 153 by Master Builders, Thorogrip by Standard Dry Wall or accepted substitute.

2.3 GENERAL FABRICATION PROCESS

- A. Standards: Comply with AWS "Code for Welding in Building Construction", AISC "Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings" and AISC "Specifications for Architecturally Exposed Structural Steel".
- B. Workmanship: Use materials of size and thickness indicated or, if not indicated, as required to produce strength and durability in finished product for use intended. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support.
- C. Fabricate of welded construction, drill and tap as required to receive hardware and similar items. Include required anchors for building into other works.
- D. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges. Ease exposed edges to a radius of approximately 1/32" unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

METAL FABRICATIONS

- E. Welded Joints: Form exposed connections with flush hairline joints. Weld corners and seams continuously with shielded arc process, complying with recommendations by AWS. At exposed connections, grind exposed welds smooth and flush to match and blend with adjoining surfaces. Provide 1/4" minimum fillet welds and full penetration butt welds.
- F. Form exposed connection with hairline joints, flush and smooth, using concealed fasteners. Only if necessary, use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts.
- G. Provide for anchorage of type indicated, coordinated with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.
- H. Cut, reinforce, drill and tap miscellaneous metal work as indicated to receive finish hardware and similar items.
- I. Galvanized Shop Finish: Provide ASTM A153 for iron and steel hardware, or ASTM A123 for fabricated shapes, plates, bars and strip.
- J. Fabricate joints that will be exposed to weather in a manner to exclude water and provide weep holes where water may accumulate.
- K. Primed Shop Finish: Apply primer at a rate to obtain a dry film thickness of 2.0-mils. Do not prime members or portions of members to be galvanized, embedded in concrete or grout and surfaces to be field welded unless indicated otherwise.

2.4 CUSTOM FABRICATED ITEMS

- A. Loose Bearing and Leveling Plates: Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction, made flat, free from warps or twists, and of required thickness and bearing area. Drill plates to receive anchor bolts and for grouting as required. Galvanize after fabrication.
- C. Miscellaneous Framing and Supports:
 - 1. Provide miscellaneous steel framing and supports that are not a part of structural steel framework, as required to complete work.
 - 2. Fabricate miscellaneous units to sizes, shapes and profiles indicated or, if not indicated, of required dimensions to receive adjacent other work to be retained by framing. Except as otherwise indicated, fabricate from structural steel shapes and plates and steel bars of welded construction using mitered joints for field connection. Cut, drill and tap units to receive hardware and similar items.
 - 3. Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed. Space anchors 24" on center and provide minimum anchor units of 1-1/4" x 1/4" x 8" steel straps.
 - 4. Galvanize miscellaneous frames and supports where indicated.
- E. Steel Pipe Railings and Handrails:
 - 1. Fabricate steel pipe railings and handrails to design, dimensions, and details indicated. Provide railings and handrails members formed of pipe of sizes and wall thickness indicated, but not less than that required to support design loading.

METAL FABRICATIONS

2. Interconnect railing and handrail members by butt-welding or welding with internal connectors, at fabricator's option, unless as otherwise indicated.
 - a. At tee and cross intersections provide coped joints.
 - b. At bends interconnect pipe by means of prefabricated elbow fittings or flush radius bends, as applicable, of radiuses indicated.
 - c. At elbow bends provide mitered joints.
 - d. Form bends by use of prefabricated elbow fittings and radius bends or by bending pipe, at fabricator's option.
 3. Form simple and compound curves by bending pipe in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross-section of pipe throughout entire bend without buckling, twisting or otherwise deforming exposed surfaces of pipe.
 4. Provide wall returns at ends of wall-mounted handrails, except where otherwise indicated.
 5. Close exposed ends of pipe by welding 3/16" thick steel plate in place or by use of prefabricated fittings.
 6. Toe Boards: Where indicated, provide toeboards at railings around openings and at the edge of open-sided floors and platforms. Fabricate to dimensions and details indicated, or if not indicated, use a 4" high x 1/8" thick plate welded to, and centered between, each railing post.
 7. Brackets, Flanges, Fittings and Anchors:
 - a. Provide wall brackets, end closures, flanges, miscellaneous fittings and anchors for interconnection of pipe and attachment of railings and handrails to other work. Furnish inserts and other anchorage devices for connecting railings and handrails to concrete or masonry work.
 - b. Provide friction fit, removable covers designed to keep sleeves clean and hold top edge of sleeve 1/2" below finished surface of concrete.
 8. Galvanize exterior steel railings, and interior steel railings where shown, including pipe, fittings, brackets, fasteners and other ferrous components. Provide black steel pipe for interior railings not indicated otherwise.
- F. Steel Framed Stairs: Specified in Section 05 51 00 MANUFACTURED STEEL STAIRS.
- G. Galvanized Steel Handrails and Railings: Using 1-1/2" diameter Schedule 40, steel pipe, fabricate to dimensions indicated with joints welded and ground smooth or use manufactured fittings. Secure posts to concrete as indicated or as required to resist structural loads. Galvanize steel after fabrication.
- H. Galvanized Steel Angle or Channel Frame for Overhead Doors: Fabricate with steel anchor bolts or flat bar anchors to masonry wall at 24" on center. Miter corners. Galvanize after fabrication.
- I. Steel Pipe and Tube Columns: Fabricate to lengths required with welded connections as detailed. Shop prime interior columns after fabrication. Shop galvanize exterior columns after fabrication.
- J. Fall Protection Anchors: Fabricate as indicated on Drawings.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication, where possible. Allow for trimming and fitting where taking field measurements.

METAL FABRICATIONS

- B. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, including, concrete inserts, sleeves, anchor bolts and miscellaneous items having integral anchors, which are to be embedded in concrete or masonry construction.

3.2 GENERAL INSTALLATION

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; including threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws and other connectors as required.
- B. Cutting, Fitting and Placement: Perform cutting, drilling and fitting required for installation of miscellaneous metal fabrications. Set work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels. Provide temporary bracing or anchors in formwork for items that are to be built into concrete masonry or similar construction.
- C. Fit exposed connections accurately together to form tight hairline joints. Weld connections that are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Grind exposed joints smooth and touch-up shop paint coat. Do not weld, cut or abrade the surfaces of exterior units that have been hot-dip galvanized after fabrication, and are intended for bolted or screwed field connections.
- D. Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, and methods used in correcting welding work.
- E. Set loose leveling and bearing plates on wedges, or other adjustable devices. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shims, but if protruding, cut-off flush with the edge of the bearing plate before packing with grout. Use metallic non-shrink grout in concealed locations where not exposed to moisture; use non-metallic non-shrink grout in exposed locations, unless otherwise indicated. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.
- F. Steel Framing: Anchor steel framing to building structure with concrete anchors or bolts with strength required to meet structural loads.
- G. Fall Protection Anchors: Install at locations indicated on Drawings.

3.3 INSTALLATION OF STEEL PIPE RAILINGS AND HANDRAILS

- A. Adjust railing prior to anchoring to ensure matching alignment at abutting joints. Space posts at spacing indicated, or if not indicated, as required by design loadings. Plumb posts in each direction. Secure posts and railing ends to building construction as follows:
 - 1. Post Anchorage:
 - a. Anchor posts in concrete by means of pipe sleeves preset and anchored into concrete. After posts have been inserted into sleeves, fill annular space between post and sleeve solid with non-shrink, non-metallic grout, mixed and placed to comply with grout manufacturer's directions.
 - b. Leave anchorage joint exposed; wipe off excess grout and leave 1/8" build-up, sloped away from post. For installation exposed on exterior or to flow of water, seal grout to comply with grout manufacturer's directions.
 - 2. Anchor posts to steel with steel oval flanges, angle type or floor type as required by conditions, welded to posts and bolted to steel supporting members.

METAL FABRICATIONS

3. Anchor rail ends into concrete and masonry with steel round flanges welded to rail ends and anchored into wall construction with lead expansion shields and bolts.
 4. Anchor rail ends to steel with steel oval or round flanges welded to rail ends and bolted to structural steel members, unless otherwise indicated.
 5. Provide removable railing sections as indicated. Furnish slip-fit metal socket or sleeve for casting into concrete. Accurately locate sleeves to match post spacing.
- B. Secure handrails to wall with wall brackets and end fittings. Provide bracket with not less than 1-1/2" clearance from inside face of handrail and finished wall surface. Locate brackets as indicated, or if not indicated, at spacing required for design loading. Secure wall brackets and wall return fittings to building construction as follows:
1. Field Connections: Provide concealed anchors and set screws except where exposed screws or bolts are indicated on Drawings. Anchor railings only to structural members, solid wood blocking or 1/4" thick steel plate blocking.
 2. Railing Standard to Concrete: Set railing standard in sleeves not less than 1/2" diameter greater than outside diameter of railing standard. Set in anchoring cement.
 3. Handrail Brackets to Masonry Wall: Drill 1" diameter hole in masonry wall. Set 3/8" diameter threaded anchor bolt in anchoring cement. Allow to set 2 hours minimum prior to installing handrail bracket.
 4. Handrail Brackets to Wood Framed Wall: Set 3/8" diameter bolt in solid wood blocking or 1/4" thick steel plate blocking with thread toward handrail bracket.
 5. Handrail to Wall Brackets: Drill and tap railing and secure to brackets with 2 flat head machine screws.
- C. Expansion Joints: Provide expansion joints at locations indicated, or if not indicated, at intervals not to exceed 40'-0". Provide slip joint with internal sleeve extending 2" beyond joint on either side; fasten internal sleeve securely to one side; locate joint within 6" of posts.
- 3.4 ADJUSTING AND CLEANING
- A. Correct or replace defective members and adjust alignment as required. Remove pits, bumps and irregular weld grinds from exposed surfaces.
- B. Touch-Up Painting:
1. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting.
 2. Apply by brush or spray to provide a minimum dry film thickness of 2.0-mils.
- C. Galvanized Surfaces: Clean field welds, bolted connections and abraded areas and apply galvanizing repair paint to comply with ASTM A780. Aervoe #142, Brite Galvanize, (800) 227-0196, or accepted substitute.
- 3.5 PROTECTION
- A. Apply protecting material to face of metal in areas of potential galvanic activity between contacting dissimilar metal materials.

END OF SECTION

METAL STAIRS

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide Bidder-designed, custom fabricated steel stair system as indicated on the Drawings and as herein specified.

1.2 REFERENCES

- A. ASTM International (ASTM):
 - 1. ASTM A36: Standard Specification for Carbon Structural Steel.
 - 2. ASTM A53: Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Stainless.
 - 3. ASTM A500: Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
 - 4. ASTM A513: Standard Specification for Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing.
 - 6. ASTM E303: Standard Test Method for Measuring Surface Frictional Properties Using the British Pendulum Tester.
- B. National Association of Architectural Metal Manufacturers (NAAMM).
 - 1. Metal Stairs Manual.

1.3 SYSTEMS DESCRIPTION

- A. Performance Requirements: Stair manufacturer shall engineer and fabricate stairs and railings to comply with requirements of the local building codes.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's product data substantiating compliance with the Drawings and Specifications.
- B. Shop Drawings: Submit shop drawings for stairs and railings. Include plans, elevations and details. Show connection and accessory items and indicate field welds. Show locations for anchor and bolt locations.
- C. Include design loads, structural calculations and material properties. Shop drawings shall be signed and sealed by a structural engineer licensed in the State of Oregon.
- D. Submit final shop drawings and calculations to the City of Lake Oswego Building Department for approval prior to fabrication and installation. See Section 01 11 20 DESIGN/BUILD REQUIREMENTS.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer shall have produced the types of stair and railing systems required for not less than 10-years, with not less than 5 similar projects that have been in successful use for not less than 5-years.

METAL STAIRS

- B. Installer Qualifications: Minimum 5-years experience in the successful installation of steel stair and railing systems of the type indicated for this project.
- C. Applicable Standards:
 - 1. NAAMM "Metal Stairs Manual".
 - 2. AISC "ASD Manual of Steel Construction" and "Manual of Steel Construction".
 - 3. AWS D1.1 "Structural Welding Code - Steel", AWS D1.3 "Structural Welding Code - Sheet Steel" and AWS "Welding Procedure and Performance Qualification".

1.6 WARRANTY

- A. Provide manufacturer's written warranty that its standard products are free from defects in material and workmanship for the life of the building and agreeing to repair or replace items proven to be defective or refund the purchase price of the item.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Steel Plates, Shapes, Channels, and Bars: ASTM A36. All components to be galvanized.
- B. Steel Tubing: Cold formed, ASTM A500 and A513. All tubing to be galvanized.
- C. Steel Pipe: ASTM A53; Type and grade selected by fabricator as required for design loading; black finish. All pipe to be galvanized.
- D. Steel Grating Treads and Landings: United Interlock Grating systems by Unistrut, or accepted substitute. Made from pre-galvanized steel. Provide with manufacturer's Anti-Skid surface.
- E. Stair Risers: Galvanized steel angles as detailed on Drawings.
- F. Galvanized Steel Nosings: Type as required.
- G. Hold-Down Clips: As standard with manufacturer.

2.2 GENERAL FABRICATION

- A. Exposed Work: True to line and level with accurate angles and surfaces and with straight sharp edges. Use only smooth materials free from burrs, pitting and other marks.
 - 1. Fastener Connections: Provide flush hairline joints at exposed connections.
 - 2. Welded Connections: Exposed welds to have finished appearance in accordance with NOMMA "Guideline 1 - Joint Finishes" for Finish #3.

2.3 STAIR AND LANDING FABRICATION

- A. Provide complete stair and landing systems including stringers, landing framing, treads, landings, connections and other components necessary for the support and installation of stairs and landings. Comply with NAAMM "Metal Stairs Manual" requirements for Service Class Stairs.
- B. Stringers: Galvanized steel plates, tubing or channels as required for compliance with performance requirements.
- C. Steel Grating; Treads and Landings: As detailed.

METAL STAIRS

1. Stair Nosings: As indicated on Drawings.
 - D. Risers: Galvanized steel angles as detailed.
 - E. Landings: Provide 4" toe plates at open edges of landings. Landing type to be slip-resistant steel with safety grit surface permanently bonded to sheet steel backing, with sealed joints between segments, z-shaped stiffeners and steel channel supports. The slip resistance is to be not less than 70 transverse per ASTM E303.
 - F. Stair Unit Connections: Provide angle brackets, bolts, expansion anchors, weld plates and other connection devices as recommended by stair manufacturer for substrates indicated.
- 2.4 RAILINGS AND HANDRAILS
- A. Railings and Handrails: Galvanized and as detailed on Drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install stairs and railings in accordance with approved shop drawings.
- B. Fit exposed connections accurately together to form tight hairline joints.
- C. Provide anchorage devices and fasteners for securing stairs and railings to in-place construction.
- D. Weld connections that cannot be shop welded because of shipping size limitations. Grind exposed joints smooth and touch-up shop paint coat.
- E. Clean field welds, bolted connections and abraded areas and prime with same material used for shop priming.

END OF SECTION

PLANK GRATINGS

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide interlocking Grating Planks walkway at roof level as indicated on Drawings and as specified herein.

1.2 REFERENCES

- A. American Institute of Steel Construction (AISC).
- B. ASTM International (ASTM):
 - 1. ASTM A446: Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality.
- C. Federal Specifications:
 - 1. Federal Specification RR-G-1602A

1.2 QUALITY ASSURANCE

- A. Material shall be provided by a qualified manufacturer with at least 5 years experience in the manufacture of interlock grating. Manufacturer shall demonstrate experience in projects of similar scope.
- B. Anti-Skid surfaced gratings shall conform to Federal Specification RR-G-1602A.
- C. The grating shall be designed to withstand the following load criteria:
 - 1. Uniform Live Load: 189 psf.
 - 2. Concentrated Load: 426 psf.
- D. Contractor shall certify that grating has been tested, indicating maximum allowable uniform and concentrated loads, with a factor of safety of 2, per AISC, Section 6.

1.4 SUBMITTALS

- A. Shop Drawings: Submit shop drawings showing grating layout, support structure and detailed sections depicting assembly.
- B. Test Reports: Complete test reports indicating maximum allowable loading, both uniform and concentrated, and the associated deflections must be provided for all products. Load/deflection information must be substantiated and certified by actual tests (not theoretical) using methods outlined in the American Iron & Steel Institute's Manual, Section 6, "Specifications for the Design of Cold Formed Steel Structural Members," and include a live load safety factor of 2.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURER

- A. Unistrut.
- B. Or accepted substitute.

PLANK GRATINGS

2.2 GRATING PLANKS

- A. Grating Planks: Roofwalk Grating Planks as manufactured by Unistrut, or accepted substitute.
- B. Grating shall be furnished in single, un-spliced sections for all requirements up to 24-ft. in length. Grating shall interlock, with male-female (M-F) legs providing a friction lock, so that no horizontal movement between units can occur. The outside leg of all runs shall be male.
- C. Planks shall include double-male leg and male-female leg planks. 12 inch plank width
 - 1. Double-Male Leg Planks: Unistrut Part No. G 11282.
 - 2. Male-Female Leg Planks: Unistrut Part No. G 12282.
- D. Roofwalks grating shall be manufactured from zinc coated, carbon steel of structural quality as specified in ASTM designation A-446, Grade A. The coating shall be Class G-90.
- E. Materials shall be 18 gauge, with a leg height of 2 ½ inches.
- F. Surface Pattern: The surface pattern shall provide at least 35% open area and no more than 42% open area. Openings shall be at least 4 inches long and no more than ¾ inches wide. The surface design shall be anti-skid.
- G. The anti-skid surface, where specified, shall provide 360° positive traction and be made up of tapered, self-cleaning teeth, approximately 1/8-in. wide by 3/8-in. long and be uniformly spaced with not less than 60 or more than 80 teeth per square foot.

2.3 ACCESSORIES

- A. Support Angles: By others.
- B. Fasteners: Manufacturer's hold-down clips or as otherwise detailed on Drawings.

PART 3 - EXECUTION

3.1 SITE EXAMINATION

- A. Examine the support structure, work area and conditions for the grating installation. If the supports, area or conditions are not satisfactory, installation shall not commence until satisfactory conditions are present.

3.2 ERECTION

- A. Grating shall be installed as detailed on the approved shop drawings.
- B. Grating shall be installed in single, unspliced sections for all requirements to 24 foot lengths.
- C. Grating shall interlock, with male-female legs providing a lock prohibiting horizontal movement. The outside leg of all members shall be male.

PLANK GRATINGS

- D. Connections of grating to support elements shall be by bolting, clamping, screwing, welding, or use of a manufacturer's approved hold-down clip.

END OF SECTION

ROUGH CARPENTRY

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide wood framing, pressure treated nailers, shims, and plywood where required or detailed on the Drawings and as herein specified.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Lumber: Construction Grade, S-dry, Douglas Fir. Moisture content shall conform to WCLIB Rules #16, latest edition, General Grading Provisions, paragraph 3, Seasoning Provisions.
 - 1. Sloped Shims: Western Red Cedar; profile as indicated on Drawings.
- B. Plywood: ½" thick, APA rated, Construction and Industrial Softwood Plywood, PS-1, Exposure 1, ICBO NER-108.
- C. Pressure Treated Lumber: Treat all lumber in contact with concrete masonry with Chemonite, Wolmanized, Osmose K-33, or accepted substitute.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install at tops of parapets as detailed on Drawings.
- B. Secure with appropriate fasteners.

END OF SECTION

SHEATHING

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide gypsum wall sheathing and plywood wall sheathing as indicated on the Drawings and as specified herein.
- B. Provide cement board floor panels as indicated on the Drawings and as specified herein.
- C. Provide plywood floor underlayment as indicated on the Drawings and as specified herein.
- D. Structural Composite Gypsum Panels are specified in Section 09 21 17 STEEL AND GYPSUM COMPOSITE STRUCTURAL PANELS

1.2 REFERENCES

- A. ASTM International (ASTM):
 - 1. ASTM C120: Standard Test Methods of Flexure Testing of Slate (Breaking Load, Modulus of Rupture, Modulus of Elasticity.
 - 2. ASTM C170: Standard Test Method for Compressive Strength of Dimension Stone.
 - 3. ASTM C518: Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
 - 3. AST C1177: Standard Specification for Glas Mat Gypsum Substrate for Use as Sheathing.
 - 4. ASTM C1186: Standard Specification for Flat Fiber-Cement Sheets.
 - 5. ASTM C1396, Standard Specification for Gypsum Board.
 - 6. ASTM D209: Standard Specification for Lampblack Pigment.
 - 7. ASTM D732: Standard Test Method for Shear Strength of Plastics by Punch Tool.
 - 8. ASTM E72: Standard Test Methods for Conducting Strength Tests of Panels for Building Construction.
 - 9. ASTM E84: Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 10. ASTM E96: Standard Test Methods for Water Vapor Transmission of Materials.
 - 11. ASTM E136: Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C.
- B. American Plywood Association: PS 1, Construction and Industrial Softwood Plywood, latest edition.
- C. APA PRP-108: Performance Standards and Policies for Structural Use Panels, latest edition.

1.3 SUBMITTALS

- A. Product Data: Submit product data and installation instructions for Cement Board Floor Panels.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver sheathing with edges protected from bundling strap damage and store above grade, protected from moisture.

SHEATHING

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Gypsum Sheathing: Georgia-Pacific Gypsum LLC:
 - 1. Fiberglass-Mat Faced Gypsum Sheathing: DensGlass Gold.
 - 2. Or accepted substitute.
- B. Cement Board Floor Panels:
 - 1. Plycem CemDeck Fiber Reinforced Cement Board as supplied by U.S. Architectural Products, Inc.,
 - 2. Or accepted substitute.

2.2 MATERIALS

- A. Plywood Wall Sheathing: 15/32" (1/2" nominal) sheathing; C-D plywood with Span Rating of 32/16. APA Rated Group 1, Exposure 1 in compliance with Voluntary Product Standards Document PS1 and Document PS2.
- B. Gypsum Wall Sheathing: Fire-Rated Fiberglass-Mat Faced Gypsum Wall Sheathing: ASTM C1177, Type X.
 - 1. Thickness: 1/2 inch.
 - 2. Width: 4 feet.
 - 3. Length: 8 feet.
 - 4. Weight: 2500 pounds per M square feet.
 - 5. Edges: Square.
 - 6. Surfacing: Coated fiberglass mat on face, back, and long edges.
 - 7. Racking Strength (Ultimate, not design value) (ASTM E72): Not less than 654 pounds per square foot, dry.
 - 8. Flexural Strength, Parallel (ASTM C1177): 100 lbf, parallel.
 - 9. Humidified Deflection (ASTM C1177): Not more than 1/8 inch.
 - 10. Permeance (ASTM E96): Not more than 12 perms.
 - 11. R-Value (ASTM C518): 0.67.
 - 12. Acceptable Products:
 - a. 1/2 inch thick DensGlass Gold Sheathing, Georgia-Pacific Gypsum.
- C. Cement Board Floor Panels:
 - 1. General: Cement board floor panels shall comply with ASTM C1186 Norm, standard specification for flat non-asbestos fiber reinforced sheets, Grade 1.
 - 2. Manufacturer: Plycem CemDeck Fiber Reinforced Cement Board as supplied by U.S. Architectural Products, Inc., or accepted substitute.
 - 3. Fire Resistance Properties:
 - a. Non-combustible in accordance with ASTM E136.
 - b. Panels shall be rated zero flame spread and zero smoke development per ASTM E-84.
 - 4. Minimum Physical Properties (in Dry Condition):
 - a. Modulus of Elasticity Perpendicular to Fiber (ASTM C120): 775,000 psi.
 - b. Modulus of Rupture Perpendicular to Fiber (ASTM C120): 1,820 psi.
 - c. Shear Strength (ASTM D732): 1,180 psi.
 - d. Tensile Strength Perpendicular to Fiber (ASTM D209): 690 psi.
 - e. Compressive Strength Perpendicular to Fiber (ASTM C170): 3,860 psi.
- D. Plywood Underlayment: 1/2" thick, Structural II, T&G Plywood, C-D, 32/16 span rating, APA rated, PS

SHEATHING

- 1, Exposure 1.
- E. Fasteners: Types as required
- a. At Plywood Wall Sheathing: Screw Fasteners: Screws: ASTM C1002, corrosion resistant treated.
 - b. At Gypsum Board Wall Sheathing: Screw Fasteners: Screws: ASTM C1002, corrosion resistant treated.
 - c. At Cement Board Floor Panels: Corrosion resistant self-countersinking head screws. Hilti PWH SD Cement Board Fasteners (part #00372760), or accepted substitute. Fasteners to be minimum #8 diameter with S-12 self-drilling "TEK" points. Lengths to equal 2 to 3 times the board thickness.
 - d. At Plywood Underlayment: Screw fasteners; type as recommended by underlayment manufacturer.
- F. Fire Treatment: Treat plywood panels with Osmose "Flame Proof" meeting flame spread 25 or less, bearing UL FR-S label, or accepted substitute.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Plywood Wall Sheathing: Install plywood either horizontal or vertical with panel edges backed with 2" nominal framing or 2x4 flat blocking.
- B. Gypsum Sheathing: In accordance with ASTM C1280 and the manufacturer's recommendations.
- 1. Manufacturer's Recommendations:
 - a. Current "Product Catalog", Georgia-Pacific Gypsum.
- C. Cement Board Floor Panels: Install per manufacturer's most current instructions as published on the internet web site at <https://architecturalproducts.com>.
- D. Plywood Underlayment: Lay underlayment panels over subflooring with end joints staggered over the subfloor joints.
- E. Small Pieces: Eliminate pieces less than 12" wide with adjustment in layout. If pieces less than 12" wide are required in any wall segment, layout must be approved prior to placement of any sheathing in that segment.

3.2 MINIMUM FASTENING SCHEDULE

- A. Plywood Wall Sheathing: As indicated on General Structural Notes unless otherwise indicated.
- B. Gypsum Wall Sheathing: As indicated on General Structural Notes unless otherwise indicated.
- C. Cement Board Floor Panels: Screw fasteners to maintain minimum of 2" distance from board corners and offset fasteners to avoid 45 degree fastener placement at board corners. Fasteners to maintain ¾" distance from all board edges. Do not overdrive screw heads. Seat screw heads flush with board surface.

SHEATHING

- D. Fastening of Plywood Underlayment:
 - 1. Lay underlayment panels over subflooring with end joints staggered over the subfloor joints.
 - 2. Fasten with recommended screws 6" on center at panel edges and 10" on center at panel interior.

END OF SECTION

ARCHITECTURAL WOOD CASEWORK

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide custom countertops where shown on the Drawings and as specified herein.

1.2 REFERENCED STANDARDS

- A. Quality Standards: Except as herein modified, materials and workmanship grades shall be as defined in Architectural Woodwork Quality Standards, published by the Architectural Woodwork Institute.

1.3 SUBMITTALS

- A. Shop Drawings:
 - 1. Show layout, dimensions, profiles, joint details, and other pertinent items.
 - 2. Show connections to adjacent work, and complete assembly whether or not materials are furnished by the cabinet shop.
 - 3. Include the manufacturer's descriptive literature for specialty items.
 - 4. Identify each item as to location, material grade, workmanship grade, wood species, finish, plastic laminate color, and location of casework.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver products to jobsite until notified by the Contractor that the project is conditioned and prepared to handle and store casework products without damage. Coordinate delivery to comply with job requirements.
- B. Protect all casework from damage during shipment, handling, and storage.

1.5 JOB CONDITIONS

- A. Temperature and Humidity Requirements: Maintain temperature and relative humidity within 5% of the amounts expected during operation of the building. Maintain materials within these limits for 48 hours prior to and during field finishing of materials.
- B. Maintain 50°F minimum in spaces where casework and shelving are being stored.
- C. Coordinate with other trades affecting or affected by the work of this Section.
- D. Protect other surfaces against damage or discoloration caused by the work of this Section.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Plywood: APA, PS 1 for softwood; PS 51 and Industry Standard, I.S. 1 for hardwood. 5-ply minimum.
- B. General Particleboard: 45-pounds per cubic foot minimum density with 8% maximum moisture content. Weyerhaeuser Timblend or Duraflake, Champion Novaply, or accepted substitute.

ARCHITECTURAL WOOD CASEWORK

- C. Low Pressure Laminate: MDL Milamine Overlay, Selply Polyester Overlay, Roseberg Forest Products, or accepted substitute, in color to match Roseberg Forest Products "Dove Gray".
- D. High Pressure Laminate:
 - 1. Manufacturers: Formica, Nevamar, Wilsonart, or accepted substitute.
 - 2. Thickness and NEMA Type:
 - a. Countertops, Splashes, and Countertop Edges: 0.048" (HGS)
 - b. Vertical Exposed Surfaces: 0.028" (VGS)
 - c. Semi-Concealed Backing: 0.020" (CLS).
 - d. Concealed Backing: 0.020" (BKL).
 - 3. Color: As selected by Architect.
- E. Plastic Edge Banding: The use of "T" mold is required on all exposed edges on cabinets, cubbies and or casework.
- F. Casework Countertop Edge Profiles: Countertop edge shall have a radius or be finished in a way that eliminates sharp edges.
- G. Fasteners: Nails, staples and screws to comply with Section 400 in AWI Quality Standards.
- H. Standard Adhesives: Urea, Resorcinol, P.V.A. and Contact adhesives as selected by the cabinet manufacturer, meeting AWI Quality Standards and building code requirements.

2.2 FINISH HARDWARE

- A. Countertop Brackets: Custom fabricated steel brackets as detailed on Drawings and as specified in Section 05 50 00 METAL FABRICATIONS.
- B. Grommets: PVC wire access grommets. 2-1/2" diameter hole; 3" outside diameter by Doug Mockett and Company, Inc., (<http://www.mockett.com>); HAFELE; or accepted substitute. Finish as selected by the Architect from the manufacturer's standard color options.

2.3 FABRICATION

- A. General:
 - 1. AWI Fabrication Grade: Premium grade.
 - 2. Conform to AWI Section 400 except as noted.
 - 3. Assemble at shop where feasible.
 - 4. Conceal end grain in exposed and semi-exposed surfaces.
- B. Materials:
 - 1. Exposed Surfaces: High Pressure Plastic Laminate. Includes the outside surfaces and top surfaces of all casework.
 - 2. Semi-exposed and Concealed Surfaces: MDL, Selply, or accepted substitute.
 - 3. Countertop Substrate: 3/4" thick general particleboard or INT-DFPA plybase "B-D" .

ARCHITECTURAL WOOD CASEWORK

PART 3 - EXECUTION

3.1 EXISTING CONDITIONS

- A. Verify that surfaces to receive casework, countertops, and shelving are straight, plumb, true, rigid, and otherwise properly prepared. Notify Contractor of any defects requiring correction prior to starting work. Do not start work until corrections have been made and are satisfactory.
- B. Verify that solid blocking has been properly installed to support casework and accessories.

3.2 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication. If field measurements differ slightly from drawing dimensions, modify work as required for accurate fit. If any measurement differs substantially, notify the Architect prior to fabrication.

3.3 INSTALLATION

- A. Miter corners, bevel-cut, and glue joints.
- B. Secure countertops in place plumb, square, true, level, and without distortion. Level where necessary with concealed shims.
- C. Anchorage: Secure countertops to grounds, furring, and solid blocking with countersunk fasteners and blind nailing as required.
- D. Accurately scribe face plates, filler strips, and trim strips to adjacent surface irregularities.
- E. Ease sharp external corners prior to finishing.

3.4 ADJUSTMENTS, CLEANING, AND REPAIRING

- A. Adjust moving parts to operate satisfactorily at time of project Substantial Completion and during warranty period.
- B. Damage Adjustments: Repair damaged or defective work as directed. Touch up finish as required. Remove and refinish damaged areas of finish.
- C. Cleaning: Clean exposed and semi-exposed surfaces. Remove labels from exposed plastic laminate finish.
- D. Including work of other trades, clean, repair, and touch-up or replace, when directed, any products that have been soiled, discolored, or damaged by work of this Section.
- E. Remove debris from project site upon work completion or sooner, if directed.
- F. Provide protective cover on counter tops until project acceptance.

END OF SECTION

SHEET WATERPROOFING

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide rubberized asphalt sheet waterproofing as indicated on the Drawings and as specified herein.

1.2 REFERENCES

- A. ASTM International (ASTM):
 - 1. ASTM C177: Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.
 - 2. ASTM D146: Standard Test Methods of Sampling and Testing Bitumen-Saturated Felts and Woven Fabrics for Roofing and Waterproofing.
 - 3. ASTM D412: Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers – Tension.
 - 4. ASTM D570: Standard Test Method for Water Absorption of Plastics.
 - 5. ASTM E96: Standard Test Methods for Water Vapor Transmission of Materials.
 - 6. ASTM E154: Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.

1.3 PERFORMANCE REQUIREMENTS

- A. It is required that waterproof membrane be watertight and not deteriorate in excess of limitations published by the manufacturer.

1.4 SUBMITTALS

- A. Product Data: Submit product data and the general recommendations from the waterproofing materials manufacturer. Include data substantiating that materials comply with requirements.
- B. Field Sample: Install 10-lineal feet of waterproofing products for review during the pre-installation conference to demonstrate the application and installation of the finished product.
- C. Warranties.

1.5 QUALITY ASSURANCE

- A. Manufacturer: Obtain primary waterproofing materials of each type required from a single manufacturer, to greatest extent possible. Provide secondary materials only as recommended by manufacturer of primary materials.
- B. Installer: Firm with not less than 3-years of successful experience in installation of waterproofing similar to requirements for this project and which is acceptable to the manufacturer of the primary waterproofing materials.
- C. Pre-Installation Conference:
 - 1. Notify the Architect, Owner, waterproofing manufacturer's representative, and installer at least 48-hours before starting waterproofing work. Arrange a mutually acceptable time for meeting at the job with all notified parties to review the waterproofing specifications and job conditions. Obtain the acceptance and approval of all parties on materials, details, and methods before beginning waterproofing work.

SHEET WATERPROOFING

2. Review substrate conditions, manufacturer's installation instructions, material condition at the site, and equipment used for installation. Provide field sample for review and approval.

1.6 PROJECT/SITE CONDITIONS

- A. Substrate: Proceed with the Work after substrate construction, openings, and penetrating work has been completed.
- B. Temperature and Moisture Requirements: Do not install during wet weather or when ambient temperature is less than 40°F. Do not install on wet, damp, or frost covered surfaces.

1.7 WARRANTY

- A. Provide written warranty, agreeing to repair or replace defective materials and workmanship. Warranty includes responsibility for removal and replacement of other work that conceals sheet waterproofing.

PART 2 - PRODUCTS

2.1 ACCEPTED MANUFACTURERS

- A. Bituthene 3000 by GCP Applied Technologies (Formerly Grace). (Specification Base).
- B. Jiffy-Seal #140/60 Membrane by Protecto-Wrap.
- C. Mel-gard by W.R. Meadows Sealtight. (Protection board not required).
- D. Mel-rol by W.R. Meadows Sealtight. (Protection board is required).
- E. QSC 701 by Quaker Products, LTD.
- F. Or accepted substitute.

2.2 RUBBERIZED ASPHALT SHEET WATERPROOFING

- A. Bituthene 3000: Self-adhering membrane of rubberized asphalt integrally bonded to polyethylene sheeting, formed into uniform flexible sheets of not less than 60 mils thickness, complying with the following:
 1. Pliability (ASTM D146): Unaffected by 180° bend over 1" mandrel at -25°F.
 2. Tensile Strength of Membrane (ASTM D412): 250-psi minimum.
 3. Ultimate Elongation (ASTM D412): 300% minimum.
 4. Puncture Resistance of Membrane (ASTM E154): 40-pounds minimum.
 5. Hydrostatic Head Resistance: 150 feet minimum.
 6. Permeance (ASTM E96, Method B): 0.05-grains/sq. ft./hr./in. Hg.
 7. Water Absorption (ASTM D570): Not more than 0.1%.

2.3 MISCELLANEOUS MATERIALS

- A. Primers: Provide type of primer as recommended by the manufacturer of sheet waterproofing material for applications required.

SHEET WATERPROOFING

- B. Flashing Materials: Except as otherwise indicated, provide types of flexible sheet material for flashing as recommended by the waterproofing sheet manufacturer.
- C. Provide mastic materials, sealants, tapes, and other accessory materials as recommended by waterproofing sheet manufacturer for a complete, waterproof installation.
- D. Protection Board: ASTM C177, expanded polystyrene board, 1.0 pound nominal density in thickness as recommended by the membrane manufacturer or any other board recommended by the membrane manufacturer and accepted by Architect. (Protection board is not required if Mel-gard by W.R. Meadows Sealtight product is used.)

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine surface specified to receive waterproofing to assure that surface is in condition acceptable to the manufacturer's requirements.
 - 1. Surface shall be dry and clean of oil, grease, dust, loose debris, or other contaminants.
 - 2. Surface shall be free of voids, spalled areas, and sharp protrusions.

3.2 PREPARATION

- A. Pre-Installation Conference: Prior to installation of waterproofing and associated work, meet at project site with the Architect and Installer of each component of associated work, and installers of work requiring coordination with the waterproofing work. Review material selections and procedures to be followed in performing work.
- B. Product data listed in Paragraph A of Article 1.4 above shall have been submitted to, reviewed, and accepted by the Architect prior to the scheduling of the Pre-Installation Conference.

3.3 INSTALLATION

- A. Apply primers to substrate surfaces as recommended by the manufacturer of the primary waterproofing materials. Prime only areas that will be covered by the waterproof membrane in the same working day; reprime areas not covered by the waterproof membrane within 24-hours.
- B. Comply with the manufacturer's instructions for handling and installation of sheet waterproofing materials.
- C. Coordinate the installation of waterproofing materials and associated work to provide complete system complying with combined recommendations of the manufacturer and installer involved in work. Schedule the installation to minimize period of exposure of the sheet waterproofing materials.
- D. Apply waterproofing sheet and flashings to vertical surfaces as shown on the Drawings and as required to provide complete membrane over area indicated to be waterproofed. Seal to projections through membrane and seal seams.
- E. Install protection board over completed membrane complying with the manufacturer's recommendations for both waterproofing sheet and protection board materials.

SHEET WATERPROOFING

3.4 PROTECTION

- A. Institute required procedures for protection of completed membrane during installation of work against the membrane and throughout remainder of construction period.

3.5 MANUFACTURER'S FIELD SERVICE

- A. Upon completion of the waterproofing system, an authorized manufacturer's representative shall make an inspection of the installation for final acceptance.

END OF SECTION

FLUID-APPLIED WATERPROOFING

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide fluid-applied waterproofing system as specified herein on concrete surfaces as indicated on Drawings.

1.2 REFERENCES

- A. ASTM International (ASTM):
 - 1. ASTM D4541: Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.
 - 2. ASTM D5957: Standard Guide for Flood Testing Horizontal Waterproofing Installations.
- B. Factory Mutual (FM).
- C. National Institute of Occupational Safety and Health (NIOSH).
- D. National Roofing Contractors Association (NRCA).
- C. Underwriters Laboratories (UL).
- D. (PMG).
- E. United States Department of Labor; Occupational Safety & Health Administration (OSHA):
 - 1. Standard Title 29, Code of Federal Regulations (CFR), Part 1910.134, Respiratory Protection.

1.3 PERFORMANCE REQUIREMENTS

- A. General Performance: Installed membrane waterproofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Membrane waterproofing and base flashings shall remain watertight.
- B. Material Compatibility: Provide waterproofing materials that are compatible with one another under conditions of service and application required, as demonstrated by waterproofing membrane manufacturer based on testing and field experience.
- C. FM Listing:
 - 1. Provide waterproofing membrane, base flashings, and component materials that comply with requirements in FM Approval 4450 and FM Approval 4470 as part of a membrane waterproofing system, and that are listed in FM Approval's "RoofNav" for Class 1 or noncombustible construction, Assembly. 174682-174663-0.
 - 2. Fire/Windstorm Classification: Class 1-90. Provide "Acceptance" documentation from PMG where necessary.
 - 3. Hail Resistance: SH.
 - 4. Provide waterproofing system materials bearing FM Approval marking on bundle, package, or container, indicating that materials have been subjected to PM's examination and follow-up inspection service.

FLUID-APPLIED WATERPROOFING

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include:
 - 1. Product test reports.
 - 2. Manufacturer's published specifications for the proposed materials and systems.
 - 3. Maintenance Data: For waterproofing system to include in maintenance manuals.
 - 4. Inspection Report: Copy of roofing system manufacturer's inspection report of completed waterproofing installation.
 - 5. Evidence of UL and FM Approvals.
 - 6. Warranties: Sample of special warranties specified in this Section.
- B. Shop Drawings: Show locations and extent of waterproofing. Include details for substrate joints and cracks, sheet flashings, penetrations, inside and outside comers, tie-ins, and other termination conditions.
- C. Submittal Prior to Contract Award:
 - 1. Letter from the proposed primary waterproofing manufacturer confirming that the bidder is an acceptable Contractor authorized to install the proposed system.
 - 2. Letter from the primary waterproofing manufacturer stating that the proposed applicant will comply with the Manufacturer's requirements in order to qualify the project for the specified warranty.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications and Requirements:
 - 1. A qualified firm that is approved, authorized, or licensed by waterproofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's warranty.
 - 2. In continuous business under same name for past 5 years.
 - 3. Completed at least 3 successful installations of specified materials and systems on projects of similar scope.
 - 4. Contractor shall provide all personnel trained in application of materials and systems and shall maintain supervision as specified elsewhere.
 - 5. Installer Field Supervision: Require installer to maintain a full-time supervisor / foreman on the job site during times that single ply waterproofing systems installation is in progress, and who is experienced in installation of the specified waterproofing systems.
- B. Manufacturer Qualifications:
 - 1. Obtain primary products, including single ply, adhesive, membrane flashings, and fasteners, from a single manufacturer. Provide secondary products as recommended and approved by the primary manufacturer for the specified roof systems.
 - 2. A qualified manufacturer that has UL listing and FM approval for membrane waterproofing system identical to that used for this Project.
 - 3. Technical Representative, as a minimum, shall be present to observe deck preparation, general installation procedures, and final completion; submit documentation of manufacturer's final acceptance.
 - 4. Work shall not proceed until such observations have been made and conditions have been approved in writing by the manufacturer.
 - 5. Technical Representative shall perform a punch list inspection upon substantial completion of the project indicating all items in need of attention, including conformance to manufacturer's published installation instructions and these contract documents; provide documentation.

FLUID-APPLIED WATERPROOFING

- C. Pre-installation Conference: Conduct conference at the Project site.
 - 1. Review waterproofing requirements including surface preparation, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special details and flashings, installation procedures, testing and inspection procedures, and protection and repairs.
- D. Product Quality Assurance Program: Primary waterproofing materials shall be manufactured under a quality management system that is monitored regularly by a third party auditor under the ISO 9001 audit process.
- E. Project Acceptance: Submit a completed manufacturer's application for roof warranty form along with shop drawings of the roofs showing all dimensions penetrations, and details. The form shall contain all the technical information applicable to the project including deck types, roof slopes. The form shall also contain accurate and complete information requested including proper names, addresses, zip codes and telephone numbers. The project must receive approval by the waterproofing manufacturer, through this process, prior to shipment of materials to the project site.
- F. Scope of Work: The work to be performed under this specification shall include but is not limited to the following: Attend necessary job meetings and furnish competent and full time supervision, experienced waterproofing mechanics, all materials, tools, and equipment necessary to complete, in an acceptable manner, the waterproofing membrane/flashings installation in accordance with this specification. Comply with the latest written application instructions of the manufacturer of the primary waterproofing products. Specified waterproofing system is to be installed where indicated on Drawings.
- G. Local Regulations: Conform to regulations of public agencies, including any specific requirements of the city and/or state of jurisdiction.
- H. Manufacturer Requirements: The waterproofing membrane flashing system manufacturer shall provide direct trained company personnel to attend necessary job meetings, perform periodic inspections as necessary, and conduct a final inspection upon successful completion of the project.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Delivery: Deliver materials in the manufacturer's original sealed and labeled containers and in quantities required to allow: continuity of application.
- B. Storage: Store closed containers in a cool, dry area away from heat, direct sunlight, oxidizing agents, strong acids, and strong alkalis. Do not store resins at temperatures below 32°F (0° C) or above 85°F (29°C). Keep away from open fire, flame or any ignition source. Store in a well ventilated area.
- C. Handling: Handle all materials in such a manner as to preclude damage and contamination with moisture or foreign matter. Keep away from open fire, flame, or any ignition source. Vapors may form explosive mixtures with air. Avoid skin and eye contact with this material. Avoid breathing fumes when above the Threshold Limit Value (TVL). Do not eat, drink, or smoke in areas where materials are stored or applied.
- D. Damaged Material: Any materials that are found to be damaged or stored in any manner other than stated above shall be automatically rejected, removed and replaced at the Contractor's expense.

FLUID-APPLIED WATERPROOFING

1.7 PROJECT/SITE CONDITIONS

- A. Requirements Prior to Job Start:
 - 1. Notification: Give a minimum of 5 days notice to the Owner and manufacturer prior to commencing any work and notify both parties on a daily basis of any change in work schedule.
 - 2. Safety: Familiarize every member of the application crew with all fire and safety regulations recommended by OSHA, NIOSH, NRCA and other industry or local governmental groups. Workers shall wear a long sleeve shirt with long pants and work boots. Workers shall use only butyl rubber or nitrile gloves when mixing or applying PMMA products. Safety glasses with side shields are required for eye protection. Use local exhaust ventilation to maintain worker exposure below the published Threshold Limit Value (TLV). If the airborne concentration poses a health hazard, becomes irritating or exceeds recommended limits, use a NIOSH approved respirator in accordance with OSHA Respirator Protection requirements published under 29 CFR 1910.134. The specific type of respirator will depend on the airborne concentration. A filtering face piece or dust mask is not appropriate for use with this product if TLV filtering levels have been exceeded.
- B. Environmental Requirements:
 - 1. Precipitation: Do not apply waterproofing materials during precipitation or in the event there is a probability of precipitation during application. Take adequate precautions to ensure that materials, applied waterproofing, and building interiors are protected from possible moisture damage or contamination.
 - 2. Temperature Restrictions - PMMA-based Materials: Do not apply catalyzed resin materials if there is a threat of inclement weather. Follow the resin manufacturer's specifications for minimum and maximum ambient, material and substrate temperatures. Do not apply catalyzed resin materials unless temperatures fall within the resin manufacturer's published range.
- C. Protection Requirements:
 - 1. Membrane Protection: Provide protection against staining and mechanical damage for newly applied waterproofing and adjacent surfaces.
- D. Owner's Requirements: Work methods and workers must perform work in a manner that shall not include open flames or sparks and all equipment must be non-sparking as required to conform to NFPA Class I, Division I Hazards, or implement a fire protection plan coordinated with the Owner to mitigate the hazard. See Section 01010 and Section 01063 for expected environmental conditions and required safety measures.

1.8 WARRANTY

- A. Waterproofing Membrane Manufacturer's Warranty: Upon successful completion of the project, and after all post installation procedures have been completed, furnish the Owner with the manufacturer's twenty (20) year labor and materials membrane warranty. The warranty shall be a term type, without deductibles or limitations on coverage amount, and shall be issued at no additional cost to the Owner. This warranty shall not exclude random areas of ponding from coverage.
 - 1. Warranty Period: Manufacturer's 20-year full system warranty.
- B. Contractor's Warranty: Installer shall provide signed warranty against workmanship defects and assurance of leak free performance for any initial waiting period stated in the waterproofing membrane manufacturer's warranty.

FLUID-APPLIED WATERPROOFING

1. Warranty Period: Contractor's 2-year warranty covering labor and materials.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Siplast. (Specification Base)
- B. Soprema, Inc.
- C. Kemper System America, Inc.
- D. Or accepted substitute.

2.2 WATERPROOFING MEMBRANE

- A. Basis of Design: Siplast Parapro Roof Membrane.
- B. Roof Membrane: Reinforced PMMA Membrane Flashing System Components.
 1. Siplast - Parapro Roof System consisting of:
 - a. Catalyst: A peroxide-based reactive agent used to induce curing of acrylic resins.
 - b. Flashing Resin: A flexible, polymethylmethacrylate (PMMA) based resin combined with a thixotropic agent for use in combination with fleece fabric to form a monolithic, reinforced flashing membrane.
 - c. Waterproofing Membrane Resin: A flexible, polymethylmethacrylate (PMMA) based resin for use in combination with fleece fabric to form a monolithic, reinforced waterproofing membrane.
 - d. Reinforcing Fleece: A non-woven, 110 g/m², needle-punched polyester fabric reinforcement as supplied by the waterproofing system manufacturer.
 - e. Color Finish Resin: A pigmented, polymethylmethacrylate (PMMA) based resin for use as a wearing coat over the field of the finished roof membrane and to provide a desired color finish.
 - 1) Color: Grey.
 - f. Thixotropic Agent: A liquid additive used to increase the viscosity of the PMMA-based resin products, allowing the resins to be applied over vertical or sloped substrates.
 - g. Anti-Skid Surfacing: Ceramic Granules No. 11 grade specification ceramic granules suitable for broadcast into the PMMA based wearing layer.
 2. Acceptable Alternative Systems:
 - a. Soprema - Alsan RS System.
 - b. Kemper System America, Inc. – Kemperol BR/BRM Waterproofing and Waterproofing System.

2.3 AUXILIARY MATERIALS

- A. Cleaning Solution/Solvent: A clear solvent used to clean and prepare transition areas of in-place catalyzed resin to receive subsequent coats of resin and to clean substrate materials to receive resin.
 1. Siplast ~ Pro Prep.
 2. Or Approved.

FLUID-APPLIED WATERPROOFING

- B. Primer: A fast-curing PMMA-based and specialized epoxy resin based primers for use over horizontal concrete substrates.
 - 1. Siplast - Pro Primer T.
 - 2. Soprema Alsan RS 276.
 - 2. Koster - Koester YAP 1 2000.
 - 3. Or Approved.
- C. Preparation Paste: A PMMA based paste used for remediation of depressions in substrate surfaces or other irregularities.
 - 1. Siplast - Pro Paste Resin.
 - 2. Or Approved.

2.4 SLOPING MEDIUM/REPAIR MORTAR MATERIALS

- A. Sloping Medium/Repair Mortar: One component cementitious repair mortar with option for aggregate extension, used for remediation of depressions or patching concrete substrates and for formation of drainage crickets.
 - 1. Raeco R-50 Overlayment by Raeco, Inc.
 - 2. Or Approved and must be acceptable to waterproofing manufacturer.
- B. Bonding Agent: Liquid Bonding agent for adhesion of cementitious patching materials.
 - 1. Sika Corporation - Sika Armatec 110 EPOCEM.
 - 2. Or Approved.

PART 3 – EXECUTION

3.1 SUBSTRATE EXAMINATION/PREPARATION

- A. General: Ensure that substrates are free from gross irregularities, loose, unsound or foreign material such as dirt, ice, snow, water, grease, oil, bituminous products, release agents, laitance, paint, loose particles/friable matter, rust or any other material that would be detrimental to adhesion of the catalyzed primer and/or resin to the substrate. Some surfaces may require scarification, shotblasting, or grinding to achieve a suitable substrate. Wipe surfaces with a clean cloth saturated with the specified cleaner/solvent to remove grease, oils or dust that may affect adhesion and to cured PMMA surfaces to receive a subsequent coat of resin.
- B. Moisture Evaluation: Evaluate the level of moisture in the substrate to determine that moisture levels are acceptable for application of specified waterproofing system. Concrete substrates to receive an application of the specified PMMA waterproofing system shall have a maximum moisture content of 6% and a maximum internal relative humidity of 75% for use of PMMA based primer. Moisture contents in concrete surfaces that exceed 6% shall require the use of epoxy resin based primer.
- C. Adhesion Testing for Concrete Substrates to Receive Resin Materials: Test the concrete substrate using a device conforming to ASTM D 4541 using a 50 mm dolly adhered with the specified catalyzed primer. Utilize the same concrete preparation methods as that which will be used prior to application of the waterproofing for areas to be evaluated for adhesion. Ensure that a minimum adhesion value of 220 psi is obtained before application of the waterproofing system. If multiple areas or substrates are involved in the scope of work, evaluate each to determine suitability. Maintain testing/evaluation records.

FLUID-APPLIED WATERPROOFING

- D. Preparation of Concrete Receive Resin: Concrete substrates shall have a minimum hardness of 3,500 psi (24 N/mm²). Scarify or shot-blast concrete or masonry surfaces to provide a sound substrate free from laitance and residue from bitumen, coal tar, primer, coatings, adhesives, sealer or any material that may inhibit adhesion. Prepare the concrete surface to generate a concrete surface profile of ~SP-2 to ~SP-4 as defined by the I~RI. Repair spalls and voids on vertical or horizontal surfaces using the specified primer and preparation paste.
- E. Concrete Substrate to Receive Resin - Repair and Leveling: Before application of the waterproofing membrane, and after priming, fill all joints, cracks, voids, fractures, depressions, small indentations, and low areas in the substrate using repair mortar.
- F. Static Crack and Cold Joint Preparation: Prime cracks and joints with the specified PMMA primer and fill cracks and joints using the specified preparation paste prior to membrane/flashing application. Commence membrane and flashing application immediately following catalyzation of the preparation paste.

3.2 MIXING OF RESIN PRODUCTS

- A. Preparation/Mixing/Repair Mortar: Explicitly follow manufacturer's mixing instructions, additive options and requirements and aggregate extension limitations.
- B. Preparation/Mixing/Catalyzing Flashing and Waterproofing Resin Products: Adhere to manufacturer's mixing instructions. Pour the desired quantity of resin into a clean container and using a spiral mixer or mixing paddle, stir the liquid for the time period specified by the resin manufacturer. Calculate the amount of catalyst powder needed using the manufacturer's guidelines and add the pre-measured catalyst to the resin component. Mix again for the time period specified by the resin manufacturer, ensuring that the product is free from swirls and bubbles. Ensure that air is not entrained into the product during the mixing process. To avoid aeration, do not use a spiral mixer unless the spiral section of the mixer can be fully contained in the liquid during the mixing process. Mix only enough product to ensure that it can be applied before expiration of resin pot life.

3.3 PREPARATION PASTE AND PRIMER MIXING/APPLICATION

- A. Primer Application: Apply primer resin using a roller or brush at the minimum rate specified by the primer manufacturer over poured reinforced concrete substrates. Increase application rates over other absorbent substrates. Do not let resin pool or pond. Do not under-apply or over-apply primers as this may interfere with proper primer catalyzation. Make allowances for saturation of roller covers and application equipment.
- B. Paste Application: Allow the primer to set and apply catalyzed preparation paste using a trowel. Before application of resin over the catalyzed paste surface, the specified cleaner/solvent, wipe the surface of the paste using the specified cleaner/solvent and allow to dry. Treat the surface again if not followed up by resin application within 60 minutes.

3.4 WATERPROOFING MEMBRANE APPLICATION

- A. Waterproof Membrane Application:
 - 1. Using the specified cleaner/solvent, wipe flashing membrane surfaces to be lapped with field membrane. Allow the surface to dry for a minimum 20 minutes before continuing work.

FLUID-APPLIED WATERPROOFING

2. Apply an even, generous base coat of field membrane resin using a roller at the minimum rate specified by the resin manufacturer to prepared surfaces. Work the fleece into the wet, catalyzed resin using a roller to fully embed the fleece in the resin and remove trapped air. Lap fleece layers a minimum of 2 inch (5 cm) and apply an additional coat of catalyzed resin between layers of overlapping fleece. Again using a roller, apply an even top coat of catalyzed resin at the minimum rate specified by the resin manufacturer immediately following embedment of the fleece, ensuring full saturation of the fleece. Make allowances for saturation of roller covers and application equipment. Allow 2 hours cure time prior to exposing the membrane to foot traffic.

B Wearing Layer:

1. Granule Anti-Skid Application: Apply an additional top coat of the catalyzed roof resin at the minimum rate specified by the resin manufacturer; and broadcast granules before the resin sets. Remove tape before the resin sets.

3.5 FIELD QUALITY CONTROL AND INSPECTIONS

- A. Site Condition: Leave all areas around job site free of debris, materials, equipment and related items after completion of job.
- B. Notification of Completion: Notify the manufacturer by means of manufacturer's printed Notification of Completion form of job completion in order to schedule a final inspection date.
- C. Final Inspection:
 1. Post-Installation Meeting: Hold a meeting at the completion of the project, attended by all parties that were present at the pre-job conference. A punch list of items required for completion shall be compiled by the Contractor and the manufacturer's representative. Complete, sign, and mail the punch list form to the manufacturer's headquarters.
- D. Issuance of The Warranty: Complete all post installation procedures and meet the manufacturer's final endorsement for issuance of the specified warranty.

END OF SECTION

WATER REPELLENTS / GRAFFITI BARRIERS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. At New CMU Wall Surfaces: Provide water repellent and graffiti barrier at new concrete masonry wall surfaces at locations indicated on Drawings.

1.2 SUBMITTALS

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

1.3 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Submit qualifications of applicator; stating applicator has a minimum of three (3) years experience using the specified or a similar product. Provide a list of several most recently completed projects, including project name and location, names of owner and architect, and description of products used, substrates, and method of application.
 - 2. Employs persons trained for the application of the specified or similar products.
 - 3. Comply with applicable federal, state, and local environmental regulations.
- B. Pre-installation Conference: Conduct at Project site with attendance of parties directly affecting work of this section, including the General Contractor, Architect, applicator, and manufacturer's representative. Review environmental regulations, test panel procedures, protection of surrounding areas and non-masonry surfaces, surface preparation, application, field quality control, final cleaning, and coordination with other work.
- C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
 - 1. Apply each product to 2 ft. X 2 ft. test panel area, in accordance with manufacturer's written instructions, to determine coverage rates, effectiveness, aesthetics, and desired results.
 - 2. Allow 10 days or until test panels are thoroughly cured before evaluating final appearance and results.
 - 3. Conduct RILEM test method II.4 to evaluate water repellent performance.
 - 4. Conduct Tag/Detag test to evaluate the graffiti barrier performance.
 - 5. Do not begin full-scale application until test panels are inspected and approved by the Architect.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver materials to the job site in original, tightly sealed, unopened containers, with labels clearly identifying product name and manufacturer. Verify that the product matches that of the original sample applied on the test panel.
- B. Storage and Handling: Store containers upright in a cool, dry place. Keep away from sparks and open flame.
- C. Comply with all applicable DEQ and local jurisdiction rules and regulations regarding collection, containment and disposal of water repellent and graffiti barrier products. Do not allow into storm drainage/sewer systems.

WATER REPELLENTS / GRAFFITI BARRIERS

1.5 WARRANTY

- A. Manufacturer's Warranty: 10 year water repellent performance warranty required for vertical surfaces.
 - 1. Complete sections 1 and 2 of Manufacturers Warranty Application and submit to manufacturer for review and approval prior to water repellent installation.
 - 2. Complete section 3 of Manufacturers Warranty Application and submit to manufacturer upon completion of water repellent installation.

PART 2 - PRODUCTS

2.1 PENETRATING WATER REPELLENTS AND GRAFFITI BARRIERS

- A. The water repellent and graffiti barrier products specified are selected as a standard of quality based upon manufacturer's recommendations for execution.
- B. Performance:
 - 1. Water repellent/ graffiti barrier shall penetrate the surface and react to form silicone rubber, which remains below the surface and prevents water and paint from penetrating and bonding while permitting moisture vapor transmission. The silicone rubber retains its characteristic 400 percent elongation, allowing for bridging of hairline cracks, compensating for thermal expansion/contraction and building movement.
 - 2. Water repellent/graffiti barrier shall be unaffected by ultraviolet light, airborne pollutants, salt spray or acid rain.
 - 3. Water repellent/graffiti barrier shall cure to a clear, flat finish. Slight darkening or enhancement is acceptable.
- C. Professional Water Sealant and Anti-Graffiti, PWS-15 Super Strength: Two coats in the two-coat process provides graffiti protection.
 - 1. Form: Liquid.
 - 2. Color: Clear.
 - 3. Active Substance: RTV Silicone Rubber.
 - 4. Percent Active Material: 15 percent.
 - 5. VOC Content: Meets local and federal requirements.
- D. Professional Water Sealant and Anti-Graffiti, PWS-8 Extra Strength: Second coat in the two-coat process provides graffiti protection on the lower elevation and water repellent only protection on area above.
 - 1. Form: Liquid.
 - 2. Color: Clear.
 - 3. Active Substance: RTV Silicone Rubber.
 - 4. Percent Active Material: 8 percent.
 - 5. VOC Content: Meets local and federal requirements.

2.2 MANUFACTURERS

- A. Acceptable Manufacturer: Professional Products of Kansas, Inc., 4456 S. Clifton, Wichita, KS 67216; Toll Free Tel: 800-676-7346; Tel: 316-522-9300; Fax: 316-522-9346; Email:ppk@watersealant.com; Web: www.watersealant.com
- B. Requests for substitutions will be considered in accordance with provisions of Section 01600.
 - 1. Proposed alternate products shall be equal in terms of chemical composition and performance standards. Products shall be a penetrating, breathable treatment using a Room Temperature Vulcanizing (RTV) Silicone Rubber base. Silane and siloxane based products will not be considered.

WATER REPELLENTS / GRAFFITI BARRIERS

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements and conditions affecting performance of the work.
 - 1. Verify that surfaces are clean and dry according to water-repellent manufacturer's requirements. Check moisture content in representative locations by method recommended by manufacturer.
 - 2. Inspect for previously applied treatments that may inhibit penetration or performance of the water repellent.
 - 3. Verify that there is no efflorescence or other removable residues that would be trapped beneath the application of the water repellent.
 - 4. Verify that repairs are complete, cured and dry before applying water repellent.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.1 PROTECTION

- A. Special precautions shall be taken to avoid fumes from entering the building being treated. Ventilation systems and fresh air intakes shall be turned off and covered.
- B. Protect sidewalks, shrubs, metal, glass, vehicles, and other building hardware from overspray.
- C. Collect, contain and dispose of water repellants, and graffiti sealers in compliance with DEQ and local jurisdiction rules and regulations. Do not allow into storm drainage/sewer systems.

3.2 PREPARATION

- A. Clean all dirt, oil, grease, mold, mildew, efflorescence, or any other coating or material from surfaces that interfere with penetration, performance, adhesion, or aesthetics of water repellents. Rinse thoroughly to remove cleaner residues. Allow surfaces to dry completely before application of water repellents.
- B. Repair, patch, and fill all cracks, voids, defects, and damaged areas in surface as approved by the Architect. Allow repair materials to cure completely before application of water repellents.
 - 1. Allow new masonry and re-pointed surfaces to cure for a minimum of 28 days before application of water repellents /graffiti barriers.
- C. Coordinate with Work of Section 04 01 00 MASONRY RESTORATION AND CLEANING.

3.3 APPLICATION OF WATER REPELLENT/GRAFFITI BARRIER

- A. Apply a heavy-saturation coating of water repellent/graffiti barrier on surfaces indicated for treatment, using low-pressure (40 to 60 p.s.i.) spray to the point of saturation in accordance with manufacturer's written instructions, environmental regulations, and application procedures determined from the test panel results approved by the Architect.
 - 1. Apply to clean, dry, cured, and properly prepared surfaces approved by Architect.
 - 2. Apply material as shipped by the manufacturer. Do not dilute.
 - 3. Do not apply to below-grade surfaces.
 - 4. Do not apply to painted surfaces.
 - 5. Do not apply to compensate for structural or material defects in substrates.
 - 6. Do not apply to substrates such as asphalt or polystyrene which may be affected by the solvent carrier.

WATER REPELLENTS / GRAFFITI BARRIERS

7. Vertical Applications: When spraying, material shall be applied from the top down, in even strokes, allowing for a 4 to 6 inch (102 mm to 152 mm) run down to ensure adequate penetration and saturation. Work all the way down the building covering the rundown as you go. Be sure to fill in between the rundown lines with an equal volume of product to ensure even application. Avoid excessive overlapping.
 - a. Some substrates may require back rolling after product is applied to smooth out any rundown lines.
 - b. Brush any excess product that may accumulate on ledges and other areas that may hold excess material.
 8. Horizontal surfaces: Do not apply graffiti resistant coating to horizontal surfaces, as it may cause surface to become slippery.
- B. At Concrete Masonry - Two Coat Application for Water Repellent/Graffiti Barrier in Locations Shown on Drawings:"
1. First Coat at lower area: Apply PWS-15 Super Strength at lower portion of wall indicated, starting at the top of the designated area, being sure to obtain a 4-6 inch rundown of product from the point where the spray makes contact with the surface. Work all the way down the building covering the rundown as you go. Avoid excessive overlapping. Some substrates may require back rolling after product is applied to smooth out any rundown lines. Brush any excess product that may accumulate on ledges and other areas that any hold excess material.
 2. Second Coat over entire surface: Allow surface to dry to the touch before application of PWS-15 Super Strength (approximately 2 hours). Repeat application as described for first coat, starting at the top of the structure.
 3. Horizontal surfaces: Do not apply graffiti resistant coating to horizontal surfaces, as it may cause surface to become slippery.
- C. Inspection: Inspect the work with the Contractor, architect, applicator, and manufacturer's representative, and compare with test panel results approved by the Architect. Verify that the substrates are suitably protected by the application.
- D. Manufacturer's Field Services: Provide the services of a manufacturer's authorized field representative to verify specified products are used; protection, surface preparation, and application of products are in accordance with the manufacturer's written instructions; and the test panel is approved by the Architect.

3.4 **CLEANING**

- A. Immediately clean water repellent/graffiti barrier from adjoining surfaces and surfaces soiled or damaged by water repellent/graffiti barrier as work progresses. The Contractor shall remove all equipment, material and debris, leaving the area in an undamaged and acceptable condition. Dispose of material containers according to state and local environmental regulations.
- B. Repair, restore, or replace to the satisfaction of the Architect, all materials, landscaping, and non-masonry surfaces damaged by exposure to material application.

END OF SECTION

THERMAL INSULATION

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Thermal blanket insulation in wall and ceiling framing spaces where indicated on Drawings and as specified herein.

1.2 REFERENCES

- A. ASTM International (ASTM):
 - 1. ASTM C665: Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
 - 2. ASTM C991: Standard Specification for Flexible Glass Fiber Insulation for Metal Buildings.
 - 3. ASTM E84: Standard Test Method for Surface Burning Characteristics of Building Materials.
- B. Thermal Insulation Manufacturer's Association: TIMA 202, Flexible Glass Fiber Insulation for Pre-Engineered Metal Buildings.
- C. Underwriter's Laboratory: UL 623, Fire Resistance Directory.
- D. Uniform Building Code: Standard No. 8-1, Test Method for Surface-Burning Characteristics of Building Materials.

1.3 SUBMITTALS

- A. Product Data: Submit for materials being used, recommended adhesives, and manufacturer's stick pin placement for insulation installation.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver all materials to the project site in the manufacturer's original packaging, indicating R-value, type of material, and other pertinent data.
- B. Store all materials off the ground and protected from weather and traffic damage.

PART 2 - PRODUCTS

2.1 THERMAL BLANKET INSULATION

- A. Insulation Data: Mineral Fiber Insulation Blanket, ASTM C665, 1.5 pound minimum density. CertainTeed, Manville, Owens/Corning, U.S. Gypsum, or accepted substitute.
 - 1. Aluminum Foil Faced: Type III, Aluminum foil vapor barrier, 0.5 perm rating. Provide with 1" flanges on vapor barrier (inside) face.
 - 2. R-Value at Wall Type I and Ceiling of Press Box: R-11, 3-1/2" thick.
 - 3. R-Value at Wall Type E of Press Box: R-19, 5-1/2" thick.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine areas scheduled to receive insulation to insure protection against weather and other hazards.
- B. Inspect space allocated for proper depth to receive specified material.

THERMAL INSULATION

- C. Coordinate timing of installation with framer, electricians, and others whose work may be affected or have effect.

3.2 INSTALLATION

- A. Thermal Blanket Insulation:
 - 1. Install blankets snugly between framing members with vapor barrier on the inside (heated space) face.
 - 2. Insulate small areas between closely spaced framing members. Cut and fit around pipes, conduits, and outlet boxes. Where pipes are located in stud spaces, place insulation between exterior wall and pipe, compressing insulation if necessary.
 - 3. Tape joints, ruptures, and terminal edges of vapor barrier faces with 2" wide duct tape to form a completely sealed vapor barrier.
 - 4. Install string wires at 24" on center across or threaded through studs to retain insulation. Secure to flanges of metal framing using an approved adhesive tape.

3.3 CLEANING

- A. Remove litter and debris leaving areas in a clean, uncluttered condition.

END OF SECTION

VAPOR RETARDER

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide vapor retarder under the cast-in-place concrete slabs as indicated on the Drawings and as herein specified.
 - 1. Provide under floor slab of Storage 105.

1.2 REFERENCES

- A. ASTM International (ASTM):
 - 1. ASTM E1643: Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs
 - 2. ASTM E1745: Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.

1.3 SUBMITTALS

- A. Product Data: Submit material sample, specifications, installation instructions and details, and all accessories that will be used in the installation.

1.4 QUALITY ASSURANCE

- A. Pre-Application Meeting for Vapor Retarder: Notify Owner, Architect, vapor retarder manufacturer's representative, reinforcing steel workers, and concrete application workers at least 48 hours prior to starting vapor retarder installation. Arrange a mutually acceptable time for meeting at the job with all notified parties to review the vapor retarder specifications and job conditions. Obtain the acceptance, approval and understanding of all parties on materials, details, methods of installation and protection of the vapor retarder materials prior to beginning slab on grade work where a retarder is required.
- B. Vapor Retarder Manufacturer's Qualifications: Vapor retarder system manufacturer shall maintain a full time factory employee with an invested interest to make periodic inspections during the installation of the vapor retarder system. The technical employee shall be available for such periodic inspections and for consultation whenever requested by the Owner, Architect or the Contractor. The technical employee shall attend the pre-application meeting and be completely knowledgeable with the installation requirements of the vapor retarder materials.

PART 2 - PRODUCTS

2.1 ACCEPTED MANUFACTURERS

- A. Stego Industries "15-MIL STEGO WRAP".
- B. Raven Industries "VAPORBLOCK 15".
- C. Fortifiber Building Systems Group "Moistop Ultra 15".
- D. Or accepted substitute.

VAPOR RETARDER

2.2 MATERIALS

- A. Vapor Retarder Sheet: Conform to ASTM E1745, Class A. Extruded minimum 15-mil thickness manufactured with ISO certified virgin resins.
- B. Accessories:
 - 1. Tape: High density polyethylene tape with pressure sensitive adhesive. Minimum width 4".
 - 2. Pipe Boot: Construct pipe boots from vapor retarder material and pressure sensitive tape per manufacturer's instructions.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Proceed with the installation of the vapor retarder only after the substrate construction has been completed and the drains and other projections through the vapor retarder have been installed and the gravel base has been leveled and compacted.
- B. Install the vapor retarder under building slabs-on-ground on top of the gravel base.
- C. Comply with the manufacturer's instructions, except where more stringent requirements are indicated.
 - 1. Install in accordance with ASTM E1643.
 - 2. Place vapor retarder with the longest dimension parallel with the direction of the pour.
 - 3. Lap vapor retarder over footings and seal to foundation walls. Seal all penetrations.
 - 4. Lap all joints 6" and seal with the manufacturer's recommended pressure sensitive tape.
 - 5. Seal pipe penetrations with pipe boot made of vapor retarder and tape per the manufacturer.
 - 6. Protect vapor retarder from damage during installation of reinforcing steel and utilities.
 - 7. Repair damaged areas by cutting patches of vapor retarder, overlapping damaged area 6" and taping all four sides with pressure sensitive tape.

END OF SECTION

SELF-ADHERED SHEET MEMBRANE AIR BARRIERS

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. This Section includes the following:
 - 1. Materials and installation methods for self-adhered vapor permeable air barrier membrane system (over plywood sheathing) located in the non-accessible part of the wall.
 - 2. Materials and installation methods to bridge and seal air leakage pathways in roof and foundation junctions, window and door openings, control and expansion joints, piping and other penetrations through the wall assembly.
- B. Air Barrier for use over concrete and concrete masonry substrates is specified in Section 07 27 26 FLUID APPLIED MEMBRANE AIR BARRIERS.

1.2 DEFINITIONS

- A. Air Barrier Assembly: The collection of air barrier materials and auxiliary materials applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.3 PERFORMANCE REQUIREMENTS

- A. General: Air barrier shall be capable of performing as a continuous vapor-permeable air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.
- B. The building envelope shall be designed and constructed with a continuous air barrier to control air leakage into, or out of the conditioned space. An air barrier shall also be provided for interior partitions between conditioned space and space designed to maintain temperature or humidity levels which differ from those in the conditioned space by more than 50% of the difference between the conditioned space and design ambient conditions. The air barrier shall have the following characteristics:
 - 1. It must be continuous, with all joints made airtight.
 - 2. It shall have an air permeability not to exceed 0.004 cfm/sq. ft. under a pressure differential of 0.3 in. water. (1.57 psf) (equal to 0.02L/sq. m @ 75 Pa), when tested in accordance with ASTM E2178.
 - 3. It shall be capable of withstanding positive and negative combined design wind, fan and stack pressures on the envelope without damage or displacement, and shall transfer the load to the structure. It shall not displace adjacent materials under full load.
 - 4. It shall be durable or maintainable.
 - 5. The air barrier shall be joined in an airtight and flexible manner to the air barrier material of adjacent systems, allowing for the relative movement of systems due to thermal and moisture variations and creep. Connection shall be made between:
 - a. Foundation and walls.
 - b. Walls and windows or doors.
 - c. Different wall systems.
 - d. Wall and roof.
 - e. Wall and roof over unconditioned space.

SELF-ADHERED SHEET MEMBRANE AIR BARRIERS

- f. Walls, floor and roof across construction, control and expansion joints.
- g. Walls, floors and roof to utility, pipe and duct penetrations.
- 6. All penetrations of the air barrier and paths of air infiltration/exfiltration shall be made airtight.

1.4 REFERENCES

- A. The following standards and publications are applicable to the extent referenced in the text. The most recent version of these standards is implied unless otherwise stated.
 - 1. ASTM C920 Specifications for Elastomeric Joint Sealants.
 - 2. ASTM D412 Standard Test Methods for Rubber Properties in Tension.
 - 3. ASTM D570 Test Method for Water Absorption of Plastics.
 - 4. ASTM D903 Standard Test Method for Peel or Stripping Strength of Adhesive Bonds.
 - 5. ASTM D1004 Test Method for Initial Tear Resistance of Plastic Film and Sheeting.
 - 6. ASTM D1876 Test Method for Peel Resistance of Adhesives.
 - 7. ASTM D1938 Test Method for Tear Propagation Resistance of Plastic Film and Sheeting.
 - 8. ASTM D1970 Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
 - 9. ASTM D4263 Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method.
 - 10. ASTM D4541 Test Method for Pull-off Strength of Coatings Using Portable Adhesion Testers.
 - 11. ASTM D5034 Test Method for Breaking Strength and Elongation of Textile Fabrics.
 - 12. ASTM E96 Test Methods for Water Vapor Transmission of Materials.
 - 13. ASTM E154 Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.
 - 14. ASTM E1186 Practice for Air Leakage Site Detection in Building Envelopes and Air Retarder Systems.
 - 15. ASTM E2178 Standard Test Method for Air Permeance of Building Materials.
 - 16. ASTM E2357 Standard Test Method for Determining Air Leakage of Air Barrier Assemblies.
 - 17. AATCC-127 Water Resistance: Hydrostatic Pressure Test (American Association of Textile Chemists and Colorists).

1.5 SUBMITTALS

- A. Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties of air barrier.
- B. Shop Drawings: Show locations and extent of air barrier. Include details for substrate joints and cracks, counterflashing strip, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
 - 1. Include details of interfaces with other materials that form part of air barrier.
 - 2. Include details of mockups.
- C. Samples: Submit representative samples of the following for approval:
 - 1. Self-Adhered Air Barrier Membrane
 - 2. Self-Adhered Transition Membrane
 - 3. Self-Adhered Through Wall Flashing
- D. Product Certificates: For air barriers, certifying compatibility of air barrier and accessory materials with project materials that connect to or that come in contact with the barrier; signed by product manufacturer.

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- E. Qualification Data: For Applicator.
- F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for air barriers, submit certified test report showing compliance with requirements specified for ASTM E2178.
- G. Warranty: Submit a sample warranty identifying the terms and conditions stated in Article 1.9.

1.6 QUALITY ASSURANCE

- A. Manufacturer: Air barrier systems shall be manufactured and marketed by a firm with a minimum of 20 years experience in the production and sales of waterproofing and air barriers. Manufacturers proposed for use, but not named in these specifications shall submit evidence of ability to meet all requirements specified, and include a list of projects of similar design and complexity completed within the past five years.
- B. Source Limitations: Obtain primary air-barrier material and through wall flashing through one source from a single manufacturer. Should project require a vapor permeable and a vapor impermeable air barrier on same project, obtain vapor-permeable and vapor impermeable air barrier and through wall flashing from one source from a single manufacturer. See specification Section 072713 for self-adhered sheet membrane air barrier - vapor impermeable.
- C. Applicator Qualifications: A firm experienced in applying air barrier materials similar in material, design, and extent to those indicated for this project, whose work has resulted in applications with a record of successful in-service performance.
- D. Mockups: Before beginning installation of air barrier, provide air barrier work for exterior wall assembly mockups, incorporating backup wall construction, external cladding, window, door frame and sill, insulation, and flashing to demonstrate surface preparation, crack and joint treatment, and sealing of gaps, terminations, and penetrations of air barrier membrane.
 - 1. Coordinate construction of mockup to permit inspection by Owner's testing agency of air barrier before external insulation and cladding is installed.
 - 2. If Architect determines mockups do not comply with requirements, reconstruct mockups and apply air barrier until mockups are approved.
- E. Pre-Installation Conference: A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work. Pre-installation conference shall include the Contractor, installer, Architect, and system manufacturer's field representative. Agenda for meeting shall include but not be limited to the following:
 - 1. Review of submittals.
 - 2. Review of surface preparation, minimum curing period and installation procedures.
 - 3. Review of special details and flashings.
 - 4. Sequence of construction, responsibilities and schedule for subsequent operations.
 - 5. Review of mock-up requirements.
 - 6. Review of inspection, testing, protection and repair procedures.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials and products in labeled packages. Store and handle in strict compliance with manufacturer's instructions, recommendations and material safety data sheets. Protect from damage

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from sunlight, weather, excessive temperatures and construction operations. Remove damaged material from the site and dispose of in accordance with applicable regulations.

- B. Do not double-stack pallets of fluid applied components on the job site. Provide cover on top and all sides, allowing for adequate ventilation.
- C. Protect fluid-applied components from freezing and extreme heat.
- D. Sequence deliveries to avoid delays, but minimize on-site storage.

1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended by air barrier manufacturer. Protect substrates from environmental conditions that affect performance of air barrier. Do not apply air barrier to a wet substrate or during snow, rain, fog, or mist.

1.9 WARRANTY

- A. Submit manufacturer's warranty that air barrier and accessories are free of defects at time of delivery and are manufactured to meet manufacturer's published physical properties and material specifications.
- B. Warranty Period: Five years from date of completion of the air barrier membrane installation.

PART 2 - PRODUCTS

2.1 MEMBRANE (Basis-of-Design)

- A. Self-Adhered Air Barrier Membrane: Perm-A-Barrier VPS manufactured by GCP Applied Technologies (Formerly Grace), or accepted substitute; a self-adhered membrane consisting of a breathable carrier film with a specially designed adhesive, which permits the transfusion of water vapor and provides superior protection against the damaging effects of air and water ingress on building structures, Product shall have the following minimum physical properties:
 - 1. Air Permeance, ASTM E2178: Not to exceed 0.004 cfm/sq. ft. under a pressure differential of 0.3 in. water. (1.57 psf) (equal to 0.02L/sq. m @ 75 Pa).
 - 2. Assembly Air Permeance, ASTM E2357: Not to exceed 0.04 cfm/sq.ft. under a pressure differential of 0.3 in. water (1.57 psf) (equal to 0.2 L/sq.m @ 75 Pa).
 - 3. Water Vapor Permeance, ASTM E96: Not less than 15 perms
 - 4. Water Resistance, AATCC-127: No less than 5 hrs at 55 cm/21 inch
 - 5. Breaking Force, ASTM D5034: 55 lbf MD, and 44 lbf CD
 - 6. Pull Adhesion, ASTM D4541: min. 15 psi to primed glass faced gypsum sheathing, min. 12 psi to primed CMU.
 - 7. Peel Adhesion, ASTM D903: min. 5 pli to primed glass faced gypsum sheathing, min. 4 pli to Perm-A-Barrier® VPS, min. 2.5 pli to primed CMU.
 - 8. UV Exposure Limit: Not more than 150 calendar days
 - 9. Water Penetration Resistance Around Nails, ASTM D1970 Modified: Pass.
 - 10. Fire Resistant: Evaluated to NFPA 285 as part of the designed wall assemblies containing foam plastic insulation.
- B. Transition Membrane: Perm-A-Barrier Detail Membrane manufactured by GCP Applied Technologies (Formerly Grace), or accepted substitute; a 0.9 mm (36 mils) of self-adhesive rubberized asphalt integrally bonded to 0.1 mm (4 mil) of cross-laminated, high-density polyethylene film to provide a

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min. 1.0 mm (40 mil) thick membrane. Membrane shall be interleaved with disposable silicone-coated release paper until installed, conforming to the following:

1. Water Vapor Transmission, ASTM E96, Method B: 2.9 ng/m²sPa (0.05 perms) max.
2. Air Permeance at 75Pa (0.3 in. water) pressure difference: 0.0006 L/(s.m²) (0.00012 cfm/ft²) max.
3. Puncture Resistance, ASTM E154: 178 N (40 lbs.) min.
4. Lap Adhesion at -4°C (25°F), ASTM D1876: 880 N/m (5.0 lbs./in.) of width
5. Low Temperature Flexibility, ASTM D1970: Unaffected to -43°C (-45°F)
6. Tensile Strength, ASTM D412, Die C Modified: min. 2.7 MPa (400 psi)
7. Elongation, Ultimate Failure of Rubberized Asphalt, ASTM D412, Die C: min. 200%.

- C. Transition Aluminum Membrane: Perm-A-Barrier Aluminum Flashing manufactured by GCP Applied Technologies (Formerly Grace), or accepted substitute; a 0.9 mm (35 mils) of self-adhesive rubberized asphalt integrally bonded to 0.1 mm (5 mil) of aluminum film to provide a min. 1.0 mm (40 mil) thick membrane. Membrane shall be interleaved with disposable silicone-coated release paper until installed, conforming to the following:

1. Water Absorption, ASTM D570: max 0.1% by weight
2. Puncture Resistance, ASTM E154: 355N (80 lbs) min.
3. Lap Adhesion at -4°C (25°F), ASTM D1876 Modified: 880 N/m (5.0 lbs./in.) of width.
4. Low Temperature Flexibility, ASTM D1970 Modified: Unaffected to -26°C (-15°F).
5. Tensile Strength, ASTM D412, Die C Modified: min. 4.1 MPa (600 Psi).
6. Elongation, Ultimate Failure of Rubberized Asphalt: ASTM D412, Die C Modified: min. 200%.

- D. Flexible Membrane Through-Wall Flashing: Perm-A-Barrier Wall Flashing manufactured by GCP Applied Technologies (Formerly Grace), or accepted substitute; a 0.8 mm (32 mils) of self-adhesive rubberized asphalt integrally bonded to 0.2 mm (8 mil) of cross-laminated, high-density polyethylene film to provide a min. 1.0 mm (40 mil) thick membrane. Membrane shall be interleaved with disposable silicone-coated release paper until installed, conforming to the following:

1. Water Vapor Transmission, ASTM E96, Method B: 2.9 ng/m²sPa (0.05 perms) max.
2. Water Absorption, ASTM D570: max. 0.1% by weight.
3. Puncture Resistance, ASTM E154: 356 N (80 lbs.) min.
4. Tear Resistance:
 - a. Initiation, ASTM D1004: min. 58 N (13.0 lbs.) M.D.
 - b. Propagation, ASTM D1938: min. 40 N (9.0 lbs.) M.D.
5. Lap Adhesion at -4°C (25°F), ASTM D1876: 880 N/m (5.0 lbs./in.) of width
6. Low Temperature Flexibility, ASTM D1970: Unaffected to -43°C (-45°F)
7. Tensile Strength, ASTM D412, Die C Modified: min. 5.5 MPa (800 psi)
8. Elongation, Ultimate Failure of Rubberized Asphalt, ASTM D412, Die C: min. 200%

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2.2 PRIMERS

- A. Primer for Primary Self-adhered air barrier membrane: Perm-A-Barrier Primer Plus manufactured by GCP Applied Technologies (Formerly Grace), or accepted substitute; a water-based primer which imparts an aggressive, high tack finish on the treated substrate. Product shall have the following minimum physical properties:
 - 1. Color: Milky White (wet), Clear (dry)
 - 2. Weight: 8.25 lbs./gal.
 - 3. Solids Content (by wt.): 53-57%
 - 4. Solvent Type: Water
 - 3. VOC Content: Not to excess 1 g/L
 - 4. Application Temperature: 4°C (40°F) and above
- B. Wall Primer for Self-adhered transition membrane and Self-adhered flexible membrane wall flashing: Perm-A- Barrier WB Primer manufactured by GCP Applied Technologies (Formerly Grace), or accepted substitute; a water-based primer which imparts an aggressive, high tack finish on the treated substrate. Product Shall have the following minimum physical properties:
 - 1. Flash Point: No flash to boiling point
 - 2. Solvent Type: Water
 - 3. VOC Content: Not to exceed 10 g/L
 - 4. Application Temperature: -4°C (25°F) and above
 - 5. Freezing point (as packaged): -7°C (21°F)

2.3 PENETRATIONS & TERMINATION SEALANT

- A. Liquid Membrane for Details and Terminations: Bituthene Liquid Membrane manufactured by GCP Applied Technologies (Formerly Grace), or accepted substitute; a two-part, elastomeric, trowel grade material designed for use with self-adhered membranes and tapes. 10 g/L max. VOC content.
- B. Substrate Patching Membrane: Bituthene Liquid Membrane manufactured by GCP Applied Technologies (Formerly Grace), or accepted substitute; a two- part, elastomeric, trowel grade material designed for use with self-adhered membranes and tapes. 10 g/L max. VOC content.
- C. Joint Sealant: Refer to sealant manufacturer's recommendations.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that substrates and conditions are ready to accept the Work of this section. Notify [engineer] [architect] [consultant] in writing of any discrepancies. Commencement of the Work or any parts thereof shall mean acceptance of the prepared substrates.
- B. All surfaces must be sound, dry, clean and free of oil, grease, dirt, excess mortar or other contaminants detrimental to the adhesion of the membranes. Fill voids, gaps and spalled areas in substrate to provide an even plane.
- C. Curing compounds or release agents used in concrete construction must be resin based without oil, wax or pigments.

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3.2 SURFACE PREPARATION

- A. Refer to manufacturer's literature for requirements for preparation of substrates. Surfaces shall be sound and free of voids, spalled areas, loose aggregate and sharp protrusions. Remove contaminants such as grease, oil and wax from exposed surfaces. Remove dust, dirt, loose stone and debris. Use repair materials and methods that are acceptable to manufacturer of the air barrier assembly.
- B. Exterior Sheathing Panels: Ensure that the boards are sufficiently stabilized with corners and edges fastened with appropriate screws in accordance with exterior sheathing manufacturers written instructions.
- C. Related Materials: Treat construction joints and install flashing as recommended by manufacturer.
- D. Clean, prepare, treat, and seal substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air barrier application.
- E. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.
- F. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate patching membrane.
- G. At changes in substrate plane, apply sealant or Bituthene Liquid Membrane at sharp corners and edges to form a smooth transition from one plane to another.
- H. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

3.3 AIR BARRIER MEMBRANE INSTALLATION

- A. Refer to manufacturer's literature for recommendations on installation
- B. Apply air barrier membrane to achieve a continuous air barrier according to air barrier manufacturer's written instructions.
- C. Application of Self-Adhered Air Barrier Membrane
 - 1. Install air barrier to dry surfaces at air and surface temperatures of 4°C (40°F) and above in accordance with manufacturer's recommendations, at locations indicated on Construction Documents.
 - 2. Prime substrate to receive air barrier membrane as required per manufacturers written instructions.
 - 3. Precut pieces of air barrier into easily handled lengths.
 - 4. Remove release linear and position membrane carefully before placing against the surface.
 - 5. Begin installation at the base of the wall.
 - 6. When properly positioned, place against surface by pressing firmly into place. Roll membrane with extension-handled countertop roller immediately after placement.
 - 7. Overlap adjacent pieces 50 mm (2 in.) and roll seams.
 - 8. Subsequent sheets of membrane applied above shall be positioned to overlap the membrane sheet below by 50 mm (2 in.). Roll firmly into place.
 - 9. Coordinate the installation of air barrier with roof installer to ensure continuity of membrane with roof air barrier.

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10. At end of each working day seal top edge of air barrier to substrate with termination sealant.
11. Do not expose air barrier membrane to sunlight for more than 150 days prior to enclosure.
12. Inspect installation prior to enclosing and repair punctures, damaged areas and inadequately lapped seams with a patch of the membrane sized to extend 150 mm (6 in.) in all directions from the perimeter of the affected area.

3.4 TRANSITION MEMBRANE INSTALLATION

- A. Install strips, transition membrane, and auxiliary materials according to air barrier manufacturer's written instructions to form a seal with adjacent construction and maintain a continuous air barrier. Install all transition membrane only after application of air barrier.
- B. Apply primer to substrates to receive transition membrane at required rate and allow to dry. Limit priming to areas that will be covered by transition tape in same day. Re-prime areas exposed for more than 24 hours.
 1. Prime glass-fiber-surfaced gypsum sheathing not covered with air membrane material with number of prime coats needed to achieve required bond, with adequate drying time between coats.
- C. Connect and seal exterior wall air barrier membrane continuously to roofing membrane air barrier, concrete below-grade structures, floor-to floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.
- D. At end of each working day, seal top edge transition membrane to substrate with termination sealant.
- E. Apply joint sealants forming part of air barrier assembly within sealant manufacturer's recommended application temperature ranges. Consult sealant manufacturer when sealant cannot be applied within these temperature ranges.
- F. Wall Openings: Prime concealed perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply transition membrane so that a minimum of 3 inches (75 mm) of coverage is achieved over both substrates.
 1. Transition Membrane: Roll firmly to enhance adhesion.
- G. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air barrier membrane with foam sealant.
- H. Repair punctures, voids, and deficient lapped seams in transition membrane. Slit and flatten fish-mouths and blisters. Patch with transition membrane extending 6 inches (150 mm) beyond repaired areas in strip direction.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner may engage a qualified testing agency to perform tests and inspections and prepare test reports.
- B. Inspections: Air barrier materials and installation are subject to inspection for compliance with requirements. Inspections may include the following:
 1. Continuity of air barrier system has been achieved throughout the building envelope with no gaps or holes.
 2. Continuous structural support of air barrier system has been provided.

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3. Site conditions for application temperature and dryness of substrates have been maintained.
 4. Maximum exposure time of materials to UV deterioration has not been exceeded.
 5. Surfaces have been primed, if applicable.
 6. Laps in transition membrane have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fish-mouths.
 7. Termination sealant has been applied on cut edges.
 8. Transition membrane has been firmly adhered to substrate.
 9. Compatible materials have been used.
 10. Transitions at changes in direction and structural support at gaps have been provided.
 11. Connections between assemblies (membrane and sealants) have complied with requirements for cleanliness, preparation and priming of surfaces, structural support, integrity, and continuity of seal.
 12. All penetrations have been sealed.
- C. Tests: Testing to be performed will be determined by Owner's testing agency from among the following tests:
1. Qualitative Testing: Air barrier assemblies will be tested for evidence of air leakage according to ASTM E1186, smoke pencil with pressurization or depressurization.
- D. Remove and replace deficient air barrier components and retest as specified above.

3.6 CLEANING AND PROTECTION

- A. Protect air barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.
- B. Protect air barrier from exposure to UV light and harmful weather exposure as required by manufacturer. Remove and replace air barrier exposed for more than 150 days.
- C. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended by manufacturer of affected construction.
- D. Remove masking materials after installation.

END OF SECTION

FLUID APPLIED MEMBRANE AIR BARRIERS

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Weather Resistant Barrier Over Concrete Foundation Walls and Over Concrete Masonry Behind Masonry Veneer: The work of this Section includes, but is not limited to, the following:
 - 1. Materials and installation methods for fluid-applied, vapor permeable air barrier membrane system located in the non-accessible part of the wall.
 - 2. Materials and installation methods to bridge and seal air leakage pathways in roof and foundation junctions, window and door openings, control and expansion joints, masonry ties, piping and other penetrations through the wall assembly.
- B. Provide as indicated on Drawings.
- C. Air Barrier over plywood sheathing is specified in Section 07 27 14 SELF-ADHERED SHEET MEMBRANE AIR BARRIERS.

1.2 PERFORMANCE REQUIREMENTS

- A. General: Air barrier shall be capable of performing as a continuous vapor-permeable air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.
- B. The building envelope shall be designed and constructed with a continuous air barrier to control air leakage into, or out of the conditioned space. The air barrier shall have the following characteristics:
 - 1. It must be continuous, with all joints made airtight.
 - 2. It shall have an air permeability not to exceed 0.004 cfm/sq. ft. under a pressure differential of 0.3 in. water (1.57 psf) (equal to 0.02 L/s. x sq. m. @ 75 Pa), when tested in accordance with ASTM E2178.
 - 3. It shall have an air permeability not to exceed 0.04 cfm/sq. ft. under a pressure differential of 0.3 in. water (1.57 psf) (equal to 0.2 L/s. x sq. m. @ 75 Pa), when tested in accordance with ASTM E2357.
 - 4. It shall be capable of withstanding positive and negative combined design wind, fan and stack pressures on the envelope without damage or displacement, and shall transfer the load to the structure. It shall not displace adjacent materials under full load.
 - 5. It shall be durable or maintainable.
 - 6. The air barrier shall be joined in an airtight and flexible manner to the air barrier material of adjacent systems, allowing for the relative movement of systems due to thermal and moisture variations and creep. Connection shall be made between:
 - a. Foundation and walls
 - b. Walls and windows or doors
 - c. Different wall systems
 - d. Walls across construction, control and expansion joints
 - e. Walls to utility, pipe and duct penetrations
 - 7. All penetrations of the air barrier and paths of air infiltration/exfiltration shall be made airtight.

FLUID APPLIED MEMBRANE AIR BARRIERS

1.3 REFERENCES

- A. The following standards and publications are applicable to the extent referenced in the text. The most recent version of these standards is implied unless otherwise stated.
- B. ASTM International (ASTM)
 - 1. ASTM C1193: Guide for Use of Joint Sealants.
 - 2. ASTM D412: Standard Test Methods for Rubber Properties in Tension.
 - 3. ASTM D570: Test Method for Water Absorption of Plastics.
 - 4. ASTM D903: Standard Test Method for Peel or Stripping Strength of Adhesive Bonds.
 - 5. ASTM D1004: Test Method for Initial Tear Resistance of Plastic Film and Sheeting.
 - 6. ASTM D1876: Test Method for Peel Resistance of Adhesives.
 - 7. ASTM D1938: Test Method for Tear Propagation Resistance of Plastic Film and Sheeting.
 - 8. ASTM D1970: Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
 - 9. ASTM D4258: Practice for Surface Cleaning Concrete for Coating.
 - 10. ASTM D4263: Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method.
 - 11. ASTM E96: Test Methods for Water Vapor Transmission of Materials.
 - 12. ASTM E154: Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.
 - 13. ASTM E1186: Practice for Air Leakage Site Detection in Building Envelopes and Air Retarder Systems.
 - 14. ASTM E2178: Standard Test Method for Air Permeance of Building Materials.
 - 15. ASTM E2357: Standard Test Method for Determining Air Leakage of Air Barrier Assemblies.

1.4 SUBMITTALS

- A. Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties of air barrier.
- B. Shop Drawings: Show locations and extent of air barrier. Include details for substrate joints and cracks, counterflashing strip, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
 - 1. Include details of interfaces with other materials that form part of air barrier
 - 2. Include details of mockups
- C. Samples: Submit representative samples of the following for approval:
 - 1. Fluid-Applied membrane
 - 2. Self-Adhered Transition Membrane
 - 3. Self-Adhered Through Wall Flashing
- D. Product Certificates: For air barriers, certifying compatibility of air barrier and accessory materials with Project materials that connect to or that come in contact with the barrier; signed by product manufacturer.
- E. Qualification Data: For Applicator.
- F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for air barriers, submit certified test report showing compliance with requirements specified for ASTM E2178.
- G. Warranty: Submit a sample warranty identifying the terms and conditions stated in Article 1.8.

FLUID APPLIED MEMBRANE AIR BARRIERS

1.5 QUALITY ASSURANCE

- A. Manufacturer: Air barrier systems shall be manufactured and marketed by a firm with a minimum of 20 years experience in the production and sales of waterproofing and air barriers. Manufacturers proposed for use, but not named in these specifications shall submit evidence of ability to meet all requirements specified, and include a list of projects of similar design and complexity completed within the past five years.
- B. Source Limitations: Obtain primary air-barrier material and through wall flashing through one source from a single manufacturer. Should project require a vapor permeable and a vapor impermeable air barrier on same project, obtain vapor-permeable and vapor impermeable air barrier and through wall flashing from one source from a single manufacturer. See specification Section 07270 for fully-adhered vapor impermeable air barrier.
- C. Applicator Qualifications: A firm experienced in applying air barrier materials similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.
- D. Mockups: Before beginning installation of air barrier, provide air barrier work for exterior wall assembly mockups, incorporating backup wall construction, external cladding, window, door frame and sill, insulation, and flashing to demonstrate surface preparation, crack and joint treatment, and sealing of gaps, terminations, and penetrations of air barrier membrane.
 - 1. Coordinate construction of mockup to permit inspection by Owner's testing agency of air barrier before external insulation and cladding is installed.
 - 2. If Architect determines mockups do not comply with requirements, reconstruct mockups and apply air barrier until mockups are approved.
 - 3. Mock-ups may be installed in place.
- E. Pre-Installation Conference: A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work. Preinstallation conference shall include the Contractor, installer, Architect, and system manufacturer's field representative. Agenda for meeting shall include but not be limited to the following:
 - 1. Review of submittals.
 - 2. Review of surface preparation, minimum curing period and installation procedures.
 - 3. Review of special details and flashings.
 - 4. Sequence of construction, responsibilities and schedule for subsequent operations.
 - 5. Review of mock-up and test adhesion of weather resistant barrier.
 - 6. Review of inspection, testing, protection and repair procedures.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials and products in labeled packages. Store and handle in strict compliance with manufacturer's instructions, recommendations and material safety data sheets. Protect from damage from sunlight, weather, excessive temperatures and construction operations. Remove damaged material from the site and dispose of in accordance with applicable regulations.

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- B. Do not double-stack pallets of fluid applied membrane components on the job site. Provide cover on top and all sides, allowing for adequate ventilation.
- C. Protect fluid-applied membrane components from freezing and extreme heat.
- D. Sequence deliveries to avoid delays, but minimize on-site storage.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended by air barrier manufacturer. Protect substrates from environmental conditions that affect performance of air barrier. Do not apply air barrier to a wet substrate or during snow, rain, fog, or mist.

1.8 WARRANTY

- A. Material Warranty: Manufacturer's standard form in which manufacturer agrees to replace fluid-applied air barrier membrane materials that fail within specified warranty period when installed and used in strict conformance with written manufacturer's instructions.
 - 1. Failures include, but are not limited to, the following:
 - a. Failure to maintain air permeance rating not to exceed 0.004 cfm/sq. ft. under a pressure differential of 0.3 in. water (1.57 psf) (equal to 0.02 L/s. x sq. m. @ 75 Pa), when tested per ASTM E2178, within specified warranty period.
 - b. Failure to maintain a vapor permeance rating greater than 10 perms when tested in accordance with ASTM E96, Method B.
 - 2. Warranty Period: Five years from date of Substantial Completion

PART 2 - PRODUCTS

2.1 FLUID-APPLIED, VAPOR PERMEABLE MEMBRANE AIR BARRIER

- A. Fluid-Applied Air Barrier Membrane: Perm-A-Barrier® VP, as manufactured by GCP Applied Technologies (Formerly Grace), or accepted substitute; a fluid-applied, vapor permeable, acrylic membrane that cures to form a resilient, monolithic, fully bonded elastomeric membrane when applied to construction surfaces. The membrane provides superior protection against the damaging effects of air and liquid water ingress on the building structures. Product shall have the following minimum physical properties:
 - 1. Membrane Air Permeance: ASTM E2178: Not to exceed 0.0004 cfm/sq. ft. under a pressure differential of 0.3 in. water (1.57 psf) (equal to 0.002 L/s. x sq. m. @ 75 Pa).
 - 2. Assembly Performance: Provide a continuous air barrier assembly that has an air leakage not to exceed 0.0008 cfm/sq. ft. of surface area under a pressure differential of 0.3 in. water (1.57 psf) (equal to 0.004 L/s. x sq. m. of surface area at 75 Pa) when tested in accordance with ASTM E2357.
 - 3. Membrane Vapor Permeance: ASTM E96, Method B: 11.2 perms.
 - 4. Peel Adhesion: ASTM D903: min. 5 pli or substrate failure to glass faced wall board, min. 20 pli to concrete/CMU.
 - 5. UV Exposure Limit: Not more than 180 calendar days.

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- B. Transition Membrane: Perm-A-Barrier Detail Membrane manufactured by GCP Applied Technologies (Formerly Grace), or accepted substitute; a 0.9 mm (36 mils) of self-adhesive rubberized asphalt integrally bonded to 0.1 mm (4 mil) of cross-laminated, high-density polyethylene film to provide a min. 1.0 mm (40 mil) thick membrane. Membrane shall be interleaved with disposable silicone-coated release paper until installed, conforming with the following:
1. Water Vapor Transmission: ASTM E96, Method B: 0.05 perms (2.9 ng/Pa s. sq. m.) max.
 2. Air Permeance at 75 Pa (0.3 in. water) pressure difference: 0.0006 L/s. sq. m (0.00012 cfm/ sq. ft.) max.
 3. Puncture Resistance: ASTM E154: 178 N (40 lbs.) min.
 4. Lap Adhesion at -4°C (25°F): ASTM D1876: 880 N/m (5.0 lbs./in.) of width.
 5. Low Temperature Flexibility: ASTM D1970: Unaffected to -43°C (-45°F).
 6. Tensile Strength: ASTM D412, Die C Modified: min. 2.7 MPa (400 psi).
 7. Elongation, Ultimate Failure of Rubberized Asphalt: ASTM D412, Die C: min. 200%.
- C. Flexible Membrane Wall Flashing: Perm-A-Barrier Wall Flashing manufactured by GCP Applied Technologies (Formerly Grace), or accepted substitute; a 0.8 mm (32 mils) of self-adhesive rubberized asphalt integrally bonded to 0.2 mm (8 mil) of cross-laminated, high-density polyethylene film to provide a min. 1.0 mm (40 mil) thick membrane. Membrane shall be interleaved with disposable silicone-coated release paper until installed, conforming with the following:
1. Water Vapor Transmission: ASTM E96, Method B: 0.05 perms (2.9 ng/ Pa s. sq. m.) max.
 2. Water Absorption: ASTM D570: max. 0.1% by weight.
 3. Puncture Resistance: ASTM E154: 356 N (80 lbs.) min.
 4. Tear Resistance:
 - a. Initiation ASTM D1004: min. 58 N (13.0 lbs.) M.D.
 - b. Propagation ASTM D1938: min. 40 N (9.0 lbs.) M.D.
 5. Lap Adhesion at -4°C (25°F): ASTM D1876: 880 N/m (5.0 lbs./in.) of width.
 6. Low Temperature Flexibility: ASTM D1970: Unaffected to -43°C (-45°F).
 7. Tensile Strength: ASTM D412, Die C Modified: min. 5.5 MPa (800 psi).
 8. Elongation, Ultimate Failure of Rubberized Asphalt: ASTM D412, Die C: min. 200%

2.2 PRIMERS

- A. Wall Primer for Self-adhered transition membrane and Self-adhered flexible membrane wall flashing: Perm-A- Barrier WB Primer manufactured by GCP Applied Technologies (Formerly Grace), or accepted substitute; a water-based primer which imparts an aggressive, high tack finish on the treated substrate.
1. Flash Point: No flash to boiling point.
 2. VOC Content: Not to exceed 10 g/L.
 3. Application Temperature: -4°C (25°F) and above.
 4. Freezing point (as packaged): -7°C (21°F)

2.3 PENETRATIONS & TERMINATION SEALANT

- A. Liquid Membrane for Details and Terminations: Bituthene Liquid Membrane manufactured by GCP Applied Technologies (Formerly Grace), or accepted substitute; a two-part, elastomeric, trowel grade material designed for use with fluid-applied membranes, self-adhered membranes and tapes. 10 g/L max. VOC content.

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- B. Substrate Patching Membrane: Bituthene Liquid Membrane manufactured by GCP Applied Technologies (Formerly Grace), or accepted substitute; a two- part, elastomeric, trowel grade material designed for use with fluid-applied membranes, self-adhered membranes and tapes. 10 g/L max. VOC content.
- C. Joint Sealant: Refer to sealant manufacturer's recommendations.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that substrates and conditions are ready to accept the Work of this section. Notify Architect in writing of any discrepancies. Commencement of the Work or any parts thereof shall mean acceptance of the prepared substrates.
- B. All surfaces must be sound, dry, clean and free of oil, grease, dirt, excess mortar or other contaminants detrimental to the adhesion of the membranes. Fill voids, gaps and spalled areas in substrate to provide an even plane. Strike masonry joints full-flush. Curing compounds or release agents used in concrete construction must be resin based without oil, wax or pigments.

3.2 SURFACE PREPARATION

- A. Refer to manufacturer's literature for requirements for preparation of substrates. Surfaces shall be sound and free of voids, spalled areas, loose aggregate and sharp protrusions. Remove contaminants such as grease, oil and wax from exposed surfaces. Remove dust, dirt, loose stone and debris. Use repair materials and methods that are acceptable to manufacturer of the fluid-applied air barrier assembly.
- B. Exterior Sheathing Panels: Ensure that the boards are sufficiently stabilized with corners and edges fastened with appropriate screws. Pre-treat all board joints with 50 – 75 mm (2-3 in.) wide, manufacturer's recommended mesh-style wallboard tape. Gaps greater than 6 mm (1/4 in.) should be filled with mastic or caulk, allowing sufficient time to fully cure before application of the mesh-style wallboard tape and fluid applied air barrier system.
- C. Related Materials: Treat construction joints and install flashing as recommended by manufacturer.
- D. Clean, prepare, treat, and seal substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air barrier application.
- E. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.
- F. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.
- G. Remove excess mortar from masonry ties, shelf angles, and other obstructions.
- H. At changes in substrate plane, apply sealant or Bituthene Liquid Membrane at sharp corners and edges to form a smooth transition from one plane to another.
- I. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with

FLUID APPLIED MEMBRANE AIR BARRIERS

stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

3.3 JOINT TREATMENT

- A. Gypsum Sheathing: Fill joints greater than 1/4 inch (6 mm) with sealant according to ASTM C1193 and with air barrier manufacturer's written instructions. Apply mesh-style wallboard tape to joint prior to installing fluid air barrier membrane.

3.4 INSTALLATION

- A. Apply air barrier membrane to achieve a continuous air barrier according to air barrier manufacturer's written instructions.
- B. Apply air barrier membrane within manufacturer's recommended application temperature ranges.
- C. Apply a continuous unbroken air barrier to substrates according to the following minimum thickness. Apply membrane in full contact around protrusions such as masonry ties.
 - 1. Vapor-Permeable Membrane Air Barrier: 90-mil (2.4-mm) wet film thickness, 42~45-mil (1.2-mm) dry film thickness.
- D. Do not cover air barrier until it has been tested and inspected by Owner's testing agency.
- E. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air barrier components.

3.5 TRANSITION MEMBRANE INSTALLATION

- A. Install strips, transition membrane, and auxiliary materials according to air barrier manufacturer's written instructions to form a seal with adjacent construction and maintain a continuous air barrier.
- B. Apply primer to substrates to receive transition membrane at required rate and allow to dry. Limit priming to areas that will be covered by transition tape in same day. Re-prime areas exposed for more than 24 hours.
 - 1. Prime glass-fiber-surfaced gypsum sheathing not covered with air membrane material with number of prime coats needed to achieve required bond, with adequate drying time between coats.
- C. Connect and seal exterior wall air barrier membrane continuously to concrete below-grade structures, floor-to floor construction, storefront systems, exterior door framing, and other construction used in exterior wall openings, using accessory materials.
- D. At end of each working day, seal top edge of strips and transition membrane to substrate with termination sealant.
- E. Apply joint sealants forming part of air barrier assembly within sealant manufacturer's recommended application temperature ranges. Consult sealant manufacturer when sealant cannot be applied within these temperature ranges.
- F. Wall Openings: Prime concealed perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply transition membrane so that a minimum of 3 inches (75 mm) of coverage is achieved over

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both substrates.

1. Transition Membrane: Roll firmly to enhance adhesion.

- G. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air barrier membrane with foam sealant.
- H. Repair punctures, voids, and deficient lapped seams in strips and transition membrane. Slit and flatten fish-mouths and blisters. Patch with transition membrane extending 6 inches (150 mm) beyond repaired areas in strip direction.

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Owner may engage a qualified testing agency to perform tests and inspections and prepare test reports.
- B. Inspections: Air barrier materials and installation are subject to inspection for compliance with requirements. Inspections may include the following:
 1. Continuity of air barrier system has been achieved throughout the building envelope with no gaps or holes.
 2. Continuous structural support of air barrier system has been provided.
 3. Masonry and concrete surfaces are smooth, clean and free of cavities, protrusions, and mortar droppings.
 4. Site conditions for application temperature and dryness of substrates have been maintained.
 5. Maximum exposure time of materials to UV deterioration has not been exceeded.
 6. Surfaces have been primed, if applicable.
 7. Laps in strips and transition membrane have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fish-mouths.
 8. Termination sealant has been applied on cut edges.
 9. Strips and transition membrane have been firmly adhered to substrate.
 10. Compatible materials have been used.
 11. Transitions at changes in direction and structural support at gaps have been provided.
 12. Connections between assemblies (membrane and sealants) have complied with requirements for cleanliness, preparation and priming of surfaces, structural support, integrity, and continuity of seal.
 13. All penetrations have been sealed
- C. Tests: Testing to be performed will be determined by Owner's testing agency from among the following tests:
 1. Qualitative Testing: Air barrier assemblies will be tested for evidence of air leakage according to ASTM E1186.
- D. Remove and replace deficient air barrier components and retest as specified above.

3.7 PROTECTION AND CLEANING

- A. Protect air barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.
- B. Protect air barrier from exposure to UV light and harmful weather exposure as required by manufacturer. Remove and replace main air barrier material exposed for more than 180 days.

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- C. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended by manufacturer of affected construction.
- D. Remove masking materials after installation.

END OF SECTION

PREFORMED METAL ROOF PANELS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. The work includes, but is not necessarily limited to, furnishing and installation of all preformed metal roofing, and accessories as indicated on the Drawings and specified herein.
 - 1. Provide associated flashing as required to make roof watertight.
 - 2. Gutters and Downspouts: Specified in Section 07 60 00 SHEET METAL FLASHING AND TRIM.
- B. Work also includes provision of the following roof assembly components as specified herein:
 - 1. Air Barrier over metal deck.
 - 2. Steel Bearing Plates, as indicated on Drawings.
 - 3. Cover board.
 - 4. Roofing Underlayment over cover board.

1.2 PERFORMANCE REQUIREMENTS

- A. Testing and Certification:
 - 1. Wind Uplift:
 - a. The panel system shall be ASTM E1592 tested under the supervision of an accredited laboratory and the laboratory shall issue the test report.
 - 1) The testing laboratory shall meet the requirements for compliance with the ISO/IEC Standards 17025 or an accredited independent agency, recognized by the International Laboratory Accreditation Cooperation Mutual Recognition Arrangement or ANSI.
 - b. UL 580 test, Class 90 rated per (select applicable construction):
 - 1) Construction #366 minimum 24 gauge panels when installed over minimum 22 gauge steel deck, with roof panel fastener clips spaced 4'-0" on center maximum.
 - 2. Air Infiltration: Panel to meet the following standard when in accordance with ASTM E-1680:
 - a. With factory-applied continuous sealant 0.08 cfm/lineal ft. of panel seam at 1.57 psf positive pressure, and 0.13 cfm/lineal ft. of panel seam at 1.57 psf negative pressure.
 - 3. Water Penetration: Panel to meet the following standard when tested in accordance with STM-E1646:
 - a. With factory-applied continuous sealant, no leakage at 6.24 psf.
- B. Roof Panels at Press Box shall be designed and secured to withstand the following loads normal to the plane of the roof:
 - 1. Positive pressure at all zones: 7.15 PSF.
 - 2. Negative pressure at all zones: 32.66 PSF.
- C. Roof Panels at Main Grandstand shall be designed and secured to withstand the following loads normal to the plane of the roof:
 - 1. Positive pressure at all zones: 14.86 PSF.
 - 2. Negative pressure at roof interior and edges: 40.37 PSF.
 - 3. Negative pressure at corner zones: 48.56 PSF.

PREFORMED METAL ROOF PANELS

1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data, installation instructions and recommendations for each type of roofing required. Include data substantiating that materials comply with requirements.
- B. Samples:
 - 1. Prior to ordering products, submit Manufacturer's standard color Samples for Architect's/Engineer's selection.
 - 2. Prior to starting work, submit (quantity) 12" long Panel Samples showing shape and a representative color chip for Architect's/Engineer's acceptance.
- C. Shop Drawings:
 - 1. Submit complete shop drawings detailing all perimeter flashings and joints in accordance with the manufacturer's standard recommendations.
 - 2. Describe all proposed details that deviate from what is shown on the plans.
 - 3. Details must allow for expansion and contraction.
- D. Design Criteria:
 - 1. Wind Uplift: The roof system manufacturer shall provide an attachment schedule or supporting calculations to resist the following uplift loads:
 - a. Uplift loads as calculated using the 2009 Edition of the IBC with a 110 MPH basic wind speed, Exposure Factor C, and Occupancy Category IV.

1.4 QUALITY ASSURANCE

- A. Installer's Qualifications:
 - 1. Installer must be approved by the Panel Manufacturer in writing prior to work commencing.
 - 2. Installer shall meet the following:
 - a. Successfully applied five metal roofs of comparable size and complexity which reflects a quality weathertight installation.
 - b. Have been in business for a minimum period of five years in the region where the work will be performed.
- B. Manufacturer's Qualifications:
 - 1. Manufacturer shall have a minimum of 10 years experience supplying metal roofing to the region where the work is to be done.
 - 2. Comply with current independent testing and certification as specified.
 - 3. Manufacturer shall provide proof of \$2,000,000 liability insurance for their metal roof system and comply with current independent testing and certification as specified.
 - 4. The roof panel manufacturer must also subscribe to Underwriters Laboratories' "Follow Up Service" assuring continuing product compliance with UL requirements. Shipment packaging of panels and attachment clips must bear UL classification markings.
 - 5. Panel manufacturers without full supporting literature; Flashings & Details Guides, Guide Specifications and Technical Support, shall not be considered equal to the specified product.
- C. Regulatory Agency Requirements:
 - 1. Comply with requirements of the 2010 Oregon Structural Specialty Code (OSSC), based on the 2009 International Building Code (IBC), if more restrictive than those specified herein.

PREFORMED METAL ROOF PANELS

- D. Pre-Installation Conference: Notify the Architect, metal roof panel manufacturer's representative, and installer at least 48 hours before starting roofing work. Arrange a mutually acceptable time for meeting at the job with all notified parties to review the specifications and job conditions. Obtain the acceptance and approval of all parties on materials, details, and methods before beginning Work.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Protect against damage and discoloration.
- B. Handle panels with non-marring slings.
- C. Do not bend panels.
- D. Store panels above ground, with one end elevated for drainage.
- E. Protect panels against standing water and condensation between adjacent surfaces.
- F. If panels become wet, immediately separate sheets, wipe dry with clean cloth, and allow to air dry.
- G. Painted panels shall be shipped with a protective plastic sheeting or a strippable film coating between all panels. Remove any strippable film coating prior to installation and in any case, do not allow the strippable film coating to remain on the panels in extreme heat, cold, or direct sunlight or other UV source.

1.6 PROJECT CONDITIONS

- A. Examine the conditions and substrates in which metal roofing work is to be installed. Substrate shall be installed level, flat and true to avoid panel stresses and distortion.
- B. Field measurements shall be taken prior to fabrication of panels.
- C. Proceed with roofing installation only after satisfactory conditions are met.

1.7 WARRANTY

- A. Manufacturer's Product Warranty:
 - 1. Manufacturer's standard performance warranty, as available for specified installation and environmental conditions.
- B. Contractor's Warranty:
 - 1. Warrant panels, flashings, sealants, fasteners and accessories against defective materials and/or workmanship, to remain watertight and weatherproof with normal usage for two (2) years following Project Substantial Completion date.
- C. Manufacturer's Watertightness Warranty:
 - 1. Provide manufacturer's standard watertightness warranty.

PREFORMED METAL ROOF PANELS

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURER

- A. Preformed Metal Roof Panel System:
 - 1. AEP Span, A Division of ASC Profiles Inc, (Specification Base).
 - a. Panel Designation: Design Span[®]hp 12” wide flat (non-striated) panels (Color: AEP Span “Cool Metallic Silver”).
 - 2. The Bryer Company.
 - a. Panel Designation: “Superseam”; 12” wide flat (non-striated) panels (Color: Match AEP Cool Metallic Silver).
 - 3. Metal Sales Manufacturing Corp.
 - a. Panel Designation: “Vertical Seam”; 12” wide flat (non-striated) panels (Color: Match AEP Cool Metallic Silver).
 - 4. Or accepted substitute.
- B. Underlayment (Below Metal Roof Panels/Over Cover Board): Henry, Owens Corning, Carlisle Coatings & Waterproofing, Incorporated, or accepted substitute.
- C. Cover Board: JM Securock Glass-Mat Board, Georgia Pacific DensDeck, or accepted substitute.

2.2 VAPOR RETARDER, UNDERLAYMENTS AND INSULATION

- A. Vapor Retarder on Metal Deck (Below Cover Board): 6 mil polypropylene.
- B. Coverboard: 5/8” thick JM Securock Glass-Mat Board, Georgia Pacific DensDeck, or accepted substitute.
- C. Underlayment over Cover Board: Self-adhered composite membrane consisting of a high softening point, SBS rubberized asphalt compound, which is integrally laminated to a blue, density cross-laminated polyethylene film with anti-slip coating.
 - 1. Manufacturer:
 - a. Blueskin PE200 HT by Henry.
 - b. Owens Corning WeatherLock Specialty Tile & Metal Waterproofing Barrier.
 - c. Grace “Ultra”.
 - d. WIP 300HT by Carlisle Coatings & Waterproofing, Incorporated
 - e. Or accepted substitute.

2.3 METAL ROOF PANELS AND ACCESSORIES

- A. Panels:
 - 1. Base Metal:
 - a. Material: Steel conforming to:
 - 1) ASTM A792 minimum yield 50,000 psi, thickness 24 gauge.
 - 2) For primers thicker than 0.5 mil] Steel conforming to ASTM A653 (formerly ASTM A446), G-90 Galvanized, minimum yield 50,000 psi, thickness 24 gauge.

PREFORMED METAL ROOF PANELS

- b. Protective Coatings:
 - 1) Conform to ASTM A792, AZ50 (Zincalume®/Galvalume®).
- 2. Exterior Finish:
 - a. DuraTech® 5000 (Polyvinylidene Fluoride), full 70% Kynar® 500/Hylar 5000® consisting of a baked-on 0.15-0.20 mil corrosion resistant primer and a baked-on 0.70-0.80 mil finish coat with a specular gloss of 10-30% when tested in accordance with ASTM D-523 at 60°.
 - 1) Color: AEP Span “Cool Metallic Silver”.
- 3. Interior Finish:
 - a. Primer Coat Material: Corrosion-resistant primer; primer coat dry film thickness: 0.15 mils; finish coat material: polyester paint, finish coat dry film thickness: 0.35 mils.
 - b. Color: Off-White to Light Gray.
- 4. Factory-Applied Seam Sealant: Cold-applied, non-skinning, butyl mastic sealant.
- 5. Configuration:
 - a. Standing Seam: Roof panels shall consist of integral self-locking standing seams 1-3/4” high spaced 12” on center.
 - 1) Flat (Non-Striated) pan.
- B. Accessories:
 - 1. Fastener Clip: UL 90 rated 18 gauge G-90 Galvanized steel, 40 ksi yield strength, 3-1/2” long triple fastener type.
 - 2. Fasteners: Per manufacturer’s recommendation.
 - 3. Sealant:
 - a. Gunnable Grade Caulking: Single component polyurethane caulk.
 - b. Tape sealant: Butyl.
 - 4. Bearing Plate: 24 gauge 4”x6” Zincalume® coated steel bearing plate.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Existing Conditions:
 - 1. Verify that members to receive panels are complete, accurately sized and located, in true plane, secure and otherwise properly prepared.
 - 2. Prior to starting work, notify General Contractor about any defects requiring correction.
 - 3. Do not start work until conditions are satisfactory.

PREFORMED METAL ROOF PANELS

3.2 PREPARATION

- A. Field Measurements:
 - 1. Verify prior to fabrication.
 - 2. If field measurements differ from drawing dimensions, notify Architect/Engineer prior to fabrication.
- B. Protection:
 - 1. Treat, or isolate with protective material, and contacting surfaces of dissimilar materials to prevent electrolytic corrosion.
 - 2. Require workmen who will be walking on Roofing Panels to wear clean, soft-soled work shoes that will not pick up stones or other abrasive material which could cause damage or discoloration.
 - 3. Protect Work of other Trades against damage and discoloration.
- C. Surface Preparation: Clean and dry surfaces prior to applying sealant.

3.3 INSTALLATION

- A. Vapor Retarder: Install 6 mil polypropylene underlayment over metal roof deck. Shingle lap ends. Lap joints 6" minimum. Tape seams.
- B. Install cover board over vapor retarder. Mechanically fasten securely to metal roof deck.
- C. Install underlayment over cover board per manufacturer's installation instructions. Install underlayment over cover board starting at the bottom of roof plane and shingling the underlayment sheets. Provide 2" side laps and 6" end laps.
- D. Panels:
 - 1. Follow roof panel manufacturer's directions.
 - 2. Install panel seams vertically.
 - 3. Lap panels away from prevailing wind direction.
 - 4. Do not stretch or compress panel side-lap.
 - 5. Secure panels without warp or deflection.
 - 6. Fully engage interlocking seams.
 - 7. Remove strippable protective film, if used, immediately preceding panel installation.
- E. Allowable Erection Tolerance:
 - 1. Maximum Alignment Variation: 1/4 inch in 40 feet.
- F. Flashing:
 - 1. Follow Manufacturer's directions and Architect approved Shop Drawings.
 - 2. Install flashings to allow for thermal movement.
 - 3. Remove strippable protective film, if used, immediately preceding flashing installation.

PREFORMED METAL ROOF PANELS

- G. Cutting and Fitting:
 - 1. Neat, square and true. Torch cutting is prohibited.
 - 2. Openings 6 inches and larger in any direction: Shop fabricate and reinforce to maintain original load capacity.
 - 3. Debur cut edge where necessary to saw-cut panels.

3.4 CLEAN UP AND CLOSE OUT

- A. Panel Damage and Finish Scratches:
 - 1. Do not apply touch-up paint to damaged paint areas that involve minor scratches.
 - 2. Panels or flashings that have severe paint and/or substrate damage shall be replaced as directed by the Contracting Officer's representative.
- B. Cleaning and Repairing:
 - 1. At completion of each day's work and at work completion, sweep panels, flashings and gutters clean. Do not allow fasteners, cuttings, filings or scraps to accumulate.
 - 2. Remove debris from Project Site upon work completion or sooner, if directed.

END OF SECTION

METAL WALL PANELS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes complete system of concealed-fastener, lap-seam metal panels in the following applications:
 - 1. Metal wall panels.
 - 2. Metal soffit panels.

1.2 REFERENCES

- A. American Society of Civil Engineers (ASCE):
 - 1. ASCE 7: Minimum Design Loads for Buildings and Other Structures.
- B. ASTM International (ASTM):
 - 1. ASTM A653: Steel Sheet, Zinc Coated (Galvanized) or Zinc Iron Alloy Coated (Galvannealed) by the Hot Dip Process.
 - 2. ASTM A792: Steel Sheet, 55 % Aluminum Zinc Alloy Coated by the Hot Dip Process.
 - 3. ASTM C1371: Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers.
 - 4. ASTM C1549: Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer.
 - 5. ASTM D523: Specular Gloss.
 - 6. ASTM E283: Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
 - 7. ASTM E331: Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
 - 8. ASTM E1592: Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference.
 - 9. ASTM E1918: Measuring Solar Reflectance of Horizontal and Low Sloped Surfaces in the Field.
 - 10. ASTM E1980: Calculating Solar Reflectance Index of Horizontal and Low Sloped Opaque Surfaces.
- C. Cool Roof Rating Council (CRRC):
 - 1. CRRC-1 Method #1: Measuring Solar Reflectance of a Flat, Opaque, and Heterogeneous Surface Using a Portable Solar Reflectometer.
- D. SMACNA Architectural Sheet Metal Manual (Current Edition).

1.3 SUBMITTALS

- A. Product Data.
- B. Shop Drawings:
 - 1. Indicate thickness and dimensions of parts, fastenings and anchoring methods, details and locations of joints, transitions and other provisions necessary for thermal expansion and contraction.
 - 2. Indicate locations of field- and factory-applied sealant.

METAL WALL PANELS

- C. Samples:
 - 1. Submit two samples, 12 inches long by full panel width, showing proposed metal thickness and seam profile.
 - 2. Submit standard color samples of metal for Architect's selection.
- D. Manufacturer Qualifications.
- E. Installer Qualifications: Submit list of completed projects, with names and contact information for architects and contractors.
- F. Test Reports: Indicating compliance of products with project requirements.
- G. Warranty Documentation.
- H. Insurance Documentation.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
 - 1. Ten years' experience, minimum, in factory fabrication of metal panels.
 - 2. Manufacturer shall carry \$2,000,000 liability insurance, minimum, for metal panel system.
- B. Installer Qualifications:
 - 1. Three years' experience, minimum, in application of metal roof or wall panels.
 - 2. Five satisfactory projects with metal panel work of similar scope and complexity to Work of this Project.
- C. Testing Agency Qualifications: Agency compliant with ISO/IEC Standard 17025, or an accredited independent agency recognized by the International Laboratory Accreditation Cooperation Mutual Recognition Arrangement or ANSI.
- D. Pre-Installation Conference: Notify the Architect, metal panel manufacturer's representative, and installer at least 48 hours before starting roofing work. Arrange a mutually acceptable time for meeting at the job with all notified parties to review the specifications and job conditions. Obtain the acceptance and approval of all parties on materials, details, and methods before beginning Work.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Storage and Handling Requirements:
 - 1. Keep panels and accessory items dry.
 - 2. Protect against damage and discoloration.
 - 3. Handle panels with non-marring slings.
 - 4. Support panels to prevent permanent deformation.
 - 5. Store panels above ground, with one end elevated for drainage.
 - 6. Protect panels against standing water and condensation between adjacent surfaces.
 - 7. If panels become wet, immediately separate sheets, wipe dry with clean cloth, and keep sheets separate for air-drying.
 - 8. Painted panels shall be shipped with protective plastic sheeting or a strippable film coating between panels. Remove strippable film coating prior to installation. Do not allow strippable film coating to remain on panels in extreme heat, cold, or direct sunlight or other UV source.

METAL WALL PANELS

1.6 WARRANTY

- A. Manufacturer's Warranty: Manufacturer's standard 25-year performance warranty, stating the following:
 - 1. Architectural fluorocarbon finish:
 - a. Will be free of fading or color change in excess of 5 Hunter delta-E units as determined by ASTM D2244-02.
 - b. Will not chalk in excess of numerical rating of 8 when measured in accordance with standard procedures specified in ASTM D4214-98 method D659.
 - c. Will not peel, crack, chip, or delaminate.
 - 2. Metal substrate will not rupture, fail structurally, or perforate.
- B. Installer's Warranty: Warranty panels, flashings, sealants, fasteners and accessories against defective materials and/or workmanship, covering repairs required to maintain wall panels watertight and weatherproof with normal usage for two years following Project Substantial Completion date.
 - 1. Furnish written warranty, signed by installer.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Products: Provide the following:
 - 1. AEP Span, a Division of ASC Profiles, Inc.; Prestige Series® (Specification Base)
 - 2. The Bryer Company: Flush.
 - 3. Metal Sales Manufacturing Corp.; Flush Series.
 - 4. Or accepted substitute.
- B. Performance Criteria:
 - 1. Wind Uplift: As required by ASCE 7 and Oregon State Structural Specialty Code based on the 2009 International Building Code (IBC).
 - a. Panel System shall be ASTM E1592 tested under the supervision of an ANSI or ISO/IEC accredited laboratory and the laboratory shall issue the test report. Test data based on ASTM E330 is not acceptable.
 - b. Deflection Limits: Withstand wind loads with deflections no greater than L/180 of the span.
 - c. Wall Panels at Press Box shall be designed to withstand the following loads normal to the plane of the roof:
 - 1) Positive pressure of 19.40 psf (929 Pa) at non-corner zones.
 - 2) Negative pressure of 21.03 psf (1007 Pa) at non-corner zones.
 - 3) Positive pressures of 19.40 psf (929 Pa) at corners.
 - 4) Negative pressures of 25.76 psf (1224 Pa) at corners.
 - 5) Positive inward.
 - c. Wall Panels at Main Grandstand shall be designed to withstand the following loads normal to the plane of the roof:
 - 1) Positive pressure of 26.09 psf (1249 Pa) at non-corner zones.
 - 2) Negative pressure of 27.72 psf (1327 Pa) at non-corner zones.
 - 3) Positive pressures of 26.09 psf (1249 Pa) at corners.
 - 4) Negative pressures of 32.46 psf (1554 Pa) at corners.
 - 5) Positive inward.

METAL WALL PANELS

2. Air Infiltration: 0.06 cfm/lf, maximum at a static difference of 1.57 psf when tested with sidelap sealant per ASTM E283.
3. Water Penetration Under Static Pressure: No leakage at 12 psf when tested with sidelap sealant per ASTM E331.
4. Thermal Movements: Accommodate thermal movement without buckling, joint opening, failure of connections, or other detrimental effects, through the following temperature changes:
 - a. 120 degrees F, ambient.
 - b. 180 degrees F, surface.

2.2 PANELS

- A. Wall and Soffit Panels: “Prestige Series®” by AEP Span, a Division of ASC Profiles, Inc.; “Flush” by The Bryer Company; “Flush Series” by Metal Sales Manufacturing Corp.; or accepted substitute.
 1. Material: Steel conforming to ASTM A792.
 - a. 24 Gauge: Yield strength 50,000 psi; with aluminum-zinc alloy coating conforming to ASTM A792, Class AZ50.
 - b. Thickness and yield strength as required for performance indicated; with aluminum-zinc alloy coating conforming to ASTM A792, Class AZ50 or with zinc coating conforming to ASTM A653, Class G 90.
 2. Profile and Pattern: Full 12” panel, flat (no ribs).
 - a. Provide perforated soffit panels where indicated on Drawings.
 3. Finishes:
 - a. Exterior Panel Finish: Provide primer and finish coat on exposed faces; provide primer on concealed faces of panels.
 - 1) DuraTech® 5000: Polyvinylidene Fluoride, full 70 percent Kynar 500/Hylar 5000, consisting of a baked-on 0.15-0.20 mil corrosion resistant primer and a baked-on 0.70-0.80 mil finish coat with a specular gloss of 8 to 15 when tested in accordance with ASTM D523 at 60 degrees.
 - 2) Exterior Panel Color:
 - a. Wall Panels: Match AEP Span “Cool Metallic Silver”.
 - b. Soffit Panels: Match AEP Span “Winter White” or The Bryer Company “Regal White” or Metal Sales Manufacturing Corp. “Snow Drift White”.
 - b. Interior Panel Finish: Corrosion-resistant primer; primer coat dry film thickness: 0.15 mils; polyester paint; dry film thickness of 0.35 mils, off-white to light gray in color.
 4. Sidelap Sealant: Factory apply sealant, except where no sealant is required. Field-applied sealant is not acceptable.

2.3 FRAMING AND SUBSTRATES

- A. Sheathing: See Section 06 16 00 SHEATHING.
- B. Air Barriers (by Others):
 1. At Concrete Masonry Walls: Specified in Section 07 27 26 FLUID APPLIED WEATHER RESISTANT BARRIERS.
 2. At Plywood Sheathing: Specified in Section 07 27 14 SELF-ADHERED MEMBRANE AIR BARRIERS.

METAL WALL PANELS

2.4 ACCESSORIES

- A. Clip: Panel clip with spring tab at one end and hold-down clamp at other end, sized to fit panels.
 - 1. Product: AEP Span; Prestige Series Clip.
 - 2. Material: 16 gauge formed steel, galvanized in conformance with ASTM A-653 Class G90.
- B. Trims and Flashings: Material, metal thickness, and finish to match panels. Profiles indicated in Drawings.
- C. Panel Penetration Flashings: As recommended by panel manufacturer.
- D. Fasteners: Per manufacturer recommendation.
- E. Profile Closures: Polyethylene foam, die-cut or formed to panel configuration.
- F. Sealant for Field Application: See Section 07 92 00 JOINT SEALANTS.
- G. Insulation: See Section 07 21 00 THERMAL INSULATION.

2.5 FABRICATION

- A. Fabrication, General:
 - 1. Unless otherwise shown on Drawings or specified herein, fabricate panels in continuous lengths and fabricate flashings and accessories in longest practical lengths.
 - 2. Panels shall be factory correctively-leveled.
- B. Fabrication Tolerances:
 - 1. Flat metal surfaces will display waviness commonly referred to as “oil canning”. This is caused by steel mill tolerances and is a characteristic, not a defect, of panels manufactured from light gauge metal. Panels are factory correctively-leveled to minimize the occurrence of “oil canning”. As such, “oil canning” will not be accepted as cause for rejection.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions: With Installer present.
 - 1. Examine conditions and substrates on which metal panels are to be installed. Structural support or substrate shall be flat and plumb to avoid panel stresses and distortion.
 - 2. Verify that air barrier work is complete and inspected.
 - 3. Prior to starting work, correct defects.
- B. Field Measurements:
 - 1. Coordinate field measurements and fabrication schedule with construction progress.
 - 2. Field measure prior to fabrication. Show recorded dimensions on shop drawings, including locations of shop-fabricated openings.
 - 3. If field measurements differ from drawing dimensions, notify Architect prior to fabrication.

METAL WALL PANELS

- C. Framing and Substrate Tolerances: Deviations from flat plane shall not exceed the following.
 - 1. 1/4 inch in 20 feet vertically or horizontally.
 - 2. 1/2 inch across building elevation.
 - 3. 1/8 inch in 5 feet.

3.2 PREPARATION

- A. Protection:
 - 1. Treat contacting surfaces of dissimilar materials to prevent electrolytic corrosion.
 - 2. Where panels or trim may come in contact with dissimilar materials or treated lumber, fabricate transitions to facilitate drainage and minimize possibility of galvanic corrosion.
 - 3. At points of contact with dissimilar metal or treated lumber, coat panel or trim with protective paint or separate materials with a weatherproof underlayment.
 - 4. Direct contact or run-off from CCA, ACQ, AC, or other treated lumber (outdoor wood) or fire retardant impregnated or treated wood shakes or siding can cause panels and trim to fail prematurely. Avoid contact with these materials.

3.3 INSTALLATION

- A. Substrate and Air Barrier: To be install according to approved shop drawings and metal panel manufacturer's recommendations.
- B. Panels and Flashing:
 - 1. Install according to approved shop drawings.
 - 2. Comply with methods and recommendations of SMACNA Architectural Sheet Metal Manual for flashing configurations required.
 - 3. Overlap flashing at least 6 inches.
 - 4. Discrepancies between job site conditions and shop drawings shall be brought to the attention of the Architect for resolution.
 - 5. Cutting and Fitting:
 - a. Cut panels neat, square, and true with shearing action cutters. Torch or power saw cutting is prohibited.
 - b. Openings 6 inches and larger: Shop fabricate and reinforce to maintain original load capacity.
 - c. Openings less than 6 inches: Field cutting is acceptable.
- C. Accessories: Install trims, panel closures, flashings according to Drawings and manufacturer's recommended details.
- D. Sealant Installation: Apply according to approved shop drawings and SMACNA Architectural Sheet Metal Manual recommendations.
- E. Installation Tolerances: Match dimensional tolerances of framing or substrate.

3.4 CLEANING

- A. Repairs:
 - 1. Touch up paint is not required for panels with scratches that do not expose metal.
 - 2. Panels or flashings with finish damage exposing metal or with substrate damage shall be replaced.

METAL WALL PANELS

- B. Cleaning and Waste Management: At completion of each day's work and at work completion, sweep panels, flashings, and gutters clean. Do not allow fasteners, cuttings, filings, or scraps to accumulate.

END OF SECTION

SBS-MODIFIED BITUMINOUS MEMBRANE ROOFING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Work includes installing a new 2-Ply SBS roofing system, substrate board, and associated flashing materials, over a steel roof deck substrate - as specified within this document.
- B. Completed system shall meet manufacturer's requirements for specified total system guarantee and satisfy local building code criteria.

1.2 RELATED SECTIONS

- A. Division 05 Section Steel Decking for steel roof deck substrate.
- B. Division 06 Section Miscellaneous Rough Carpentry: Wood nailers and curbs.
- C. Division 07 Section Sheet Metal Flashing: Counter flashings, reglets, and other sheet metal flashings.

1.3 REFERENCES

- A. ASTM C1177 - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
- B. ASTM D41 - Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing.
- C. ASTM D4601 - Standard Specification for Asphalt-Coated Glass Fiber Base Sheet Used in Roofing.
- D. ASTM D 6163 - Standard Specification for fiberglass reinforced SBS Based Membrane Roofing.
- E. ASTM D 6164 - Standard Specification for polyester/glass reinforced SBS Based Membrane Roofing.
- F. UL (RMSD) - Roofing Materials and Systems Directory; Underwriters Laboratories Inc.; current edition. Completed roofing system shall meet a minimum UL Class A Fire Rating.
- G. ASCE 7 (2010) Wind Uplift Resistance: Roofing system shall resist minimum wind uplift pressures based on ASCE 7 (2010) calculations.
- H. Factory Mutual Wind-uplift Criteria: Completed roofing system shall be installed in a manner that will satisfy minimum FM 1-60 fastening densities.

1.4 SUBMITTALS

- A. Product Data: Provide data indicating membrane materials, flashing materials, insulation, surfacing, and fasteners.
- B. Samples for Verification: Submit two samples illustrating type, thickness, and color of membrane.
- C. Manufacturer's Certificate Roof Assembly Letter: Manufacturer shall certify that products meet and/or exceed specified requirements. The roofing manufacturer shall provide written documentation confirming the proposed system will satisfy both the FM 1-60 minimum fastening densities, and the ASCE 7 (2010) wind-uplift calculations as defined within this document. The more stringent requirement of the two shall be utilized for installation fastening densities.
- D. Warranty

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in the manufacturing of SBS Bituminous membrane materials with a minimum of 10 years manufacturing experience.
- B. Roof Classification: The SBS membrane roofing system shall achieve a minimum UL Class A fire rating.

SBS-MODIFIED BITUMINOUS MEMBRANE ROOFING

- C. Manufacturers Specifications: Unless otherwise noted in this specification, the roofing contractor must comply with the manufacturer's current specifications and details.
- D. Applicator: The roofing system must be installed by an applicator authorized and trained by the manufacturer in compliance with shop drawings as approved by the manufacturer. The roofing applicator shall be thoroughly experienced and upon request be able to provide evidence of having at least 5 years successful experience installing SBS bituminous roofing systems and having installed at least three (3) roofing applications or several similar systems of equal or greater size within the last year.
- E. Crew Experience and Supervision: Provide adequate number of experienced workmen regularly engaged in this type of work who are skilled in the application techniques of the materials specified. Provide at least one thoroughly trained and experienced foreman or superintendent on the job at all times roofing work is in progress.
- F. Deviations: There shall be no deviations made from this specification or the approved shop drawings without the prior written approval of the specifier. Any deviation from the manufacturer's installation procedures must be supported by a written certification on the manufacturer's letterhead and presented for the specifier's consideration.
- G. Inspection: Upon completion of the installation, the applicator shall arrange for an inspection to be made by a non-sales technical representative of the membrane manufacturer in order to determine whether or not corrective work will be required before the warranty will be issued. Notify the building owner and/or architect seventy-two (72) hours prior to the manufacturer's final inspection.

1.6 PERFORMANCE AND DESIGN REQUIREMENTS

- A. General Performance: Installed roofing system and flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, or installation. Roof system and flashings shall remain watertight for duration of specified manufacturer guarantee.
- B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roof membrane manufacturer based on testing and field experience.
- C. Wind Uplift Resistance: Roofing system shall resist minimum wind uplift pressures based on ASCE 7 (2010) calculations. ASCE 7 (2010) wind-uplift pressure calculations shall be project specific and based on the following criteria:
 - 1. Project Address & Location.
 - 2. Building Height in Feet.
 - 3. Building Exposure Category.
 - 4. Wind-Speed Design, V (mph).
 - 5. Building Risk Category.

Note 1: Refer to Design Criteria under General Structural Notes and/or on Architectural Roof Plan Page for additional information.

Note 2: The roofing manufacturer shall provide written documentation confirming the proposed system will satisfy the ASCE 7 (2010) wind-uplift calculations as defined above.

- D. FM 1-60 Wind-uplift Criteria (minimum): Completed roofing system shall be installed in a manner that will satisfy minimum FM 1-60 fastening densities. Note: The roofing manufacturer shall provide written documentation confirming the proposed system will satisfy both the FM 1-60 minimum fastening densities, and the ASCE 7 (2010) wind-uplift calculations as defined above. The more stringent requirement of the two shall be utilized.

SBS-MODIFIED BITUMINOUS MEMBRANE ROOFING

- E. Hail Resistance: Completed roofing system shall satisfy FM Severe Hail (SH) criteria. The roofing manufacturer shall provide written documentation confirming the proposed system will satisfy FM Severe Hail criteria.
 - F. UL Class A Fire Rating: Completed roofing system shall satisfy a UL Class B minimum fire rating. The roofing manufacturer shall provide written documentation confirming the proposed system will satisfy UL Class A fire rating criteria.
- 1.7 PRE-INSTALLATION MEETING
- A. Convene one week before starting work of this section.
 - B. Review preparation and installation procedures and coordinating and scheduling required with related work.
 - C. Participants at the Pre-Installation Meeting shall include:
 - 1. Roofer.
 - 2. General Contractor.
 - 3. Roofing Manufacturer's Representative.
 - 4. Sheet Metal Contractor.
 - 5. Interlocking Grating Planks Walkway Installer.
 - 6. Owner's Representative.
 - 7. Architect.
 - 8. Others as identified by Owner's Representative and/or Architect.
- 1.8 DELIVERY, STORAGE, AND PROTECTION
- A. Deliver products in manufacturer's original containers, dry, undamaged, with seals and labels intact.
 - B. Store products in weather protected environment, clear of ground and moisture.
 - C. Protect foam insulation from direct exposure to sunlight.
- 1.9 WARRANTY
- A. Provide manufacturer's 20-year Membrane System Warranty covering both labor and materials with no dollar limitation.
 - 1. Warranty Term: 20 years.
 - 2. The warranty shall contain no exclusion or limitation for damage caused by wind or gale. Minimum wind speed limitation under warranty shall be 72 M.P.H. measured at 10 meters above ground level.
 - 3. Warranty shall include the membrane and all roofing related accessories, including insulation, fasteners and plates, adhesives, etc.
 - 4. The warranty shall contain no exclusion or limitation for improper installation, or damage from environmental contaminants, or damage from water that ponds, or does not drain freely.
 - 5. The warranty shall be from the manufacturer of the membrane, not the marketer. No membrane rebranded products will be accepted.
 - 6. Pro-rated System Warranties are not acceptable.

SBS-MODIFIED BITUMINOUS MEMBRANE ROOFING

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Styrene Butadiene Styrene (SBS) Membrane Materials and Associated Components:
 - 1. Johns Manville, basis of design: www.specjm.com.
 - 2. Siplast Manufacturing.
 - 3. Malarkey Roofing Products: www.malarkeyroofing.com.
 - 4. Substitutions: See Section 016000 (01600) - Product Requirements.

2.2 SBS BASE PLY AND CAP SHEET MATERIALS

- A. Johns Manville Products:
 - 1. JM DynaWeld FR SBS Torch-Grade Mineral-Surfaced Cap Sheet Membrane Material: JM DynaWeld FR SBS Mineral-Surfaced Cap sheet membrane material complying with ASTM D 6163, Type I, Grade G, Fiberglass Reinforced. Roll Weight 106 lbs. Roll thickness 165-mils. Coverage 95.8 sq.ft per roll. Color White.
 - 2. JM DynaBase HW SBS Torch-Grade Base Ply Sheet Membrane Material: JM DynaBase HW SBS Base Ply Membrane material complying with ASTM D 6163, Type I, Grade S, Fiberglass Reinforced. Roll Weight 83 lbs. Roll thickness 91-mils. Coverage 148.2 sq.ft per roll.
- B. Siplast Manufacturing Products:
 - 1. Siplast Paradiene 20 TG/30 FR TG Torchable Roof System.
 - a. Modified Bitumen Base, Stripping, and Flashing Reinforcing Ply: Siplast Paradiene 20 - Torchable Grade.
 - b. Modified Bitumen Finish Ply: Siplast Paradiene 30 FR - Torchable Grade.
- C. Malarkey Roofing Products:
 - 1. Malarkey 630 Paragon ULTRA TG Cap, ASTM D6163 Type I, G, Roll weight 107 lb (48.5 kg), Roll thickness 150-mils, 1 square roll.
 - 2. Malarkey 620 Paragon ULTRA TG Base, ASTM D6163 Type I, S, Roll weight 76 lb (34.5 kg), Roll thickness 138-mils, 1 square roll.

2.3 SBS FLASHING SHEET MATERIALS

- A. Johns Manville Products:
 - 1. JM DynaWeld Cap 180 FR SBS Torch-Grade Mineral-Surfaced Base Flashing Membrane Material (for use at walls and curbs): JM DynaWeld Cap 180 FR SBS Mineral-Surfaced Base Flashing membrane material complying with ASTM D 6164, Type I, Grade G, Glass Scrim Polyester Reinforced. Roll Weight 105 lbs. Roll thickness 157-mils. Coverage 95.8 sq.ft per roll. Color White.
 - 2. JM DynaWeld 180 S SBS Torch-Grade Smooth-Surfaced Flashing Membrane Material (for stripping in edge metal materials): JM DynaWeld 180 S SBS Smooth-Surfaced flashing membrane material complying with ASTM D 6164, Type I, Grade S, Glass Scrim Polyester Reinforced. Roll Weight 86 lbs. Roll thickness 118-mils. Coverage 95.8 sq.ft per roll.
 - 3. JM PermaPly 28 Base Sheet (for backer sheet if required): JM PermaPly 28 Base Sheet complying with ASTM D 4601, Type II, asphalt-impregnated and coated, glass-fiber sheet, dusted with fine mineral surfacing on both sides.

SBS-MODIFIED BITUMINOUS MEMBRANE ROOFING

- B. Siplast Manufacturing Products:
 - 1. Flashing Membrane Assembly: Siplast Paraflor 30 TG Flashing System.
 - a. Cant Backing Sheet and Flashing Reinforcing Ply: Siplast Paradiene 20 SA.
 - b. Modified Bitumen Flashing Ply: Siplast Parafor 30 TG.
 - c. Catalyzed Acrylic Resin Flashing System: Parapro 123 Flashing System by Siplast; Irving, TX.
- C. Malarkey Roofing Products:
 - 1. Malarkey 630 Paragon ULTRA TG Cap, ASTM D6163 Type I, G, Roll weight 107 lb (48.5 kg), Roll thickness 150-mils, 1 square roll.
 - 2. Malarkey 620 Paragon ULTRA TG Base, ASTM D6163 Type I, S, Roll weight 76 lb (34.5 kg), Roll thickness 138-mils, 1 square roll.
 - 3. Malarkey 501 Paragon MOD Base Sheet (for backer sheet if required), ASTM D4601 Type II, Roll weight 90 lb (41 kg), 3 square roll.

2.4 LIQUID APPLIED FLASHING MATERIALS

- A. JM PermaFlash Urethane-Base Liquid Applied Flashing System: JM PermaFlash System is a liquid-applied and fabric reinforced flashing system created with a stitch bonded polyester scrim and a two-component, moisture cured, elastomeric, liquid applied flashing material, consisting of an asphalt extended urethane base material and an activator.
- B. JM Polymethyl-Methacrylate (PMMA) Liquid Applied Membrane System: JM PMMA liquid applied membrane system is a two-component resin with catalyst and reinforcement fabric. Used for flashing in curbs, pipes, through-wall scuppers, and a variety of other through-roof penetration conditions.
- C. Malarkey Roofing Products:
 - 1. Malarkey EZ Seal, Poly Methyl Methacrylate (PMMA) Liquid Applied Membrane. Multi-component resin system.

2.5 SUBSTRATE BOARD

- A. JM 5/8-inch DensDeck Prime Substrate Board: 5/8-inch thick DensDeck Prime Substrate Board. Materials shall meet the requirements of ASTM C 1177 and shall incorporate a coated fiberglass facer ideal for adhered membrane applications.

2.6 ACCESSORIES

- A. Johns Manville Accessories:
 - 1. JM Substrate Board Fasteners & Plates: JM #12 UltraFast Insulation Fastener and UltraFast Steel Plate (flat-bottom type). Length as required for thickness of insulation material and penetration of deck substrate.
 - 2. JM Asphalt Primer: JM Asphalt Primer complying with ASTM D 41.
 - 3. JM MBR Utility Cement: JM MBR Utility Cement is an asphalt-based, two-component, asbestos-free, trowel-grade, cold-applied adhesive specially formulated for compatibility and use with flashing applications.
 - 4. JM Metal Termination Bars: JM Termination Bar options include standard predrilled stainless-steel or aluminum bars, with anchors.

SBS-MODIFIED BITUMINOUS MEMBRANE ROOFING

- B. Siplast Manufacturing Accessories:
 - 1. Mastic: Siplast PA-1021 Plastic Cement by Siplast; Irving, TX.
 - 2. Primers:
 - a. Primer: Siplast PA-1125 Asphalt Primer by Siplast; Irving, TX.
 - b. Primer for Self-Adhesive Sheets: Siplast TA-119 Primer by Siplast; Irving, TX.
 - 3. Sealant (Horizontal Applications): Siplast PS-209 Elastomeric Sealant by Siplast; Irving, TX.
 - 4. Sealant (Vertical and Sloped Applications): Siplast PS-715 NS Elastomeric Sealant by Siplast; Irving, TX.
 - 5. Ceramic Granules: No. 11 Grade specification ceramic granules of color scheme matching the granular surfacing of the finish ply.
 - 6. Perlite Cant Strips: Composed of volcanic minerals combined with waterproofing binders. Top surface shall be pre-treated with an asphalt based coating. The face of the cant shall have a nominal 4 inch dimension.
 - 7. Fasteners:
 - a. Insulation Fasteners: Parafast Fastener by Siplast; Irving, TX.
 - b. Flashing Reinforcing Sheet Fasteners for Wood/Plywood Substrates to Receive Flashing Coverage: 12 gauge, spiral or annular threaded shank, zinc coated steel roofing fastener having a minimum 1 inch head. Fasteners shall be approved by Roofing Manufacturer. Acceptable Fasteners:
 - 1) Square Cap by Maze Nails; Peru, IL.
 - 2) Simlex Cap Nail by Simplex Nails, Inc.; Americus, GA.
- C. Malarkey Roofing Products:
 - 1. Fasteners and Plates: Factory-coated steel fasteners and metal plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roofing components to substrate, tested by manufacturer for required pullout strength, and acceptable to roofing system manufacturer.
 - 2. Asphalt Primer: Asphalt Primer complying with ASTM D 41.

PART 3 - EXECUTION

3.1 INSTALLATION - GENERAL

- A. Perform work in accordance with manufacturer's instructions.
- B. Do not apply roofing system during unsuitable weather.
- C. Do not apply roofing system when ambient temperature is outside the temperature range recommended by manufacturer.
- D. Do not apply roofing system to damp or frozen deck surface or when precipitation is expected or occurring.
- E. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.
- F. Coordinate the work with installation of associated counter flashings installed by other sections as the work of this section proceeds.
- G. Install roofing system according to roofing system manufacturer's written instructions. Installation shall satisfy specified Performance Criteria as defined within these specifications and completed system shall qualify for the specified membrane manufacturer labor and material warranty.

SBS-MODIFIED BITUMINOUS MEMBRANE ROOFING

- H. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at end of workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.
- 3.2 EXAMINATION
 - A. Verify that surfaces and site conditions are ready to receive work.
 - B. Verify deck is supported and secure.
 - C. Verify deck is clean and smooth, flat, free of depressions, waves, or projections, properly sloped and suitable for installation of roof system.
 - D. Verify deck surfaces are dry and free of snow or ice.
 - E. Verify that roof openings, curbs, and penetrations through roof are solidly set, and reglets are in place.
- 3.3 SUBSTRATE BOARD INSTALLATION AND ATTACHMENT
 - A. Install substrate board with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt substrate boards together.
 - B. Fasten substrate board to top flanges of steel deck to resist uplift pressure at corners, perimeter, and field of roof per roofing system manufacturer's written instructions.
 - C. Fastening of substrate board shall satisfy Part 1 Performance and Design Requirements as defined within these specifications. Fastening of board at field of roof areas, including fastening enhancements at perimeter and corner locations, shall satisfy the specified ASCE 7 (2010) wind-uplift calculations, FM 1-60 fastening densities, and membrane manufacturer 20-year guarantee requirements with 72-MPH windspeed protection.
 - D. Do not apply more substrate board material than can be covered with membrane and made watertight by end of day.
- 3.4 SBS MEMBRANE APPLICATION
 - A. JM DynaBase HW SBS Base/Ply Sheet – Heat Welded: Install one (1) ply of JM DynaBase HW SBS Base/Ply sheet. Base/Ply membrane materials is to be adhered in place to the underlying substrate board materials using the heat-weld torch-grade application process.
 - B. JM DynaWeld Cap FR SBS Cap Sheet – Heat Welded Torch-Grade: Install one (1) top cap ply of JM DynaWeld Cap FR SBS cap sheet. Cap sheet membrane material is to be adhered in place to the underlying ply sheet membrane materials using the heat-weld torch-grade application process.
- 3.5 SBS BASE FLASHING MEMBRANE APPLICATION
 - A. Wall and Curb SBS Base Flashing Conditions – Heat Welded Torch-Grade: Install one (1) cap ply of DynaWeld 180 FR Base Flashing membrane at all vertical curb and/or wall locations. Base flashings shall extend up the vertical a minimum of 8-inches above finished roof elevation height and shall be counter-flashed with appropriate sheet metal counter flashing materials. Base flashing membrane materials are to be adhered in place using the heat-weld torch-grade application process.
- 3.6 SBS BASE FLASHING MEMBRANE APPLICATION
 - A. Wall and Curb SBS Base Flashing Conditions – Heat Welded Torch-Grade: Install one (1) cap ply of DynaWeld 180 FR Base Flashing membrane at all vertical curb and/or wall locations. Base flashings shall extend up the vertical a minimum of 8-inches above finished roof elevation height and shall be counter-flashed with appropriate sheet metal counter flashing materials. Base flashing membrane materials are to be adhered in place using the heat-weld torch-grade application process.

SBS-MODIFIED BITUMINOUS MEMBRANE ROOFING

3.7 LIQUID APPLIED MEMBRANE FLASHING APPLICATION

- A. JM PermaFlash Liquid Applied Membrane Flashing – Adhered: At pipe penetrations, through-wall scupper drains, or other unusually shaped through-roof penetrations that are difficult to flash with standard sheet good membrane materials, apply JM PermaFlash liquid-applied scrim reinforced flashing system. Substrates shall be primed with PermaFlash Primer prior to application. **Note:** In lieu of the PermaFlash materials described above, it is an acceptable alternate to use JM PMMA liquid-applied flashing system.

3.8 RAISED STEEL WALKWAY SYSTEM

- A. At the raised steel walkway system, proceed to flash-in and make watertight the supporting through-roof stanchion penetrations. Stanchions shall be made watertight using JM PermaFlash or PMMA liquid applied flashing materials.
- B. Stanchion substrates shall be primed prior to application of liquid applied flashing.
- C. Liquid applied flashing system shall incorporate the use of polyester scrim reinforcement at all areas.

3.10 FIELD QUALITY CONTROL

- A. Require site attendance of roofing manufacturer's field technical inspector. Random inspections of the work in progress shall be performed. Additionally, at completion of the work, roofing manufacturer shall perform a final inspection to verify specification conformance.

3.11 CLEANING

- A. In areas where finished surfaces are soiled by work of this section, consult manufacturer of surfaces for cleaning advice and conform to their documented instructions.
- B. Repair or replace defaced or damaged finishes caused by work of this section.

3.12 PROTECTION OF FINISHED WORK

- A. Protect installed roofing and flashings from construction operations.
- B. Where traffic must continue over finished roof membrane, protect surfaces using durable materials.

END OF SECTION

SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Sheet metal flashing, edge flashing, leader boxes, scuppers, and all other sheet metal items required to weatherproof the roofing as indicated on the Drawings and as specified herein.
 - 1. Provide steel pipe downspouts.
- B. Work of this Section also includes sheet metal beam covers as indicated on the Drawings and as specified herein.

1.2 REFERENCES

- A. ASTM International (ASTM):
 - 1. ASTM A167: Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
 - 2. ASTM A480: Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip.
 - 3. ASTM A653: Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 4. ASTM B32: Standard Specification for Solder Metal.
 - 5. ASTM B209: Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 - 6. ASTM B370: Standard Specification for Copper Sheet and Strip for Building Construction.
 - 7. ASTM C920: Standard Specification for Elastomeric Joint Sealants.
 - 8. ASTM D4586: Standard Specification for Asphalt Roof Cement, Asbestos-Free.
- B. Sheet Metal and Air Conditioning National Association, Inc. (SMACNA): Architectural Sheet Metal Manual, latest edition.
- C. American National Standards Institute / Single Ply Roofing Institute ES-1 (SPRI/ANSI ES-1), Wind Design Standard for Edge Systems used with Low Slope Roofing Systems.

1.3 SYSTEM DESCRIPTION

- A. Design, fabricate and install flashings at roof edges in accordance with ANSI/SPRI, ES-1, except with basic wind speed of 95 mph.
- B. Moisture Infiltration: Finish work free from water leakage under all weather conditions.
- C. Thermal Movements: Provide sheet metal flashing and trim that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of sheet metal and trim thermal movements. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

1.4 SUBMITTALS

- A. Shop Drawings: Submit shop drawings of flashing details showing dimensions, anchorage, and joint construction.
- B. Samples: Submit 3 samples of factory finished metal for color selection.

SHEET METAL FLASHING AND TRIM

1.5 QUALITY ASSURANCE

- A. SMACNA Manual: Comply with latest edition of the "Architectural Sheet Metal Manual" by SMACNA. Conform to details and description in reference standards unless otherwise indicated on the Drawings.
- B. Fabricator and Installer Qualifications: Company specializing in sheet metal work with 10 years of documented experience.
- C. Pre-Installation Conference: Attend Pre-Installation Conference specified in Section 07 51 00 BUILT-UP BITUMINOUS ROOFING.

1.6 SEQUENCING AND SCHEDULING

- A. Coordinate with the new roofing work specified in Section 07 54 23 THERMOPLASTIC POLYOLEFIN MEMBRANE ROOFING.

1.7 WARRANTY

- A. Provide installer's written warranty against defects in materials and workmanship for a period of not less than 2 years.
- B. Provide manufacturer's standard 20 years warranty on coil coated steel sheet.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Pre-Painted Coil Coated Steel: For use at the inside face of the mechanical screen wall. 24-gage minimum, hot-dipped galvanized steel conforming to ASTM A653, G90 coating class.
 - 1. Paint Finish at Exposed Side: Factory applied baked-on 2 coat system comprised of 1 coat of full strength 70% resin fluorocarbon (polyvinylidene fluoride PVF2) over a smooth coat of corrosion-resistant epoxy-based primer. Color to match AEP Span color "Cool Metallic Silver".
 - 2. Paint Finish at Underside: A washcoat over a coat of corrosion-resistant epoxy-based primer.
- B. Galvanized Steel: 24-gage or 26 gage, hot-dip galvanized steel conforming to ASTM A653, G90 coating class. 20 year warranty on baked enamel finish. Factory applied, prefinished "Kynar 500 Fluorocarbon coating". Minimum thickness 0.70-mil over 0.25-mil prime coat.
- C. Stainless Steel: 26-gage; ASTM A167, Type 302/304, dead soft, annealed, 2D (matte non-reflective) finish in accordance with ASTM A480. At concealed locations use 24-gage galvanized steel. At joints in wall and cap flashing use at standing seam only. Use hexagon head fasteners equipped with neoprene washers. Drive pins or similar hammer/expanding fasteners are prohibited.

SHEET METAL FLASHING AND TRIM

- D. Solder: ASTM B32; use 50/50 for all applicable work unless otherwise specified.
- E. Soldering Flux: Type best suited for specific material.
- F. Provide TPO coated sheet metal flashings where indicated on Drawings.

2.2 ACCESSORIES

- A. Flashing Membrane: Grace Ultra manufactured by W. R. Grace & Co.–Conn., Grace Construction Products, Cambridge, MA.
- B. Clips: Same gage and type as metal covering, 2" wide.
- C. Continuous Clips: Same gage and type as coil coated steel used for metal flashings.
- D. Concealed Fasteners: Hot-dip galvanized steel, stainless steel nails, or cadmium plated or stainless steel screws of type as appropriate for materials and substrates encountered.
- E. Exposed Fasteners: Hot-dip galvanized steel or stainless steel nails or cadmium plated screws with neoprene grommets washers and head to match sheet metal color. Color matching rivets may be used on exposed flashing. Provide type(s) as appropriate for the substrates encountered.
- F. Sealants: ASTM C920; Type as required for conditions being sealed, compatible with materials encountered. ChemKalk 900, Sonnebourn NP1, or accepted substitute.
- G. Plastic Cement: Non-running, heavy-body flashing cement composed of mineral ingredients to meet ASTM D4586.
- H. Gutters: Provide new continuous roll formed gutters of prefinished coil coated 24-gage material in manufacturer's standard color selected by the Architect.
- I. Downspouts: 3" diameter 16 gage, galvanized steel pipe. Prime painted prior to installation. See Section 09 91 00, Painting.
- J. Downspout Brackets: As detailed on Drawings. Prime painted prior to installation. See Section 09 91 00, Painting.

2.3 FABRICATION

- A. Minimum Sheet Thickness: 24-gage.
- B. Shop Forming Requirements:
 - 1. Fabricate sheet metal flashing and wall liners as detailed and in accordance with reviewed shop drawings. Use the SMACNA Architectural Sheet Metal Manual Specifications and Details as a guide and basis for fabrication wherever applicable.
 - 2. Provide for thermal movement of sheet metal.
 - 3. Angle bottom edges of exposed vertical surfaces to form hemmed drip edge.
 - 4. Fabricate to dimensions indicated on shop drawings.
 - 5. Fabricate sheet metal with lines, brakes and angles sharp and true, and surfaces free from oilcanning, wave, warp, or buckle.
 - 6. Fold exposed edges of sheet metal back to form 1/2" wide hem on side concealed from view.
 - 7. Provide galvanic protection in areas where dissimilar metals are adjacent to each other.

SHEET METAL FLASHING AND TRIM

8. Spring Locks: Provide flashing pieces fabricated to spring lock where indicated on the Drawings.
9. Mechanically fasten the top edge of base flashing. Cover metal flashing flanges at roof edges with one ply.
- C. Gutters:
 1. Provide new continuous seamless bracketed gutters only.
 2. Profile as indicated on Drawings.
 3. Gutters shall be one piece, fabricated from hot dipped galvanized steel with baked enamel finish in manufacturer's standard color selected by the Architect.
 4. Gutter expansion joints allowing gutter movement without disturbing roof system are required.
 5. Maximum lengths of gutter sections are not to be greater than 100 feet. Submit gutter break joints to the Architect prior to fabrication.
- D. Downspouts: Provide round, 16 gage prefinished sheet metal downspouts as indicated on Drawings. Schedule.
 1. Mounting Brackets: As indicated on Drawings.
- E. Leader Box: Provide as indicated on Drawings.
- E. Scuppers: Provide TPO coated prefinished sheet metal scuppers in locations and size as indicated on the Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Do not proceed with Work until construction to receive the Work is completed.
- B. Examine substrates and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected. Surfaces to receive sheet metal shall be clean, even, smooth, dry, and free from defects and projections that might adversely affect the application. Verify slope prior to installation.

3.2 PREPARATION

- A. Cover surfaces to receive sheet metal with flashing membrane specified herein.
- B. Verify that flashing membrane material, specified under roofing work, has been installed prior to sheet metal installation. Refer to Drawings for membrane and sheet metal application.

3.3 INSTALLATION

- A. Cleating at Seams: For size and spacing, refer to Drawings and SMACNA Manual. Secure one end with two fasteners and fold the cleat over the fastener heads. Unless otherwise indicated, use 2" x 3" long cleats of the same material and thickness of metal being installed.
- B. Soldering: Perform with well-heated coppers, so as to heat thoroughly the seam and sweat the solder through its full width. Roughen edges of stainless steel and monel with emery cloth before soldering. Do not solder aluminum or pre-finished metal.
- C. Flux: Use type of flux compatible with the sheet metal. Remove acid flux residue by neutralizing with ammonia or baking soda and rinsing with water.

SHEET METAL FLASHING AND TRIM

- D. Seams: Comply with SMACNA Manual details (Figures 3-2 and 3-3 and other Figures as applicable to specific installations). Orient seams properly for direction of water flow.
 - 1. Standing Seams: Finish seams 1" high as detailed and in accordance with SMACNA standards. Fold the ends over to form watertight, 45° finished ends.
 - 2. Flat Lock Seams: Provide four-ply flat lock horizontal seams at cap flashing on top of parapet and crickets. Solder lap seams around roof scuppers. Solder exposed gutter and downspouts seams. Finish not less than 1" wide.
 - 3. All cap flashing is to have standing seams as indicated above.
 - 4. Cap is to extend a minimum of 3" over edge, with felts tucked underneath or single ply to extend over top of curb or parapet wall. Use fastening clip at parapet and curb flashing. No screws through top of parapet. Seal at corners with Dow Corning 795.
- E. Wall Coping: Provide as detailed and in accordance with SMACNA standards. Lock front edge in continuous cleat. Miter, seam, and seal corners of coping with solder. Lap adjacent lengths of coping 2" minimum.
- G. Wall Flashing: Install galvanized steel flashing 4" high behind siding above wall openings for doors, windows, louvers, and entrance soffits.
- H. Roof-Edge Flashings: Secure metal flashings at roof edges according to Section 1505.5 of the International Building Code.

3.4 SCHEDULE

- A. Fabricate sheet metal flashing and trim from the following materials of the minimum thicknesses indicated, unless otherwise required on the Drawings or to meet performance requirements.
- B. Gutters with Girth 26 to 30 Inches:
 - 1. Pre-Finished Galvanized Steel: 0.040 inch (20 gage) thick.
- C. Downspouts and Downspout Leaders:
 - 1. Pre-Finished Galvanized Steel: 0.040 inch (20 gage) thick.
- D. Copings:
 - 1. Pre-Finished Galvanized Steel: 0.028 inch (24 gage) .
- E. Saddles: Fabricate concealed saddles fully welded.
 - 1. Galvanized Steel: 0.028 inch (24 gage) thick.
- F. Base Flashing:
 - 1. Galvanized Steel: 0.028 inch (24 gage) thick.
- G. Counter flashing:
 - 1. Galvanized Steel: 0.028 inch (24 gage) thick.
- H. Roof-Penetration Flashing:
 - 1. Galvanized Steel: 0.028 inch (24 gage) thick.
- I. Opening Flashings in Frame Construction: Fabricate head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings. Form head and sill flashing with 2-inch-high, end dams.
 - 1. Galvanized Steel: 0.028 inch (24 gage) thick.

SHEET METAL FLASHING AND TRIM

- J. Sill Pans: Fabricate storefront sill pan flashings with end and back dams and all corners sealed watertight.
 - 1. Stainless Steel: 0.031 inch (22 gage) thick at floor line.
 - 2. Pre-Finished Galvanized Steel: 0.028 inch (24 gage) thick at raised openings.
- K. Equipment Support Flashing:
 - 1. Galvanized Steel: 0.028 inch (24 gage) thick.

END OF SECTION

JOINT SEALANTS

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide complete sealant systems as indicated on Drawings and specified herein.
- B. Section includes building sealants for weatherproofing at all areas where work is performed, including but not limited to, perimeter joints of jambs, sills and trim; perimeter of door and window frames; penetrations of mechanical, electrical, and roof drainage equipment and parts through exterior wall, soffit and trim; expansion joints.
 - 1. Provide miscellaneous sealant products used throughout job.

1.2 QUALITY ASSURANCE

- A. Guarantee: Furnish written guarantee at completion of work. Guarantee period shall be 2 years from date of substantial completion. Include repair and replacement of defective work, such as leaks, failure of material, loss of adhesion, running of compound, or staining of adjacent work.
- B. Provide manufacturer's standard warranties as follows:
 - 1. 20 year Structural Adhesion Warranty.
 - 2. 20 year Weatherseal Warranty.
 - 3. 20 year Non-Staining Warranty.
- C. Installer must have 5 years of experience in the installation of sealants specified herein.
- D. Laboratory Adhesion Tests: Contractor shall furnish samples of surface materials being sealed to the Sealant manufacturer for laboratory testing. Sealant Manufacturer shall perform laboratory tests of staining, weatherseal, and structural adhesion of sealant on each type of material being sealed. Sealant Manufacturer shall furnish written report of results and recommendations to the Architect and the Contractor prior to first pre-installation conference.
- E. Pre-installation Conferences: Notify the Architect, sealant manufacturer's representative, and sealant installer at least 2 weeks before starting sealant work. Arrange a mutually acceptable time for meeting at the job with all notified parties to review the sealant specifications and job conditions. Obtain acceptance and approval of all parties on materials, details, and methods before beginning sealant installation.
 - 1. Schedule 2 on-Site Pre-installation Meetings.
 - 2. First Pre-installation Meeting: The sealant manufacturer shall perform field adhesion tests of each type of material to determine and reconfirm if primer is required. Install sealants (and primers, where recommended) at representative areas at the first Pre-installation Meeting preparatory to the pull tests. After applying sealant at test locations, allow a minimum of 7 days to 14 days for sealants to cure prior to performing pull tests. Refer to recommendations made by sealant manufacturer resulting from laboratory adhesion tests.
 - 3. Second Pre-installation Meeting: Reconvene at the Site to perform pull tests. Allow at least 7 to 14 calendar days for test sealants to cure prior to second meeting.
- F. Sealant Manufacturer's Inspections: Arrange for required manufacturer's periodic and final field inspections.

1.3 SUBMITTALS

- A. Product Data: Manufacturer's specifications, handling, installation and curing instructions, and performance data for each product to be used.

JOINT SEALANTS

- B. Submit in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.

PART 2 – PRODUCT

2.1 SEALANTS

- A. One Component Interior Non-elastomeric Sealant:
1. S-1 Acrylic-Latex: Esaply ALS by W.R. Meadows, AC-20 by Pecora, Sonolac by Sonneborn, Acrylic Latex by Tremco, Silaflex 419/420 by Sika.
- B. One Component Exterior Elastomeric Sealant:
1. S-2 Acid Type Silicon Rubber: Silicone or 795 by Dow Corning, or approved equal.
 2. S-3 Non-Acid Type Silicone Rubber: 790 or 795 by Dow Corning, or approved equal.

2.2 PREPARATION AND BACKING MATERIALS

- A. Joint Cleaner and Primer / Sealer: As recommended by sealant manufacturer for the joint surface to be cleaned, primed or sealed.
- B. Bond Breaker Tape: Polyethylene or other plastic self-adhesive tape, compatible with sealant, which will not bond to sealant.
- C. Sealant Backer Rod: Nonabsorptive closed cell compressible rod stock, compatible with sealant, which will not bond to sealant. Sonofoam by Sonneborn, Backer Rod by W.R. Meadows.
- D. Polyurethane Backing Tape Sealant: Polytite-B by Sandell.

PART 3 - EXECUTION

3.1 JOINT SURFACE PREPARATION

- A. Clean, prime and seal joint surfaces as recommended by sealant manufacturer.
- B. Support sealant from back with construction indicated or with joint filler or backer rod where recommended by sealant manufacturer.

3.2 INSTALLATION

- A. Comply with manufacturer's printed instructions. Select sealant color to match adjacent surfaces, except where separate color is indicated on Drawings. Use only one manufacturer for each sealant application. Select sealant which is compatible with adjacent materials, weather exposure, joint size, shape and finish (paintable, non-paintable).
- B. Install sealant in the following locations and as indicated in the Drawings and Specifications.
1. Around all penetrations of exterior walls as required to prevent air, moisture and water from penetrating the building systems and interior.
 2. Butt joints in exterior trim.
 3. Around exterior door frames.
 4. Under door thresholds.
 5. Around vents, louvers and vent wall caps.
 6. Around exterior window frames.
 7. Around wood trim at interior attic access doors.

JOINT SEALANTS

8. At joint between vinyl flooring and bathtub.
 9. At intersection between exterior door threshold and vinyl flooring.
 10. At intersection of metal or wood door frame and wood brick molding.
- C. Skilled workmen shall install each type of material in locations as called for. All material struck neat to line and cleaned from adjacent surfaces.
 - D. Apply sealants only to clean and dry surfaces at correct temperatures, and with approved protection from adverse weather conditions and dust.
 - E. Thoroughly clean and remove any non-compatible substances remaining on surfaces such as lacquers, curing compounds, form coatings, bond breakers and silicone water repellents. Clean out any dust and loose material by brushing, scraping and blowing with air jet as necessary. Clean metal and glass with solvents.
 - F. Run full, continuous and uniform beads of sealant in joints to be sealed keeping faces of work clean. Dry tool joint to concave profile.
 - G. 1/2" maximum joint depth and 3/4" maximum width. Use backing rod to make approximately 1:2 joint section depth to width ratio. Use polyethylene bond breaker tape as required to prevent adhesion to back of joints where backer rod cannot be used or would not allow for proper depth to width ratio.
 - H. Install elastomeric sealants in non-traffic joints to size and shape indicated or with slightly concave surface and depth equal to 50% of normal joint width, but not more than 1/2" and not less than 1/4".
 - I. Install elastomeric sealants in concrete traffic joints to size and shape indicated or with slightly concave surface and depth equal to 75% of normal joint width, but not more than 5/8" and not less than 3/8" deep.
 - J. Install non-elastomeric sealants to size and shape indicated or with slightly concave surface and depth from 75% to 125% of normal joint width.

3.3 ADJUSTING AND CLEANING

- A. Remove excess and spillage promptly. Replace materials improperly installed as directed by the Architect.

3.4 SEALANT SCHEDULE

	<u>SUBSTRATE NO. 1</u>	<u>SUBSTRATE NO. 2</u>	<u>EXPOSED EXTERIOR</u>	<u>EXPOSED INTERIOR</u>
A.	Concrete	Concrete	S-2, S-3	S-2
B.	Concrete	Masonry	S-2, S-3	S-2
C.	Concrete	Metal	S-2	S-1
D.	Masonry	Masonry	S-3	S-3
E.	Masonry	Metal	S-3	S-1
F.	Metal	Metal	S-2	S-2

END OF SECTION

METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide hollow metal doors and hollow metal door frames at locations indicated on the Drawings and as specified herein.

1.2 REFERENCES

- A. American National Standards Institute, Inc.: ANSI A115, Frames.
- B. ASTM International (ASTM):
 - 1. ASTM A653: Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 2. ASTM A1008: 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.
 - 3. ASTM A1011: Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
- C. Hollow Metal Manufacturers Association (HMMA), a Division of the National Association of Architectural Metal Manufacturers (NAAMM): HMMA 861, Guide Specifications for Commercial Hollow Metal Doors and Frames.
- D. Steel Door Institute (SDI): SDI 100, Recommended Specifications for Standard Steel Doors and Frames.

1.3 SUBMITTALS

- A. Shop Drawings: Submit shop drawings of all hollow metal louvers, frames and doors. Include details showing the construction of the door vision frames.
- B. Product Data:
 - 1. Submit product information on door, relites, and frames. Show door frame fabrication and details of glazing of relite frames. Provide product information on factory finish and hardware preparation.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver to job in time for building into walls and partitions and protect from weather and construction damage. Replace dented and bent hollow metal work with new undamaged work as directed. Filled dents and straightened work are not acceptable.

METAL DOORS AND FRAMES

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. The American Welding and Manufacturing Co. (Amweld).
- B. The Ceco Corporation.
- C. Curries.
- D. Mesker Door, Inc.
- E. NCS Manufacturing.
- F. Republic Builders Products Corporation.
- G. Stiles Custom Metal, Inc.
- H. Steelcraft, American-Standard.
- I. Or accepted substitute.

2.2 MATERIALS

- A. Door Face Sheets: Commercial quality, level, cold- rolled steel conforming to ASTM A1008 or hot-rolled, pickled and oiled steel conforming to ASTM A1011. Provide steel free of scale, pitting, coil breaks, buckles, waves, or other surface blemishes. Provide steel free of defects caused by the use of improperly leveled sheets.
 - 1. Exterior Door Face Sheets: 14-gage minimum thickness, having a zinc coating applied by the hot-dip process conforming to ASTM A653 with a coating weight of not less than 0.60 ounces per square foot (0.30 ounces per square foot per side).
- B. Frame Steel: Commercial quality, cold-rolled steel conforming to ASTM A1008 or hot rolled, pickled, and oiled steel conforming to ASTM A1011. Provide steel free of scale, pitting, coil breaks, or other surface defects.
 - 1. Exterior Frames: 14-gage minimum thickness. Provide zinc coating applied by the hot-dip process conforming to ASTM A653 (A60 or G60) with a coating weight of not less than 0.60 ounces per square foot (0.30 ounces per square foot per side).

2.3 EXTERIOR DOOR FABRICATION DATA

- A. Fabrication Data: Standard: HMMA 861.
- B. Thickness: 1-3/4".

METAL DOORS AND FRAMES

- C. Stiffen doors with continuous vertically formed steel sections spanning the full thickness of the interior space between the door faces.
 - 1. Exterior Doors: A rigid core of polyurethane foam slab bonded to face sheets by a thermosetting adhesive. Compressive strength of core shall not be less than 1500-psf and a shear strength of not less than 18-psi. The strength of the bond between the polyurethane and the steel face panels shall exceed the strength of the polyurethane, so that delamination does not occur under any operating conditions.
 - a. Exterior doors to be filled with a core material to produce a minimum thermal “U” factor of 0.20 tested per SDI 116. Doors might require ANSI cutout for concealed alarm switch.
- D. Edge Treatment: Join door face sheets at their vertical edges by a continuous weld extending the full height of the door, with no visible seams on their faces or vertical edges.
- E. Close top and bottom edges with a continuous channel not less than 16-gage thickness, spot welded to both face sheets. Treatment can be either flush or inverted.
- F. Exterior Doors: Fit with an additional flush closing channel at the top edges. Where required for attachment of weatherstripping, provide a flush closure channel at the bottom edge. Provide openings in bottom closure channel to permit escape of entrapped moisture.
- G. Edge Profiles on Both Vertical Edges of Doors: Beveled 1/8" in 2" profile.
- H. Finish: Manufacturer's standard prime finish.

2.4 **FRAME FABRICATION**

- A. Standard Exterior Door Frames: 2" face, height and width as indicated on the Drawings with 5/8" high integral stop. (Provide 4" face where indicated on the Drawings.) Corner joints shall have all contact edges closed tight with faces mitered and stops either butted or mitered. Faces and soffits shall be continuously welded and the faces finished smooth and free of any visible seam. Continuously weld and finish smooth all other face joints.
- B. Anchors: Provide frames with minimum 18 gage anchor for attachment to floor. For wall conditions that do not allow the use of a floor anchor, an additional jamb anchor shall be provided. Provide frames with a minimum of three anchors per jamb as required for the adjoining wall construction. Provide anchors of not less than 18 gage steel or 7 gage diameter wire.
- C. At frames in masonry wall openings wider than 4 feet, provide an angle or channel stiffener factory welded into the head when the head is grouted. Provide 12-gage minimum thick stiffener and not longer than opening width.
- E. Grouting Dams: 26-gage minimum thick steel, welded in place at all hardware mortises on frames set in masonry openings.

2.5 **HARDWARE PREPARATION**

- A. General:
 - 1. Prepare doors and frames to receive finish hardware, including cutouts, reinforcing, drilling, and tapping for mortised hardware, complying with ANSI A115.
 - 2. Provide manufacturer's standard reinforcing complying with these Specifications at hinge pockets, lockset, latchset openings, and closers.

METAL DOORS AND FRAMES

3. Prepare single door frames to receive 3 silencers on strike jambs and double door frames to receive 2 or 4 silencers on head.
- B. Doors and Frames:
 1. Mortise, reinforce, drill, and tap doors and frames at the factory for completely templated mortised hardware in accordance with final accepted hardware schedule and templates provided by the hardware supplier.
 2. Reinforce doors and frames where surface mounted, anchor hinges, or non-templated mortise hardware are to be applied.
 3. Minimum Gages for Door Hardware Reinforcement:
 - a. Full Mortise Hinges and Pivots: 7-gage.
 - b. Reinforcement for Lock Fronts, Concealed Holders, Surface Mounted Closers: 12-gage.
 - c. Internal Reinforcements for All Other Surface Applied Hardware: 14-gage.
 4. Minimum Gages for Frame Hardware Reinforcing Plates:
 - a. Hinge and Pivot Reinforcements: 7-gage x 1-1/4" x 10" in length.
 - b. Strike Reinforcements: 12-gage.
 - c. Closer Reinforcements: 12-gage.
 - d. Flush Bolt Reinforcements: 12-gage.
 - e. Reinforcements for Surface Applied Hardware: 12-gage.
 - f. Reinforcements for Hold Open Arms: 12-gage.
 - g. Reinforcements for Surface Panic Devices: 12-gage.

2.6 FINISHING

- A. Shop prime door and frame surfaces, using manufacturer's standard rust-inhibitive primer. Doors and frames are to be thoroughly cleaned and chemically treated to insure maximum paint adhesion. All surfaces of the door and frame exposed to view shall receive a factory applied coat of rust inhibiting primer, either air dried or baked on. The finish shall meet the requirements for acceptance stated in ANSI A224.1. "Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces." The prime finish is not intended to be the final layer of protection from the outside elements. Field painting shall be performed in accordance with the recommendations of the door and frame manufacturer.
- B. Coat inside faces of door frames with approved sound deadening material.
- C. Coat welds in galvanized doors and frames with zinc-rich coating.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install steel door frames in accordance with the manufacturer's instructions and HMMA 861. Anchor frames to wall as recommended by the manufacturer. Secure door frames to floor with 2 fasteners at each jamb.
- B. Seal opening between door frames and exterior walls with sealants as indicated on the Drawings and as specified in Section 07 92 00, Joint Sealants.
- C. Doors must be installed plumb, level and square. Assist as necessary to insure that the door operates without binding, tightness, or stickiness from finish hardware installation.
- D. Fit doors to frame providing clearances as specified in HMMA 861. The nominal clearance between the

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door and frame head and jambs shall be 1/8" in the case of both single swing and pairs of doors. The nominal clearance at the bottom shall be 1/4". The nominal clearance between the face of the door and door stop shall be 1/16".

- E. Grout interior and exterior door frames solid where indicated on the Drawings.
- F. Fill all drilled and dimpled frames after installation and sand smooth.

3.2 ADJUSTING AND CLEANING

- A. Adjust door clearances and hardware placement to allow for smooth operation.
- B. Clean frame surfaces and touch up scratched prime and factory finished paint.
- C. Seal openings between frame and wall as directed.

END OF SECTION

ACCESS DOORS AND PANELS

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide access door panels where indicated on the Drawings and as herein specified.
- B. Refer to Division 26, Electrical for additional electrical equipment access requirements.

1.2 SUBMITTALS

- A. Submit shop drawings and manufacturer's detail sheets for review before ordering. Show installation details, list all required parts and accessories. Indicate required modifications to standard products required for this installation.

1.3 QUALITY ASSURANCE

- A. Door panels shall be tested and listed by Warnock Hersey to standards: NFPA 288, ASTM E119, CAN/ULC S101 and NFPA 251.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Floor Doors: Activar, Inc. (Construction Products Group), or accepted substitute.
- B. Access Door to Access the Interstitial Space between Old Gym and New Gym: The Williams Bros. Corporation of America, or accepted substitute.

2.2 MATERIALS

- A. Floor Doors: 1 hour rated floor doors.
 - 1. Manufacturer/Model: FFD1 Series by Activar, Inc., or accepted substitute.
 - 2. Frame: 12 ga (2.75 mm) and 14 ga (1.99 mm) primed, bonderized steel. Depth is 4-3/8" (11 mm).
 - 3. Door: 3/16" (4.78 mm) steel diamond plate. Gasketed on all 4 sides on the upper section of the frame only. Door panel is filled with a high temperature insulation material.
 - 4. Finish: Electrostatically applied grey primer or mill finish aluminum.
 - 5. Hardware: Continuous stainless steel hinges, 316 stainless steel slam latch with a removable cover plug, operable from the top side by a removable tool and the underside by a spoon handle. Opening of door by (2) stainless steel nitrogen cylinders.
 - 6. Design Live Load: 150 lbs./ft.2 (700kg/sq meter)
 - 7. Sizes: 24" x 36" (Model FFD1-2436).
- B. Access Door to Access the Interstitial Space between Old Gym and New Gym: WB MD SEC 1000 Series Medium Security Access Door by The Williams Bros. Corporation of America, or accepted substitute.
 - 1. Door: 12 ga. steel.
 - a. Provide custom louvered door.
 - 2. Frame: 16 ga. steel.
 - 3. Hinge: Semi-concealed piano hinge. Allows opening to 180°.
 - 4. Anchors: Heavy steel, welded to frame.
 - 5. Lock: Counter sunk tamperproof screws.

ACCESS DOORS AND PANELS

- 6. Finish: Gray baked enamel.
- 7. Size: 24" x 24".

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install all panels in accordance with the manufacturer's standard specifications and recommendations.
- B. Furnish and install all units free from damage and to be in perfect operating condition.

END OF SECTION

COILING DOORS AND GRILLES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: electric operated overhead rolling doors.
- B. Related Sections:
 - 1. 05 50 00 Metal Fabrications. Door opening jamb and head members.
 - 2. 08 31 00 Access Doors and Panels. Access doors.
 - 3. Division 26. Electrical wiring and conduit, fuses, disconnect switches, connection of operator to power supply, and installation of control station and wiring.
- C. Products That May Be Supplied, But Are Not Installed Under This Section:
 - 1. Control Station

1.2 SYSTEM DESCRIPTION

- A. Design Requirements:
 - 1. Wind Loading:
 - a. Doors to withstand up to 24 psf (1.15 Pa) design wind load
 - 2. Cycle Life:
 - a. Standard construction for normal use of up to 20 cycles per day maximum, and an overall maximum of 50,000 operating cycles for the life of the door

1.3 SUBMITTALS

- A. Reference Section 01 33 00 Submittal Procedures; submit the following items:
 - 1. Product Data.
 - 2. Shop Drawings.
 - 3. Quality Assurance/Control Submittals:
 - a. Provide proof of manufacturer ISO 9001:2015 registration.
 - b. Provide proof of manufacturer and installer qualifications - see 1.4 below.
 - c. Provide manufacturer's installation instructions.
 - 4. Closeout Submittals:
 - a. Operation and Maintenance Manual.
 - b. Certificate stating that installed materials comply with this specification.

1.4 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Manufacturer Qualifications: ISO 9001:2015 registered and a minimum of five years' experience in producing doors of the type specified.
 - 2. Installer Qualifications: Manufacturer's approval.

1.5 DELIVERY STORAGE AND HANDLING

- A. Reference Section 01 66 00 Product Storage and Handling Requirements.
- B. Follow manufacturer's instructions.

COILING DOORS AND GRILLES

1.6 WARRANTY

- A. Standard Warranty: Two years from date of shipment against defects in material and workmanship.
- B. Maintenance: Submit for owner's consideration and acceptance of a maintenance service agreement for installed products.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Manufacturer:
 - 1. Cornell: 24 Elmwood Avenue, Mountain Top, PA 18707.
Telephone: (800) 233-8366.
 - a. Model: Cornell ESD10
 - 2. Cookson.
 - 3. Clopay Building Products.
 - 4. Amarr.
 - 5. R & S Manufacturing.
 - 6. Overhead Door.
 - 7. Or accepted substitute.

2.2 MATERIALS

- A. Curtain:
 - 1. Configuration:
 - a. Standard curtain configuration
 - 2. Slats:
 - a. Galvanized Steel: No. 5F, minimum 24 gauge (prefinished with GalvaNex™ Coating System), Grade 40 steel, ASTM A 653 galvanized steel zinc coating.
 - 3. Finish:
 - a. SpectraShield® Coating System:
 - 1) Zirconium pre-treatment followed by baked-on polyester powder coat, with color as selected by Architect from manufacturer's standard color range, over 180 colors; minimum 2.5 mils (0.065 mm) cured film thickness; ASTM D-3363 pencil hardness: H or better.
 - a) Color: Match Cookson color RAL 5024.
- B. Endlocks:

Alternate slats each secured with two ¼" (6.35 mm) rivets. Fabricate interlocking sections with high strength nylon. Provide windlocks as required to meet specified wind load.
- C. Bottom Bar:
 - 1. Configuration:
 - a. Extruded Aluminum (Standard on doors 21.5' DBG and smaller): Extruded aluminum alloy 6063-T5, min height 3 3/8" min base thickness 3/16", min width 4".
 - a. Structural Steel Angles (Standard on doors larger than 21.5' DBG): 2 structural steel angles minimum 2"x2"x1/8".

COILING DOORS AND GRILLES

2. Finish:
 - a. SpectraShield® Coat System (Color Selected by Architect):
 - 1) Zirconium pre-treatment followed by baked-on polyester powder coat, with color as selected by Architect from manufacturer's standard color range, over 180 colors; minimum 2.5 mils (0.065 mm) cured film thickness; ASTM D-3363 pencil hardness: H or better.
 - a) Color: Match Cookson color RAL 5024.
- D. Guides:
 1. Fabrication:
 - a. Minimum 3/16 inch (4.76 mm) structural steel angles. Provide windlock bars of same material when windlocks are required to meet specified wind load. Top of inner and outer guide angles to be flared outwards to form bellmouth for smooth entry of curtain into guides. Provide removable guide stoppers to prevent over travel of curtain and bottom bar. Top 16 ½" (419.10 mm) of coil side guide angles to be removable for ease of curtain installation and as needed for future curtain service.
 2. Configuration:
 - a. Standard guide configuration.
 3. Finish:
 - a. SpectraShield® Coating System (Color Selected by Architect):
 - 1) Zirconium pre-treatment followed by baked-on polyester powder coat, with color as selected by Architect from manufacturer's standard color range, over 180 colors; minimum 2.5 mils (0.065 mm) cured film thickness; ASTM D-3363 pencil hardness: H or better.
 - a) Color: Match Cookson color RAL 5024.
- E. Counterbalance Shaft Assembly:
 1. Barrel: Steel pipe capable of supporting curtain load with maximum deflection of 0.03 inches per foot (2.5 mm per meter) of width.
 2. Spring Balance: Oil-tempered, heat-treated steel helical torsion spring assembly designed for proper balance of door to ensure that maximum effort to operate will not exceed 25 lbs (110 N). Provide wheel for applying and adjusting spring torque.
- F. Brackets: Fabricate from minimum 3/16 inch (5 mm) steel plate with permanently lubricated ball or roller bearings at rotating support points to support counterbalance shaft assembly and form end closures.
 1. Finish:
 - a. SpectraShield® Coating System (Color Selected by Architect):
 - 1) Zirconium pre-treatment followed by baked-on polyester powder coat, with color as selected by Architect from manufacturer's standard color range, over 180 colors; minimum 2.5 mils (0.065 mm) cured film thickness; ASTM D-3363 pencil hardness: H or better.
 - a) Color: Match Cookson color RAL 5024.

COILING DOORS AND GRILLES

- G. Hood: Minimum 24-gauge galvanized steel with reinforced top and bottom edges. Provide minimum 1/4 inch (6.35 mm) steel intermediate support brackets.
 - 1. Finish:
 - a. SpectraShield® Coating System (Color Selected by Architect):
 - 1) Zirconium pre-treatment followed by baked-on polyester powder coat, with color as selected by Architect from manufacturer's standard color range, over 180 colors; minimum 2.5 mils (0.065 mm) cured film thickness; ASTM D-3363 pencil hardness: H or better/
 - a) Color: Match Cookson color RAL 5024.

2.3 OPERATION

- A. Motor – Standard Use – Model MG (Industrial Duty Gear Head) Operator: The operator must not extend above or below the door coil when mounted front-of-coil. Rated for a maximum of 20 cycles per hour (not to be used for consecutive hours) cULus listed (to comply with UL requirements in The United States and Canada), Totally Enclosed Non Ventilated gear head operator(s) rated 1/3 hp as recommended by door manufacture for size and type of door, 120 Volts, 1 Phase.
- B. Provide complete with electric motor and factory pre-wired motor control terminals, maintenance free solenoid actuated brake and control station(s).
- C. Motor shall be high starting torque, industrial type, protected against overload with an auto-reset thermal sensing device. Primary speed reduction shall be heavy-duty, lubricated gears with mechanical braking to hold the door in any position.
- D. Operator shall be equipped with an emergency push button at interior side of door which will activate opening the door. Operator drive and door driven sprockets shall be provided with #50 roller chain. Operator shall be capable of driving the door at a speed of 8 to 9 inches per second (20 to 23 cm/sec). Fully adjustable, driven linear screw type cam limit switch mechanism shall synchronize the operator with the door. The electrical contractor shall mount the control station(s) and supply the appropriate disconnect switch, all conduit and wiring per the overhead door wiring instructions.
- B. Control Stations:
 - 1. Surface Mounted (at Exterior Side of Door): "Open/Close" key switch with "Stop" push button; NEMA 3R.
 - a. Key to Building masterkey system.
 - b. Provide "Open" button at interior side of doors.
- C. Control Operation:
 - 1. Constant Pressure to Close:
 - a. 2-wire, electric sensing edge seal extending full width of door bottom bar. Contact before door fully closes shall cause door to immediately stop downward travel and reverse direction to the fully opened position. Provide with wireless sensing edge.
- D. Sensing/Weather Edge:
 - 1. Electric Sensing Edge Device: Automatic sensing switch within neoprene or rubber astragal extending full width of door bottom bar. Contact before door fully closes shall cause door to immediately stop downward travel and automatically reverse direction to the fully opened position. Provide a wireless sensing edge connection to motor operator eliminating the need for a physical traveling electric cord connection between bottom bar sensing edge device and motor operator.

COILING DOORS AND GRILLES

2.4 ACCESSORIES

- A. Locking: None.
- B. Interior Aesthetic Covers:
 - 1. Operator and Bracket Mechanism Cover: Minimum 24 gauge galvanized steel to enclose exposed moving operating components at coil area of unit. Finish matching hood.
 - 2. Trim Package: Minimum 16 gauge powder coated steel to match guides. PART 3 - EXECUTION

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates upon which work will be installed and verify conditions are in accordance with approved shop drawings.
- B. Coordinate with responsible entity to perform corrective work on unsatisfactory substrates.
- C. Commencement of work by installer is acceptance of substrate.

3.2 INSTALLATION

- A. Install door and operating equipment with necessary hardware, anchors, inserts, hangers and supports.
- B. Follow manufacturer's installation instructions.

3.3 ADJUSTING

- A. Following completion of installation, including related work by others, lubricate, test, and adjust doors for ease of operation, free from warp, twist, or distortion.

3.4 CLEANING

- A. Clean surfaces soiled by work as recommended by manufacturer.
- B. Remove surplus materials and debris from the site.

3.5 DEMONSTRATION

- A. Demonstrate proper operation to Owner's Representative.
- B. Instruct Owner's Representative in maintenance procedures.

END OF SECTION

COILING COUNTER DOORS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Manual rolling counter doors with integral frame and countertop, built-in type.
- B. Related Sections:
 - 1. 05 50 00 Metal Fabrications. Door opening jamb and head members.
 - 2. 08 31 00 Access Doors and Panels. Access doors.

1.2 SUBMITTALS

- A. Reference Section 01 33 00 Submittal Procedures; submit the following items:
 - 1. Product Data.
 - 2. Shop Drawings: Include special conditions not detailed in Product Data. Show interface with adjacent work.
 - 3. Quality Assurance/Control Submittals:
 - a. Provide proof of manufacturer ISO 9001:2015 registration.
 - b. Provide proof of manufacturer and installer qualifications - see 1.3 below.
 - c. Provide manufacturer's installation instructions.
 - 4. Closeout Submittals:
 - a. Operation and Maintenance Manual.
 - b. Certificate stating that installed materials comply with this specification.

1.3 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Manufacturer Qualifications: ISO 9001:2015 registered and a minimum of five years experience in producing counter doors with integral frame assembly of the type specified.
 - 2. Installer Qualifications: Manufacturer's approval.

1.4 DELIVERY STORAGE AND HANDLING

- A. Reference Section 01 66 00 Product Storage and Handling Requirements.
- B. Follow manufacturer's instructions

1.5 WARRANTY

- A. Standard Warranty: Two years from date of shipment against defects in material and workmanship.
- B. Maintenance: Submit for owner's consideration and acceptance of a maintenance service agreement for installed products.

COILING COUNTER DOORS

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Manufacturer:
 - 1. Cornell: 24 Elmwood Avenue, Mountain Top, PA 18707.
Telephone: (800) 233-8366.
 - a. Model: ESC20.
 - 2. Cookson.
 - 3. Clopay Building Products.
 - 4. Amarr.
 - 5. Overhead Door.
 - 6. R & S Manufacturing.
 - 5. Or accepted substitute.

2.2 FABRICATION

- A. Factory weld head, and jambs and countertop into single unit, fully assembled, ready for installation

2.3 MATERIALS

- A. Curtain:
 - 1. Slat Configuration:
 - a. Galvanized Steel with Finish as Described Below: No. 1F, interlocked flat-faced slats, 1-1/2 inches (38 mm) high by 1/2 inch (13 mm) deep, 22 gauge ASTM A 653, Commercial Quality, galvanized steel with powder coated steel angle bottom bar with continuous lift handle and vinyl astragal.
 - 2. Finish:
 - a. SpectraShield® Coating System:
 - 1) ASTM A 653 galvanized base coating treated with dual process rinsing agents in preparation for chemical bonding, gray baked-on base coat and gray baked-on polyester finish coat.
 - 2) Zirconium treatment followed by baked-on polyester powder coat, with color as selected by Architect from manufacturer's standard color range, over 180 colors; minimum 2.5 mils (0.065 mm) cured film thickness; ASTM D-3363 pencil hardness: H or better.
 - a) Color: Match Cookson color RAL 5024.
- B. Endlocks: Fabricate interlocking slat sections with high strength molded nylon endlocks riveted to ends of alternate slats.
- C. Head and Jamb Frame:
Integral welded with guide groove incorporated into jamb design. Build to fit wall thickness.
 - 1. Fabrication:
 - a. Stainless Steel: 16 gauge AISI 300 series formed shapes
 - 2. Finish:
 - a. Stainless steel: type 304 #4 finish

COILING COUNTER DOORS

- E. Counterbalance Shaft Assembly:
 - 1. Barrel: Steel pipe capable of supporting curtain load with maximum deflection of 0.03 inches per foot (2.5 mm per meter) of width
 - 2. Spring Balance: Oil-tempered, heat-treated steel helical torsion spring assembly designed for proper balance of door to ensure that maximum effort to operate will not exceed 25 lbs (110 N). Provide wheel for applying and adjusting spring torque.
- F. Brackets: Fabricate from reinforced steel plate with bearings at rotating support points to support counterbalance shaft assembly and form end closures for hood
- G. Hood and Fascia: 16 gauge steel with reinforced top and bottom edges.

2.4 OPERATION

- A. Manual Crank Hoist: Provide crank hoist operator including crank gear box, steel crank drive shaft and geared reduction unit. Fabricate gear box to completely enclose operating mechanism and be oil-tight.

2.5 ACCESSORIES

- A. Locking:
 - 1. Padlockable Slide Bolt: Padlockable slide bolt on coil side of bottom bar at each jamb extending into slots in guides.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates upon which work will be installed and verify conditions are in accordance with approved shop drawings
- B. Coordinate with responsible entity to perform corrective work on unsatisfactory substrates
- C. Commencement of work by installer is acceptance of substrate

3.2 INSTALLATION

- A. General: Install door unit and operating equipment with necessary hardware, anchors, inserts, hangers and supports
- B. Follow manufacturer's installation instructions

3.3 ADJUSTING

- A. Following completion of installation, including related work by others, lubricate, test, and adjust doors for ease of operation, free from warp, twist, or distortion

COILING COUNTER DOORS

3.4 CLEANING

- A. Clean surfaces soiled by work as recommended by manufacturer
- B. Remove surplus materials and debris from the site

3.5 DEMONSTRATION

- A. Demonstrate proper operation to Owner's Representative
- B. Instruct Owner's Representative in maintenance procedures

END OF SECTION

ALUMINUM WINDOWS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes Kawneer Architectural Aluminum Windows including perimeter trims, stools, accessories, shims and anchors, and perimeter sealing of window units.
 - 1. Types of aluminum windows include:
 - a. Kawneer Series 8225TL Thermal Windows.
 - b. Inswing Casement Windows.
 - c. 2-1/4" (57.2 mm) frame depth, with 0.090" (2.3 mm) wall thickness.
 - d. AW-PG90-C.
- B. Related Sections:
 - 1. 072700 "Air Barriers"
 - 2. 079200 "Joint Sealants"

1.3 DEFINITIONS

- A. Definitions: For fenestration industry standard terminology and definitions refer to American Architectural Manufacturers Association (AAMA) – AAMA Glossary (AAMA AG).

1.4 PERFORMANCE REQUIREMENTS

- A. General Performance: Aluminum-framed window system shall withstand the effects of the following performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction.
- B. Window Performance Requirements:
- C. Performance Requirements:
 - 1. Provide aluminum windows of performance indicated that comply with AAMA/WDMA/CSA 101/I.S.2/A440 (NAFS).
 - a. Performance Class and Grade: AW-PG90-C.
 - 2. Air Infiltration: The test specimen shall be tested in accordance with ASTM E 283 at a minimum window size of 36" x 60" (914 x 1524 mm). The air infiltration rate shall not exceed 0.10 cfm/ft² at a static air pressure differential of 6.24 psf (300 Pa).
 - 3. Water Resistance: The test specimen shall be tested in accordance with ASTM E 547 and ASTM E 331 at a minimum window size of 36" x 60" (914 x 1524 mm). There shall be no leakage as defined in the test method at a static air pressure differential of 12 psf (574 Pa).
 - 4. Uniform Load Deflection: A minimum static air pressure difference of 90 psf (4310 Pa) shall be applied in the positive and negative direction in accordance with ASTM E 330. There shall be no deflection in excess of L/175 of the span of any framing member.
 - 5. Uniform Load Structural Test: A minimum static air pressure difference of 135 psf (6465 Pa) shall be applied in the positive and negative direction in accordance with ASTM E 330. The unit shall be evaluated after each load.
 - 6. Component Testing: Window components shall be tested in accordance with procedures described in AAMA/WDMA/CSA 101/I.S.2/A440 (NAFS).
 - 7. Energy Efficiency:

ALUMINUM WINDOWS

- a. Thermal Transmittance Test (U-Factor): When tested in accordance with AAMA 1503, the conductive thermal transmittance (U-Factor) shall not be more than:
 - 1) Outswing Casement: U-Factor not more than .60 BTU/hr/sf/°F per AAMA 507 or NFRC100 when using project specified glass.
 - 2) Inswing Casement: U-Factor not more than .62 BTU/hr/sf/°F per AAMA 507 or NFRC100 when using project specified glass.
 - 8. Condensation Resistance Test (CRF): When tested in accordance with AAMA 1503, the condensation resistance factor (CRF) shall not be less than:
 - a. Outswing Casement: (CRF_f) frame not less than 56 with clear glass.
 - b. Outswing Casement: (CRF_g) glass not less than 55 with clear glass.
 - c. Inswing Casement: (CRF_f) not less than 56 with clear glass.
 - d. Inswing Casement: (CRF_g) not less than 55 with clear glass.
 - 9. Forced Entry Resistance: All windows shall conform to ASTM F588, Grade 10.
 - 10. Thermal Barrier Tests: Testing shall be in general accordance with AAMA 505 Dry Shrinkage and Composite Thermal Cycling test procedure, AAMA TIR-A8, Structural Performance of Composite Thermal Barrier systems.
- D. Environmental Product Declarations (EPD): Shall have a Type III product specific EPD created from a Product Category Rule specific to North America.

1.5 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, fabrication methods, dimensions of individual components and profiles, hardware, finishes, and operating instructions for each type of aluminum window indicated.
- B. Shop Drawings: Include plans, elevations, sections, details, hardware, attachments to other work, operational clearances and installation details.
- C. Samples for Initial Selection: For units with factory-applied color finishes including samples of hardware and accessories involving color selection.
- D. Samples for Verification: For aluminum windows and components required.
- E. Product Schedule: For aluminum windows. Use same designations indicated on Drawings.
- F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency for each type, class, grade, and size of aluminum window. Test results based on use of downsized test units will not be accepted.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An installer which has had successful experiences with installation of the same or similar units required for this project and other projects of similar size and scope.
- B. Manufacturer Qualifications: A manufacturer capable of fabricating aluminum windows that meet or exceed performance requirements indicated and of documenting this performance by inclusion of test reports, and calculations.
- C. Source Limitations: Obtain aluminum windows through one source from a single manufacturer.
- D. Product Options: Drawings indicate size, profiles, and dimensional requirements of aluminum windows and are based on the specific system indicated. Refer to Division 01 Section "Product Requirements." Do not modify size and dimensional requirements.
 - 1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

ALUMINUM WINDOWS

- E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mockup for type(s) of window(s) indicated, in location(s) shown on Drawings.
- F. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify aluminum window openings by field measurements before fabrication and indicate measurements on Shop Drawings.

1.8 WARRANTY

- A. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty.
 - 1. Warranty Period: Two (2) years from Date of Substantial Completion of the project provided however that the Limited Warranty shall begin in no event later than six months from date of shipment by manufacturer.
- B. Insulating Glass: Warranted to be free from defects (excluding breakage) for a period of five (5) years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product:
 - 1. Kawneer Company Inc.
 - 2. Series 8225TL Thermal Windows - Inswing Casement.
 - 3. 2-1/4" (57.2 mm) frame depth, with 0.090" (2.3 mm) wall thickness.
 - 4. AW-PG90-C.
- B. Or accepted substitute.

2.2 MATERIALS

- A. Aluminum Extrusions: Alloy and temper recommended by aluminum window manufacturer for strength, corrosion resistance, and application of required finish and not less than 0.090" (2.3 mm) wall thickness at any location for the main frame and sash members.
- B. Thermal Barrier: The thermal barrier shall be a Kawneer IsoLock™ with a nominal 3/8" (9.5 mm) separation consisting of a two-part, chemically curing high density polyurethane which is mechanically and adhesively bonded to the aluminum.
- C. Fasteners: Aluminum, nonmagnetic stainless steel or other materials to be non-corrosive and compatible with aluminum window members, trim, hardware, anchors, and other components.
- D. Anchors, Clips, and Accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.
- E. Reinforcing Members: Aluminum, nonmagnetic stainless steel, or nickel/chrome-plated steel complying with ASTM B 456 for Type SC 3 severe service conditions, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.

ALUMINUM WINDOWS

- F. Sealant: For sealants required within fabricated windows, provide window manufacturer's standard, permanently elastic, non-shrinking, and non-migrating type recommended by sealant manufacturer for joint size and movement.

2.3 WINDOW SYSTEM

- A. Series 8225TL Thermal Windows - Inswing and Outswing Casement (Basis of Design).

2.4 GLAZING

- A. Glass and Glazing Materials: Refer to Division 08 Section "Glazing" for glass units and glazing requirements applicable to glazed aluminum window units.
- B. Glazing System: Glazing method shall be a wet/dry type in accordance with manufacturer's standards. Exterior glazing shall be silicone back bedding sealant. Interior glazing shall be snap-in type glazing beads with an interior gasket in accordance with AAMA 702 or ASTM C864.

2.5 HARDWARE

- A. General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, or other corrosion-resistant material compatible with aluminum; designed to smoothly operate, tightly close, and securely lock aluminum windows, and sized to accommodate sash weight and dimensions.
- B. Casement Window Typical Hardware:
 - 1. Locking:
 - a. Cast White Bronze Cam Locks (Standard).
 - b. Access Control Locks.
 - c. Hook Lock Handle.
 - d. Roto-Operator.
 - e. Multipoint Lock.
 - 2. Hinging:
 - a. Butt Hinges.
 - b. Friction Adjusters.
 - c. Limit Stop.
- C. Optional Dual glazing (Interior Access Panels): Extruded aluminum profiles, 6063-T6 alloy and temper, mitered and fastened joints. Optional Dual Glazing (Interior Access Panels) shall be lift-off or hinged type.

2.6 FABRICATION

- A. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:
 - 1. Profiles that are sharp, straight, and free of defects or deformations.
 - 2. Accurately fit joints; make joints flush, hairline and weatherproof.
 - 3. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
 - 4. Physical and thermal isolation of glazing from framing members.
 - 5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
 - 6. Provisions for field replacement of glazing.
 - 7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- B. Window Frame Joinery: Screw-Spline, Factory sealed frame and vent corner Joints

ALUMINUM WINDOWS

- C. Fabricate aluminum windows in sizes indicated. Include a complete system for assembling components and anchoring windows.
- D. Fabricate aluminum windows that are re-glazable without dismantling sash or framing.
- E. Mullions: Provide mullions and cover plates as shown, matching window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections, as indicated. Provide mullions and cover plates capable of withstanding design loads of window units.
- F. Sub frames: Provide sub frames with anchors for window units as shown, of profile and dimensions indicated but not less than 0.093" (2.4 mm) thick extruded aluminum. Miter or cope corners, and join with concealed mechanical joint fasteners. Finish to match window units. Provide sub frames capable of withstanding design loads of window units.
- G. Factory-Glazed Fabrication: Glaze aluminum windows in the factory where practical and possible for applications indicated. Comply with requirements in Division 08 Section "Glazing" and with AAMA/WDMA/CSA 101/1.S.2/A440 (NAFS).
- H. Glazing Stops: Provide snap-on glazing stops coordinated with Division 08 Section "Glazing" and glazing system indicated. Provide glazing stops to match frame.

2.7 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. Factory Finishing:
 - 1. Kawneer Permanodic™ AA-M10C21A31, AAMA 611, Architectural Class II Clear Anodic Coating (Color #17 Clear) (Standard).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work. Verify rough opening dimensions, levelness of sill plate and operational clearances. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure a coordinated, weather tight window installation.
 - 1. Metal Surfaces: Dry; clean; free of grease, oil, dirt, rust, corrosion, and welding slag; without sharp edges or offsets at joints.
 - 2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with Drawings, Shop Drawings, and manufacturer's written instructions for installing windows, hardware, accessories, and other components.
- B. Install aluminum framed window system level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction.
- C. Set sill members in bed of sealant or with gaskets, as indicated, for weather tight construction.
- D. Install aluminum framed window system and components to drain condensation, water penetrating joints, and moisture migrating within system to the exterior.

ALUMINUM WINDOWS

- E. Separate aluminum from dissimilar materials to prevent corrosion or electrolytic action at points of contact.

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections and prepare test reports.
 - 1. Testing and inspecting agency will interpret tests and state in each report whether tested work complies with or deviates from requirements.
- B. Testing Services: Testing and inspecting of installed windows shall take place as follows:
 - 1. Testing Methodology: Testing Standard shall be per AAMA 502 including reference to ASTM E 783 for Air Infiltration Test and ASTM E 1105 for Water Penetration Test.
 - a. Air Infiltration Test: Conduct test in accordance with ASTM E 783 at a minimum uniform static test pressure of 1.57 psf (75 Pa) for CW or 6.24 psf (300 Pa) for AW. The maximum allowable rates of air leakage for field testing shall not exceed 1.5 times the project specifications.
 - b. Water Infiltration Test: Water penetration resistance tests shall be conducted in accordance with ASTM E 1105 at a static test pressure equal to 2/3 the specified water test pressure.
 - 2. Testing Extent: Architect shall select window units to be tested as soon as a representative portion of the project has been installed, glazed, perimeter caulked and cured. Conduct tests for air infiltration and water penetration with manufacturer's representative present.
 - 3. Test Reports: Shall be prepared according to AAMA 502.

3.4 ADJUSTING, CLEANING, AND PROTECTION

- A. Adjust operating sashes, screens, hardware, and accessories for a tight fit at contact points and weather stripping for smooth operation and weather tight closure. Lubricate hardware and moving parts.
- B. Clean aluminum surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.
- C. Clean glass immediately after installing windows. Comply with manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels, and clean surfaces.
- D. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.
- E. Protect window surfaces from contact with contaminating substances resulting from construction operations. In addition, monitor window surfaces adjacent to and below exterior concrete and masonry surfaces during construction for presence of dirt, scum, alkaline deposits, stains, or other contaminants. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written recommendations.

END OF SECTION

DOOR HARDWARE

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide finish hardware for doors as scheduled on the Drawings and as specified herein.
 - 1. Base Bid: See Door Schedule on Drawings.
 - 2. Alternate No. 2: See Door Schedule on Drawings.

1.2 REFERENCES

- A. National Fire Protection Association: NFPA 80, Fire Doors and Fire Windows.
- B. Americans with Disabilities Act (ADA): ADA Accessibility Guidelines for Buildings and Facilities (ADAAG).
- C. The National Fire Protection Association: NFPA 101, Life Safety Code.

1.3 SUBMITTALS

- A. Hardware Schedule: Submit 5 copies of the final hardware schedule. Comply with construction progress schedule requirements.
- B. Samples:
 - 1. Furnish only upon request and prior to submittal of the last draft of the hardware schedule and prior to delivery of hardware.
 - 2. Submit 1 sample of each exposed hardware unit, finished as required, and tagged with full description for coordination with the schedule.
 - 3. Samples will be returned to the supplier. Units that are acceptable and remain undamaged through submittal, review and field comparison procedures may, after final check of operation, be used in the work.
- C. Templates: Furnish hardware templates and copy of approved hardware schedule to each fabricator of doors and frames within 2 weeks after approval of hardware schedule.
- D. Warranty: 10 year factory guarantee of satisfactory performance on all hydraulic closers. 2 year warranty on all electrified closers.

1.4 QUALITY ASSURANCE

- A. Manufacturer: To the greatest extent possible, obtain each type of hardware from only 1 manufacturer.
- B. Supplier: Provide hardware supplier who has furnished hardware in the same market area as the project for a period of not less than 2 years, and who has in his employment an experienced hardware consultant who is available for project hardware consultation to the Owner, Architect, and Contractor.
- C. Labels:
 - 1. Provide hardware for fire-rated openings in compliance with NFPA Standard No. 80.
 - 2. Provide hardware that has been tested and listed by UL for the types and sizes of doors required, and complies with the requirements for the door and door frame labels.

DOOR HARDWARE

- D. ADA Compliance:
1. Interior Doors: All interior doors are required to meet ADAAG requirement that the force for pushing or pulling open interior swinging egress doors, other than fire doors, shall not exceed 5-pounds. Any interior swinging egress door not meeting this requirement will not be allowed.
 2. Exterior Doors: The maximum opening force allowed is to not exceed 8-1/2-pounds.
 3. Interior Fire Doors: Conform to NFPA 101 for the opening forces for interior side-hinged or pivoted-swinging door leaves without closers. These forces shall not exceed 5-pounds while the forces required to fully open any door leaf manually in a means of egress shall not exceed 15-pounds to release the latch, 30-pounds to set the leaf in motion, and 15-pounds to open the leaf to the minimum required width.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Provide secure lock up for hardware delivered to the project, but not yet installed.
- B. Control the handling and installation of hardware items that are not immediately replaceable, so that the completion of the work will not be delayed by hardware losses, both before and after installation.
- C. Coordinate the delivery of hardware with the scheduled installation and fabrication of doors and frames.
- D. Tag each item or package separately, with identification related to the final hardware schedule. Include basic installation instructions in the package.
- E. Deliver individually packaged hardware items at the times and to the shop or field for installation, as directed by the Contractor.
- F. Key Delivery:
1. Place sets of change keys in suitable individual envelopes tagged and plainly marked with the change number or symbol, door designation and all other identifying information as required. Assemble change key envelopes into 1 package and deliver to the Owner.
 2. Forward masterkeys by registered mail. See Section 01 70 00, Execution and Closeout Requirements.
 3. Place construction masterkeys in 1 envelope, clearly identified and deliver with the hardware.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Finish Hardware Manufacturers:
1. Armor Plate: Ives, or accepted substitute.
 2. Astragals: National Guard Products, Inc., or accepted substitute.
 3. Cores: Everest Primus by Schlage Locks.
 4. Door Bottom Rain Drips: National Guard Products, Inc., or accepted substitute.
 5. Door Contact: SCE.
 6. Dust Proof Strikes: Ives, or accepted substitute.
 7. Door Sweep: National Guard Products, Inc., or accepted substitute.
 8. Drip Caps: National Guard Products, Inc., or accepted substitute.
 9. Electric Hinges: Ives, or accepted substitute.
 10. Hinges: Ives, or accepted substitute.
 11. Kickplates: Ives, or accepted substitute.
 12. Latchsets and Locksets: Schlage Locks.
 13. Manual Flush Bolts: Ives, or accepted substitute.

DOOR HARDWARE

14. Overhead Stop and Holder: LCN.
15. Seals: National Guard Products, Inc., or accepted substitute.
16. Security Astragal: National Guard Products, Inc., or accepted substitute.
17. Surface Door Closers: LCN.
18. Thresholds: National Guard Products, Inc., or accepted substitute.
19. Wall Stops: Ives, or accepted substitute.

2.2 MATERIALS

- A. Fasteners:
1. Furnish screws for installation, with each hardware item. Provide Phillips flat-head screws to match the hardware finish, or if exposed in surfaces of other work, to match the finish of such other work.
 2. Provide concealed fasteners for hardware units which are exposed when the door is closed whenever possible.
 3. Do not use through bolts where the bolt head or nut on the opposite face is exposed. Where it is not possible to adequately reinforce the work, use machine screws or concealed fasteners with flush heads.
 4. Provide fasteners that are compatible with both the unit fastened and the substrate.
- B. Hand of Door: The drawings show the swing or hand of each door leaf (left, right and reverse bevel). Furnish each item of hardware for proper installation and operation of the door swing as indicated.
- C. Hardware Finishes: Provide finish as scheduled at the end of this Section in the Hardware Schedule.
- D. Butts:
1. Provide full mortise butts in exact width required to clear projection of trim.
 2. Provide butts with flat tips and retainer device to prevent rising during use.
 3. Provide butts for exterior out-swinging doors and where noted with non-removable pins.
 4. 4 ½" X 4 ½" sized butts unless scheduled otherwise.
- E. Latch and Lock Sets:
1. Design: Schlage design as scheduled in 3.2 HARDWARE SCHEDULE. No substitutions.
 2. Strikes: Provide locks and latches with curved lip wrought box strikes in matching metal and finish.
 3. Furnish with anti-friction latchbolts.
 4. Interchangeable cores (where specified) will be furnished by Owner. (Contractor to provide temporary construction cores.)
 5. Keyways vary with each facility. Consult with Owner.
- F. Surface Door Closers:
1. Type: Liquid-controlled, all weather fluid.
 2. 10 year factory guarantee of satisfactory performance on all hydraulic closers. 2 year warranty on all electrified closers.
 3. Provide closers that permit the door to open as far as construction conditions permit and do not limit the door swing.
 4. Provide closers with key-type regulating screws.
 5. Closers to have independent closing, latch and backcheck valves and adjustable spring power.
- H. Kickplates: Provide 10" high (unless scheduled otherwise) kickplates at all designated doors. Finish as scheduled. Provide with all edges beveled.

DOOR HARDWARE

- I. Manual Flush Bolts: Provide flush bolts with matching dustproof strikes and suitable floor attachment screws or bolts.

2.3 KEYING AND KEY CONTROL SYSTEM

- A. Provide locks and cylinders with masterkeying, grand masterkeying, and construction masterkeying. Provide interchangeable core cylinders where specified. Provide temporary construction cores pre-installed where interchangeable core cylinders are specified. Install permanent cores as furnished by Owner. After installation of permanent cores return temporary cores to hardware supplier. Provide E keyway. Key to existing master key system.
- B. Upon receipt of approved hardware schedules, hardware supplier shall request Architect to arrange a keying meeting between hardware supplier and the Owner. Submit a detailed keying schedule in triplicate for final approval prior to ordering locks and cylinders.
- C. Keys: Provide nickel silver keys in the following quantities:
 - 1. Change Keys: 3 keys each lock or cylinder.
 - 2. Master Keys: 6 keys each set.
 - 3. Key Blanks: 20 for each different keyway.
 - 4. Construction Masterkeys: 10 keys.
- D. Stamp Keys: "Do Not Duplicate."

PART 3 - EXECUTION

3.1 HARDWARE MOUNTING HEIGHTS

- A. Where hardware mounting heights are not indicated in other Sections of this specification, use the following heights as a guide:
 - 1. Top Hinges: 5" header rabbet to top of hinge.
 - 2. Bottom Hinge: 10" finish floor to bottom of hinge.
 - 3. Center Hinge: Equal distance between top and bottom hinges.
 - 4. Locksets/Latchsets: 40" finish floor to center of knob.
 - 5. Push Plates: 45" finish floor to center of plate.
 - 6. Other Hardware: Install in heights recommended by the manufacturers.

3.2 INSTALLATION

- A. Installation on Field Finished Surfaces:
 - 1. Wherever cutting and fitting is required to install hardware on field finished surfaces, install hardware and then remove and store hardware in a secure place during application of field finish.
 - 2. After completion of the field finish, reinstall hardware.
 - 3. Do not install surface-mounted items until field finishes have been completed.
- B. Install kickplates with oval-head full-thread screws spaced uniformly at a maximum of 5" on center along kickplate perimeter.
- C. Install thresholds with a positive anchoring device or lead expansion shield and anchor bolts. Set in full bed of sealant.

DOOR HARDWARE

3.3 ADJUSTING AND CLEANING

- A. Check and adjust operating hardware and each door operation to ensure proper operation. Lubricate moving parts with type of lubrication recommended by the manufacturer. Use silicone type if no other recommended.
- B. Verify that the doors have been installed plumb, level, and square, without binding, tightness, or stickiness from gaskets. The door must have smoothly operating door bottom seals and hinges. Door latching including fire and security hardware must operate smoothly without sticking. Adjust, repair, or replace any hardware that does not meet all of these requirements.
- C. Replace hardware that cannot be adjusted and lubricated to operate freely and smoothly as intended.
- D. Adjust door control devices to compensate for final operation of heating and ventilating equipment.
- E. Where hardware installation is made more than one month prior to acceptance or occupancy of a space or area, return to the work during the week prior to acceptance or occupancy, and make a final check and adjustment of all hardware and doors.

3.4 HARDWARE SCHEDULE

- A. Furnish the following hardware groups for each door as indicated on the Door Schedule, and as required for a complete project:

DOOR HARDWARE

HW SET: 01

FOR USE ON DOOR(S):

101A

EACH OPENING TO HAVE:

<u>QTY</u>		<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	630	IVE
1	EA	POWER TRANSFER	EPT10 CON	✓ 689	VON
1	EA	VANDL EU STOREROOM	ND96TDEU RHO XQ07-351 RX	✓ 626	SCH
			CON12V/24V DC		
1	EA	FSIC CORE	20-740 OR 23-030 CONFIRM KEYWAY	626	SCH
			WITH DISTRICT		
1	EA	SURFACE CLOSER	4011 TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
1	EA	GASKETING	188SBK PSA	BK	ZER
1	EA	DOOR SWEEP	8193AA PULL SIDE	AA	ZER
1	EA	RAIN DRIP	142AA	AA	ZER
1	EA	DOOR BOTTOM RAIN	11A PUSH SIDE	A	ZER
		DRIP			
1	EA	THRESHOLD	568A-223	A	ZER
1	EA	WIRE HARNESS	CON-38P POWER TRANSFER TO		SCH
			ELECTRIFIED HARDWARE		
1	EA	WIRE HARNESS	CON-6W FROM INCOMING POWER		SCH
			SUPPLY		
			ACCESS CONTROL - WORK OF		
			DIVISION 28		
			POWER SUPPLY - WORK OF DIVISION		
			28		

COORDINATE DOOR UNDERCUT WITH THRESHOLD. DOOR MUST MAKE FULL CONTACT WITH THRESHOLD SEAL.

HW SET: 02

FOR USE ON DOOR(S):

101B	101C	104AA	104AB	105AA	105AB
110C	110D	110E	110F		

EACH OPENING TO HAVE:

<u>QTY</u>	<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
1		HARDWARE BY DOOR MANUFACTURER		

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SECTION 08 71 00

DOOR HARDWARE

HW SET: 03

FOR USE ON DOOR(S):

102A

EACH OPENING TO HAVE:

<u>QTY</u>		<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	630	IVE
1	EA	PANIC HARDWARE	LD-99-NL	626	VON
1	EA	FSIC CORE	20-740 OR 23-030 CONFIRM KEYWAY WITH DISTRICT	626	SCH
1	EA	RIM CYLINDER	20-057 ICX	626	SCH
1	EA	ELECTRIC STRIKE	6111 FSE CON	✎ 630	VON
1	EA	SURFACE CLOSER	4111 SCUSH TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	RAIN DRIP	142AA	AA	ZER
1	EA	GASKETING	188SBK PSA	BK	ZER
1	EA	DOOR SWEEP	8198AA	AA	ZER
1	EA	THRESHOLD	546A-223	A	ZER
1	EA	WIRE HARNESS	CON-6W FROM INCOMING POWER SUPPLY		SCH
1	EA	MOTION SENSOR	SCANII POWER SUPPLY - WORK OF DIVISION 28 ACCESS CONTROL - WORK OF DIVISION 28	✎ WHT	SCE

HW SET: 04

FOR USE ON DOOR(S):

103A 103B

EACH OPENING TO HAVE:

<u>QTY</u>		<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	STOREROOM LOCK	ND80TD RHO	626	SCH
1	EA	FSIC CORE	20-740 OR 23-030 CONFIRM KEYWAY WITH DISTRICT	626	SCH
1	EA	SURFACE CLOSER	4011 TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

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SECTION 08 71 00

DOOR HARDWARE

HW SET: 05

FOR USE ON DOOR(S):

104A	104B	104C	104D	104E	104F
104G	105A	105B	105C	105D	105E
105F	105G				

EACH OPENING TO HAVE:

<u>QTY</u>		<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	PRIVACY WITH OCCUPIED INDICATOR	L9456T 06A L583-363 L283-722	626	SCH
1	EA	FSIC CORE	20-740 OR 23-030 CONFIRM KEYWAY WITH DISTRICT	626	SCH
1	EA	SURFACE CLOSER	4011T TBWMS	695	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER

DOOR HARDWARE

HW SET: 06

FOR USE ON DOOR(S):

106A 107A

EACH OPENING TO HAVE:

<u>QTY</u>		<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	STOREROOM LOCK	L9080T LLL 06A L283-150 LESS OUTSIDE LEVER	626	SCH
1	EA	FSIC CORE	20-740 OR 23-030 CONFIRM KEYWAY WITH DISTRICT	626	SCH
1	EA	ELECTRIC STRIKE	6111 FSE CON	✓ 630	VON
1	EA	PUSH PLATE	8200 4" X 16"	630	IVE
1	EA	SURFACE CLOSER	4011 TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
1	EA	RAIN DRIP	142AA	AA	ZER
1	EA	DOOR BOTTOM RAIN DRIP	11A PUSH SIDE	A	ZER
1	EA	GASKETING	188SBK PSA	BK	ZER
1	EA	DOOR SWEEP	8193AA PULL SIDE	AA	ZER
1	EA	THRESHOLD	568A-223	A	ZER
1	EA	WIRE HARNESS	CON-6W FROM INCOMING POWER SUPPLY POWER SUPPLY - WORK OF DIVISION 28 ACCESS CONTROL - WORK OF DIVISION 28 DOOR CONTACT(S) - WORK OF DIV. 28		SCH

COORDINATE DOOR UNDERCUT WITH THRESHOLD. DOOR MUST MAKE FULL CONTACT WITH THRESHOLD SEAL.

DOOR HARDWARE

HW SET: 07

FOR USE ON DOOR(S):

201A 202A 203A 204A 205A

EACH OPENING TO HAVE:

<u>QTY</u>		<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	630	IVE
1	EA	CLASSROOM LOCK	ND70TD RHO	626	SCH
1	EA	FSIC CORE	20-740 OR 23-030 CONFIRM KEYWAY WITH DISTRICT	626	SCH
1	EA	ELECTRIC STRIKE	6211 FSE CON	✓ 630	VON
1	EA	SURFACE CLOSER	4011 TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	DOOR SWEEP	8193AA PULL SIDE	AA	ZER
1	EA	GASKETING	188SBK PSA	BK	ZER
1	EA	THRESHOLD	568A-223	A	ZER
1	EA	WIRE HARNESS	CON-6W FROM INCOMING POWER SUPPLY		SCH
1	EA	MOTION SENSOR	SCANII	✓ WHT	SCE
			ACCESS CONTROL - WORK OF DIVISION 28		
			POWER SUPPLY - WORK OF DIVISION 28		
			DOOR CONTACT(S) - WORK OF DIV. 28		

LISTED MANUFACTURERS SYMBOL IDENTIFICATION

ASSA	ASSA ALBOY
IVE	IVES
LCN	LCN CLOSERS
NGP	NATIONAL GUARD PRODUCTS, INC.
PRO	PRODATA
SCE	SCHLAGE ELECTRONICS
SCH	SCHLAGE LOCK
VON	VON DUPRIN

END OF SECTION

STEEL AND GYPSUM COMPOSITE STRUCTURAL PANELS

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide steel and gypsum composite structural panels as indicated on the Drawings and as specified herein.
 - 1. Panels are identified on the Drawings as “structural composite gypsum panels”.

1.2 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. ASTM A653: Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 2. ASTM A924: Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
 - 3. ASTM C36: Specification for Gypsum Wallboard.
 - 4. ASTM C79: Standard Specification for Treated Core and Nontreated Core Gypsum Sheathing Board.
 - 5. ASTM C518: Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
 - 6. ASTM C954: 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.
 - 7. ASTM C1177: Standard Specification for Glas Mat Gypsum Substrate for Use as Sheathing.
 - 8. ASTM E72: Standard Test Methods for Conducting Strength Tests of Panels for Building Construction.
 - 9. ASTM E96: Standard Test Methods for Water Vapor Transmission of Materials..

1.3 SUBMITTALS

- A. Product Data: Submit manufacturer’s product data and installation instructions.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Comply with manufacturer’s instructions and recommendations.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURER

- A. Sure-Board Series 200 Structural Panel by CEMCO, or accepted substitute.
- B. Fiberglass-Mat Faced Gypsum Sheathing Panels: DensDeck Gold by Georgia-Pacific Gypsum LLC.

2.2 MATERIALS

STEEL AND GYPSUM COMPOSITE STRUCTURAL PANELS

- A. Composite Structural Panels: Panels Located at Exterior Side of Wall Framing: Fabricated from 1/2" thick fiberglass-mat faced gypsum sheathing, complying with ASTM C79, laminated with water soluble EVA adhesive to sheet metal. Sheet steel to be No. 22 (0.027", 27 mil) base metal thickness complying with ASTM A653, Grade 33, and hot-dipped galvanized coating conforming to ASTM A653 and ASTM A924. Panels available in standard 8, 9 and 10 foot lengths, as required. Panels shall be identified with a label located on the top right and bottom left hand corner on the metal facing.
1. Fiberglass-Mat Faced Gypsum Sheathing Panels: Fire-Rated Fiberglass-Mat Faced Gypsum Wall Sheathing: ASTM C1177, Type X.
 - a. Thickness: 1/2 inch.
 - b. Width: 4 feet.
 - c. Length: 8 feet.
 - d. Weight: 2500 pounds per M square feet.
 - e. Edges: Square.
 - f. Surfacing: Coated fiberglass mat on face, back, and long edges.
 - g. Racking Strength (Ultimate, not design value) (ASTM E72): Not less than 654 pounds per square foot, dry.
 - h. Flexural Strength, Parallel (ASTM C1177): 100 lbf, parallel.
 - i. Humidified Deflection (ASTM C1177): Not more than 1/8 inch.
 - j. Permeance (ASTM E96): Not more than 12 perms.
 - k. R-Value (ASTM C518): 0.67.
 - l. Acceptable Products:
 - 1) 1/2 inch thick DensGlass Gold Sheathing, Georgia-Pacific Gypsum.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install panels as indicated on Drawings and in compliance with manufacturer's written installation instructions.

END OF SECTION

GYPSUM BOARD

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide gypsum drywall partitions and ceilings on metal framing and metal furring. Include backing for applied finishes and installation of acoustical insulation as scheduled on the Drawings.

1.2 REFERENCES

- A. ASTM International (ASTM):
 - 1. ASTM A653: Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 2. ASTM C473: Standard Test Methods for Physical Testing of Gypsum Panel Products.
 - 3. ASTM C475: Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
 - 4. ASTM C645: Standard Specification for Nonstructural Steel Framing Members.
 - 5. ASTM C754: Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel.
 - 6. ASTM C919: Standard Practice For Use of Sealants in Acoustical Applications.
 - 7. ASTM C1396: Standard Specification for Gypsum Board.
 - 8. ASTM D3273: Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
 - 9. ASTM E119: Standard Test Methods for Fire Tests of Building Construction and Materials.
- B. Gypsum Association:
 - 1. GA-214: Recommended Levels of Gypsum Board Finish.
 - 2. GA-216: Application and Finishing of Gypsum Panel Products.

1.3 SYSTEM DESCRIPTION

- A. Structural Requirements:
 - 1. Steel Framing Systems: Maximum deflection of L/240 for design loads.
 - 2. Steel Ceiling Suspension Systems: Maximum deflection of L/360 for design loads.
 - 3. Seismic Loads: Provide steel bracing members to carry loads created by seismic movement of the ceiling systems.
- B. System Tolerances: Do not exceed 1/4" variation in 8'-0" from plumb, level and true lines.

1.4 SUBMITTALS

- A. Product Data: Submit the manufacturer's specifications and installation instructions for each gypsum drywall product component, including other data as may be required to show compliance with these specifications.
- B. Submit product preparation instructions and recommendations, storage and handling requirements and installation methods.

GYPSUM BOARD

1.5 QUALITY ASSURANCE

- A. Regulatory Agency Requirements:
 - 1. Comply with building code and governing authorities requirements for fire-rated partitions and ceilings.
 - 2. Provide materials, accessories and use application procedures that have been listed and approved by UL, ICC, and tested in accordance with ASTM E119 for the type of construction scheduled. When requested, provide UL design numbers for fire-rated wall and ceiling assemblies.
- B. Field Samples: Provide 100 square foot minimum of in-place wall and ceiling joint and fastener treatment for the Architect's review prior to the joint finishing of gypsum board surfaces. The Architect will review smoothness and hiding of board joints and fasteners only. Acceptable samples may be incorporated in the work.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Coordinate the delivery of materials with the installation to minimize storage periods. Deliver materials in original packages, containers or bundles bearing brand name and identification of manufacturer or supplier.
- B. Store gypsum and steel materials in dry, ventilated space, under cover protected from weather, direct sunlight, and above grade floor slabs. Neatly stack gypsum boards flat to prevent sagging.
- C. Protect structural members from excessive stress during delivery and erection.
- D. Handle gypsum boards to prevent damage to edges, ends or surfaces. Protect metal corner beads and trim from being bent or damaged.

1.7 SITE CONDITIONS

- A. Temperature Requirements: Do not begin installing gypsum board until building is enclosed or ambient temperature remains above 55°F.
- B. Cold Weather Protection: When ambient outdoor temperatures are below 55°F, maintain continuous, uniform, comfortable building working temperatures of not less than 55°F for a minimum period of 48 hours prior to, during, and following application of gypsum board and joint treatment materials or bonding of adhesives.
- C. Ventilation: Ventilate building spaces as required to remove water in excess of that required for drying of joint treatment material immediately after its application. Avoid drafts during dry, hot weather to prevent too rapid drying.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Obtain all components and materials of the gypsum drywall system from a single manufacturer, or from producers recommended by the manufacturer, unless otherwise indicated.

GYPSUM BOARD

2.2 WALL FRAMING MATERIALS

- A. Cold-Formed Structural Material:
 - 1. All structural light-gage steel members shall be mill certified prime steel meeting ASTM A653 Structural quality; Grade 33 for steels thinner than 16 gage (54 mils) and grade 50 for steels 16 gage (54 mils) and thicker. Grade 33 steel shall have a $f_y = 33000$ psi and $f_u = 45000$ psi. Grade 50 steel shall have a $f_y = 50000$ psi and $f_u = 60000$ psi.
 - 2. All light-gage steel shall be galvanized per ASTM A653 with minimum coating of G60 for exterior and/or load bearing members and G40 for interior non-load bearing members.
- B. Metal Studs: Steel studs shall be a minimum 1 5/8" x width noted. Studs shall have a minimum uncoated base metal thickness of 0.033" (20 gage). Studs shall be of adequate size, gage and spacing to sustain applied structural loading.
- C. Tracks: Stud width track shall be the same gauge as studs unless noted otherwise and shall be unpunched type at the top and bottom of wall. Track shall be of adequate size to develop full stud bearing at load-bearing walls and shall be sized to fit studs.
- D. Bridging: Minimum lateral support shall be per the manufacturer's recommendations in order to develop the full strength of the structural material. Sheathing on the wall shall not be considered effective in bracing studs unless sheathing is applied on both faces of the wall.
- E. Connections:
 - 1. Bolted connections are to use as a minimum either ASTM A307(type A) or ASTM A325, structural bolts. All screws shall be a #10 minimum size and conform to ASTM C-1002 and ASTM C-954 type S and/or Type S-12. Length of screw should be approximately 3/8" to 1/2" longer than the total material thickness and a minimum of 3 exposed threads should extend through the steel. All screws shall be thread-forming or thread-cutting, with or without a self-drilling point.
 - 2. All fasteners that fasten dissimilar metals (such as aluminum and steel) are to be stainless steel or zinc-plated corrosion resistant screws.
- F. Prefabricated Metal Connectors: Prefabricated metal connectors are to be manufactured by the steel network or Simpson Strong-Tie, and shall be installed as noted on the Drawings. Other types of metal connectors require prior review.
- G. Screw Furring Channels: ASTM C645, roll-formed, hat shaped, 25-gage hot dipped galvanized steel, knurled face, 1-3/8" wide by 7/8" deep with hemmed legs.
- H. Framing Fasteners: Unless otherwise noted on Drawings, provide fasteners per LIGHT GAUGE STEEL FASTENING SCHEDULE on Sheet S0.1 STRUCTURAL NOTES. Screws shall not be overdriven. Alternate fastening of pins must be reviewed and accepted by the registered design Professional.

2.3 FACE AND BACKING BOARDS

- A. Gypsum Face Panels: ASTM C1396. Long edges tapered. 5/8" thick, 48" wide, Type "X" gypsum core, UL classified.
 - 1. Use moisture and mold resistant type at all locations. Conform to ASTM C473, ASTM C1396 and ASTM D3273.
- B. Gypsum Base Panels: ASTM C1396, Type "X" fire retardant type, UL classified, with long edges

GYPSUM BOARD

tapered.

1. Use moisture and mold resistant type at all locations. Conform to ASTM C473, ASTM C1396 and ASTM D3273.

2.4 GYPSUM ACCESSORIES

- A. Acoustical Sealants: U.S. Gypsum Acoustical sealant, Tremco Drywall Sealant, A.C. Horn Vulcatex Thriftube, non-setting, non-staining, acoustically tested caulking, or accepted substitute.
- B. Acoustical Insulation: U.S. Gypsum Thermafiber sound attenuation fire blankets, 3" thick, 15-25 flame spread, smoke developed 0; Certaineed Acoustitherm Batts, Owens/Corning Fiberglas Sonobatts, unfaced, 3-1/2" thick, Type II, smoke developed 10; or accepted substitute.
- C. Screw Fasteners: ASTM C645. No nailing of gypsum materials will be allowed.
- D. Gypsum Board Metal Trim: Manufacturer's standard 26-gage galvanized steel. All trim to have fine mesh expanded metal flanges. U.S.G. #701B and #801B "L" shaped, #800 corner bead, #093 control joint, and others as detailed, or accepted substitute.
- E. Interior Joint Reinforcing Tape: Fiber tape not less than 2-1/4" wide, ASTM C475.
- F. Exterior Joint Reinforcing Tape: Open weave glass fiber tape not less than 2-1/2" width, ASTM C475.
- G. Interior Joint Treatment Materials: ASTM C475, ready-mixed type as recommended by gypsum wallboard manufacturer. Provide 2 separate grades, 1 specifically for bedding tapes and filling depressions and 1 for topping and sanding. Use chemical-hardening type for bedding and filling where required.
- H. Skim Coat: "First Coat" by U.S. Gypsum, Georgia-Pacific "Ready-Mix All-Purpose Joint Compound" or accepted substitute.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protection: Provide temporary covering to eliminate splattering of joint compound and spray texture on adjacent finished surfaces.
- B. Adjusting Location of Steel Framing: Coordinate ceiling suspension wire locations with plumbing, heating, ventilating, fire protection piping and electrical work. Adjust framing locations to align new finish flush with existing finish, where required.
- C. Suspension wires must be supported from structure above unless approved otherwise by the Architect.
- D. Do not bridge building expansion joints with support systems, frame both sides of joints with furring and other supports as indicated.
- E. Install suspension wires through the structural metal decking prior to the pouring of the concrete topping slab.

GYPSUM BOARD

3.2 INSTALLATION OF METAL FRAMING SYSTEMS

- A. Comply with ASTM C754 for installation of studs, runners, and furring channels.
- B. Screws shall be installed and tightened in accordance with the manufacturer's recommendations.
- C. Isolate system from building structure to prevent transfer of loading and deflections into metal support system, both vertically and horizontally. Provide slip or cushioned type joints to attain lateral support and avoid axial loading.
- D. Install runner tracks to floor and ceiling with approved fasteners located 2" from each end and spaced at not over 24" on center. Position metal stud framing and furring of size and spacing as detailed, but in any case not over 24" on center. Install additional studs as required at all partition intersections, corners and openings.
 - 1. Bearing: Provide complete, uniform, and level support for the bottom track at each stud. Verify that load bearing studs are properly seated in tracks prior to fastening.
- E. Place studs against walls of dissimilar materials and anchor in place at not over 36" on center. Where a possibility of water penetration exists, install asphalt felt strips between studs and adjacent surface.
- F. Space framing and fasteners as required to meet allowable deflection and fire rating requirements, give proper support for covering material and as indicated on the Drawings. Comply with UL design requirements for fire rated assemblies.
- G. Provide doubled 25-gage or single 20-gage drywall C-studs to support toilet compartments and screens, grab bars, handrail brackets, shower seats, electrical equipment, fixtures, toilet accessories, furnishings, fire extinguisher cabinets mounted on stud partitions and similar work to comply with applicable published recommendations of the gypsum board manufacturer.
- H. Coordinate opening requirements for pipes, conduits, ducts and other items concealed within framing space.
- I. Provide framed openings around items shown to be recessed within framing space. Install steel cold-rolled channels above and below wall openings to transfer loads to adjacent studs.
- J. Secure metal frames to 25-gage studs at each jamb, then install second 25-gage stud in contact with the first stud. Attach gypsum board to both studs with screws at 8" on center to form a column section. Use 20-gage first stud on all frames supporting solid core doors and frames 36" to 48" in width. Frames over 48" in width, supporting double doors, shall have two 20-gage studs at each jamb. All stud assemblies supporting door jambs are to be securely anchored at the floor and run full height and secured to the structure above.
- K. Fill boxed studs or header beams with insulation equal to adjacent wall insulation where wall is indicated with thermal or noise control insulation.
- L. Acoustical Sealant: Seal sound insulating partitions by setting floor runners in a 1/4" diameter continuous bead of acoustical sealant. Apply acoustical sealant at all board to floor joints. Apply sealant at the perimeter of all objects penetration the wall system. Continue acoustical sealant vertically between studs and concrete or masonry walls. See the Drawings for locations of sound insulating partitions.

GYPSUM BOARD

- M. Where studs are surfaced on one side only, or surfacing does not run full height of studs, the stud flanges must be laterally braced and braced to adjacent structure as recommended by the manufacturer to meet lateral design loads.
- N. Install 16-gage sheet metal backing plates not less than 6" wide and one or more stud spacing long at location of wall mounted hardware equipment or devices. Refer to accessory fixture list for location, type, size and installation.

3.3 INSTALLATION OF WALL AND CEILING PANELS

- A. General and Fire Rating Requirements:
 - 1. Comply with Gypsum Association Specifications GA-216.
 - 2. Install acoustical insulation where indicated, without gaps and with snug fit against studs and support where necessary to prevent movement or dislocation. Install full height of partition, unless otherwise indicated. Fit carefully behind electrical outlets and other work that penetrates partition or face of wall.
 - 3. Install panels of thickness indicated and as required meeting structural and fire rating requirements.
 - 4. Screw wallboard to metal framing members as recommended by the manufacturer.
 - 5. For vertical partition wallboard installation, offset panel joints on opposite sides of stud framing.
 - 6. In areas where gypsum wallboard is scheduled for wall and ceilings, install the ceiling first then the wallboard.
 - 7. Verify that acoustical insulation is in place, where scheduled, prior to completing panel installation.
 - 8. Where partitions are sound or fire rated construction, acoustical sealant shall be applied to all cutouts and intersections with adjoining structure as described herein. This will require that the gypsum board be cut for loose fit around the partition perimeter leaving a space approximately 1/8" wide.
 - 9. Cut board neatly and fit around pipes, electrical outlets, mechanical work, etc. Remove any loose face paper at cuts and fill holes or openings with quick setting plaster.
 - 10. Use panels of maximum practical length to minimize end joints. Arrange joints on opposite sides of partition walls to occur on different studs and stagger butt joints on the same surface. Where partitions intersect exterior walls, start installation at exterior end to position butt joints as far away from exterior wall as possible. Board shall be brought into contact but not forced into place with all ends and edges neatly fitted. Bottom edge of gypsum board on walls shall be a maximum of 1/4" above floor.
 - 11. Attach to framing with all edges over framing members using screw fasteners. Space screws at 12" on center on ceiling and 16" on center on walls, staggered on abutting edges. Power drive screws at least 1/32" deep. Space screws at not less than 3/8" from edge and ends of board. Where board may appear loose from framing, install second fastener within 1-1/2" for the first fastener.
 - 12. While fasteners are being driven, hold the gypsum board in firm contact with underlying supports, fastening from the center of the board toward ends and edges. Drive fasteners home with heads slightly below surface, taking care to avoid breaking the paper face.
 - 13. Install gypsum base panels as a substrate for face panels where 2 layers are required. Fasten both the base layer and face layer separately to framing members with screws.

GYPSUM BOARD

14. Finish in every location with metal edge and corner bead unless other finishing details are given and edge is covered with molding or trim. Install control joints vertically at a maximum of 30 feet apart on unbroken wall surfaces whether shown on the Drawings or not. Extend control joint from head to ceiling and from window sill to floor. Verify all expansion joint locations with the Architect prior to installation of gypsum board.
15. Cover both faces of stud framing with gypsum board in concealed spaces (above ceilings, etc.), except in chase walls that are braced internally. Except where concealed application is required for sound, fire, air or smoke ratings, coverage may be accomplished with scraps of not less than 8 square feet area, and may be limited to not less than 75% of the full coverage.
16. Use water resistant type board on all wet and high moisture areas. Seal all cut ends and openings with recommended sealant.

3.4 SEALANT APPLICATIONS

- A. Partition Perimeter: Apply a 1/4" minimum bead of sealant on each side of plates, including those used at intersections with dissimilar wall construction. Immediately install gypsum board, squeezing sealant to form contact with adjacent surfaces. Fasten board as specified. Conform to ASTM C919 for sealant application.
- B. Partition Intersections: Seal edges of face layer of wallboard abutting intersection partitions, before taping and finishing.
- C. Openings: Apply a 1/4" bead of acoustical sealant around all cut outs to seal openings of electrical boxes, ducts, pipes and similar penetrations. Seal sides and backs of all electrical boxes.
- D. Control Joints: Before installing control joints, apply sealant in back of joint to reduce flanking sound path.
- E. Install acrylic latex sealant where required to fill exposed openings.

3.5 FINISHING

- A. Levels of Finish:
 1. Level 4 (at Press Box Walls and Ceilings): All joints and interior angles shall have tape embedded in joint compound and two separate coats of joint compound applied over all flat joints and one separate coat of joint compound applied over interior angles. Fastener heads and accessories shall be covered with three separate coats of joint compound. All joint compound shall be smooth and free of tool marks and ridges. Mop down all walls after the final mud coat prior to priming.
 2. Level 5 (at Patched Ceilings at Existing Building):
 - a. All joints and interior angles shall have tape embedded in joint compound and two separate coats of joint compound applied over all flat joints and one separate coat of joint compound applied over interior angles. Fastener heads and accessories shall be covered with three separate coats of joint compound. A thin skim coat shall be trowel applied to the entire surface. The surface shall be smooth and free of tool marks and ridges.
 - b. The skim coat is applied with a fine knap roller over the entire surface to fill imperfections in the joint work, smooth the paper texture, and provide a uniform surface. The entire surface is to be lightly sanded leaving a film of skim coating compound completely covering the paper. Smeared roller marks will not be accepted. Mop down all walls after the final mud coat prior to priming.

GYPSUM BOARD

3.6 CLEAN UP

- A. Do not dispose of or leave excess drywall materials or debris on the premises. Leave each area "broom clean" after completing drywall work. Clean spots and spills of taping and finishing compounds off of all adjacent surfaces and equipment.

END OF SECTION

RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide resilient base and accessories in locations indicated on the Drawings and as herein specified.

1.2 SUBMITTALS

- A. Samples: Submit 2 samples of each type and color of resilient base and trim accessory. Provide 2-1/2" long samples for each accessory.
- B. Submit product preparation instructions and recommendations, storage and handling requirements and installation methods.

1.3 QUALITY ASSURANCE

- A. Manufacturer: Provide each type of resilient base and accessory as produced by a single manufacturer, including recommended adhesives.

1.4 PROJECT/SITE CONDITIONS

- A. Maintain materials and areas of work at temperatures between 70°F and 90°F for not less than 48 hours before, during, and 48 hours after the material installation.
- B. Install resilient base and accessories after other finishing operations, including painting and installation of built-in casework have been completed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Roppe.
- B. Flexco.
- C. Or accepted substitute.

2.2 ACCESSORY MATERIALS

- A. Rubber Base: Type I, 1/8" gage, 4" high, top set with coved toe. Provide continuous roll lengths.
 - 1. Color: As selected by Architect.

PART 3 - EXECUTION

3.1 INSTALLATION OF ACCESSORIES

- A. Apply wall base to walls, columns, pilasters, casework and other permanent fixtures in rooms or areas where base is required.
 - 1. Install base in lengths as long as practicable with corners fabricated from base materials, mitered, or coped inside corners.

RESILIENT BASE AND ACCESSORIES

2. Tightly bond base to substrate throughout length of each piece with continuous contact at horizontal and vertical surfaces.

3.2 EXTRA STOCK

- A. Deliver stock of maintenance materials to the Owner's designated storage area. Furnish maintenance materials from same manufactured lot as materials installed and enclosed in protective packaging with appropriate identifying labels.
- B. Base Materials: Salvage left over materials to the Owner.

END OF SECTION

URETHANE RESINOUS FLOORING

PART 1 – GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Resinous flooring system (UR1) as shown on the Drawings and in Schedules.
 - 2. If Alternate No. 1 is exercised by the Owner, provide at:
 - a. Concessions 101.
 - 3. If Alternative No. 2 is exercised by the Owner, provide at:
 - a. Unisex RR 104A.
 - b. Unisex RR 104B.

1.2 SYSTEM DESCRIPTION

- A. The work shall consist of preparation of the substrate, the furnishing and application of a cementitious urethane based self-leveling seamless flooring system with flintshot quartz aggregate broadcast and urethane topcoat.
- B. The system shall have the color and texture as specified by the Owner with a nominal thickness of 1/4 inch. It shall be applied to the prepared area(s) as defined in the plans strictly in accordance with the Manufacturer's recommendations.
- C. Cove base to be applied where noted on plans and per manufacturers standard details unless otherwise noted.

1.3 SUBMITTALS

- A. Product Data: Latest edition of Manufacturer's literature including performance data and installation procedures.
- B. Manufacturer's Material Safety Data Sheet (MSDS) for each product being used.
- C. Samples: A 3 x 3 inch square sample of the proposed system. Color, texture, and thickness shall be representative of overall appearance of finished system subject to normal tolerances.

1.4 QUALITY ASSURANCE

- A. The Manufacturer shall have a minimum of 10 years experience in the production, sales, and technical support of epoxy and urethane industrial flooring and related materials.
- B. The Applicator shall have experience in installation of the flooring system as confirmed by the manufacturer in all phases of surface preparation and application of the product specified.
- C. No requests for substitutions shall be considered that would change the generic type of the specified System.

URETHANE RESINOUS FLOORING

- D. System shall be in compliance with requirements of United States Department of Agriculture (USDA), Food, Drug Administration (FDA), and local Health Department.
- E. System shall be in compliance with the Indoor Air Quality requirements of California section 01350 as verified by a qualified independent testing laboratory.
- F. System shall be certified "High Traction" by National Floor Safety Institute (NFSI).
- G. A pre-installation conference shall be held between Applicator, General Contractor and the Owner to review and clarification of this specification, application procedure, quality control, inspection and acceptance criteria and production schedule.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Packing and Shipping:
 - 1. All components of the system shall be delivered to the site in the Manufacturer's packaging, clearly identified with the product type and batch number.
- B. Storage and Protection:
 - 1. The Applicator shall be provided with a dry storage area for all components. The area shall be between 60 F and 85 F, dry, out of direct sunlight and in accordance with the Manufacturer's recommendations and relevant health and safety regulations.
 - 2. Copies of Material Safety Data Sheets (MSDS) for all components shall be kept on site for review by the Engineer or other personnel.
- C. Waste Disposal:
 - 1. The Applicator shall be provided with adequate disposal facilities for non-hazardous waste generated during installation of the system.

1.7 PROJECT CONDITIONS

- A. Site Requirements:
 - 1. Application may proceed while air, material and substrate temperatures are between 60 F and 85 F providing the substrate temperature is above the dew point. Outside of this range, the Manufacturer shall be consulted.
 - 2. The relative humidity in the specific location of the application shall be less than 85 % and the surface temperature shall be at least 5 F above the dew point.
 - 3. The Applicator shall be supplied with adequate lighting equal to the final lighting level during the preparation and installation of the system.
- B. Conditions of new concrete to be coated with cementitious urethane material.
 - 1. Concrete shall be moisture cured for a minimum of 7 days and have fully cured for 14 days in accordance with ACI-308 prior to the application of the coating system pending moisture tests outside of these parameters manufacturer shall be consulted.
 - 2. Concrete shall have a flat rubbed finish, float or light steel trowel finish (a hard steel trowel finish is neither necessary nor desirable).
 - 3. Sealers and curing agents should not to be used.
 - 4. Concrete surfaces on grade shall have been constructed with a vapor barrier to protect against the effects of vapor transmission and possible delamination of the system.

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- C. Safety Requirements:
 - 1. The Owner shall be responsible for the removal of foodstuffs from the work area.
 - 2. Non-related personnel in the work area shall be kept to a minimum.

1.8 WARRANTY

- A. Dur-A-Flex, Inc. warrants that material shipped to buyers at the time of shipment substantially free from material defects and will perform substantially to Dur-A-Flex, Inc. published literature if used in accordance with the latest prescribed procedures and prior to the expiration date.
- B. Dur-A-Flex, Inc. liability with respect to this warranty is strictly limited to the value of the material purchase.

PART 2 – PRODUCTS

2.1 FLOORING

- A. Dur-A-Flex, Inc, Poly-Crete MDB (self leveling broadcast quartz), Urethane topcoat seamless flooring system.
 - 1. System Materials:
 - a. Topping: Dur-A-Flex, Inc, Poly-Crete MD resin, hardener and aggregate.
 - b. The aggregate shall be Dur-A-Flex, Inc. flintshot quartz aggregate.
 - c. Topcoat: Dur-A-Flex, Inc. Poly-Crete Color-Fast resin, hardener and powder aggregate.
 - 2. Patch Materials:
 - a. Shallow Fill and Patching: Use Dur-A-Flex, Inc. Poly-Crete MD (up to ¼ inch).
 - b. Deep Fill and Sloping Material (over ¼ inch): Use Dur-A-Flex, Inc. Poly-Crete WR.

2.2 MANUFACTURER

- A. Dur-A-Flex, Inc., 95 Goodwin Street, East Hartford, CT 06108, Phone: (860) 528-9838, Fax: (860) 528-2802.
- B. Manufacturer of Approved System shall be single source and made in the USA.

2.3 PRODUCT REQUIREMENTS

- | | | |
|----|---|---------------------------|
| A. | Topping: | Poly-Crete MD |
| 1. | Percent Reactive: | 100 % |
| 2. | VOC: | 0 g/L |
| 3. | Bond Strength to Concrete ASTM D 4541: | 400 psi, substrates fails |
| 4. | Compressive Strength, ASTM C 579: | 7,400 psi |
| 5. | Tensile Strength, ASTM D 638: | 1,800 psi |
| 6. | Impact Resistance @ 125 mils, MIL D-3134, | >160 inch lbs |
| | No visible damage or deterioration | |

URETHANE RESINOUS FLOORING

- B. Topcoat: Poly-Crete Color-Fast
- | | | |
|----|--|-----------------------|
| 1. | Percent Solids: | 100% |
| 2. | VOC: | 0 g/L |
| 3. | Compressive Strength, ASTM C 579: | 7,800 psi |
| 4. | Tensile Strength, ASTM D 638: | 4,200 psi |
| 5. | Flexural Strength, ASTM D 790: | 1,000 psi |
| 6. | Abrasion Resistance, ASTM D 4060:
CS-17 wheel, 1,000gm load, 1,000 cycles | 30 mg loss |
| 7. | Impact Resistance, ASTM D 1709: | 160 in.lbs |
| 8. | Shore D Hardness, ASTM D 2240: | 65 |
| 9. | Gloss, ASTM D 523, 60°: | Semi-gloss appearance |
- C. Poly-Cote Color: Grey.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas and conditions, with Applicator present, for compliance with requirements for maximum moisture content, installation tolerances and other conditions affecting flooring performance.
1. Verify that substrates and conditions are satisfactory for flooring installation and comply with requirements specified.

3.2 PREPARATION

- A. General
1. New and existing concrete surfaces shall be free of oil, grease, curing compounds, loose particles, moss, algae growth, laitance, friable matter, dirt, and bituminous products.
 2. Moisture Testing: Perform tests recommended by manufacturer and as follows.
 - a. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 99% relative humidity level measurement.
 - b. If the relative humidity exceeds 99% then the Owner and/or Engineer shall be notified and advised of additional cost for the possible installation of a vapor mitigation system that has been approved by the manufacturer or other means to lower the value to the acceptable limit.
 - c. If the vapor drive exceeds 99% relative humidity or 20 lbs/1,000 sf/24 hrs then the Owner and/or Engineer shall be notified and advised of additional cost for the possible installation of a vapor mitigation system that has been approved by the manufacturer or other means to lower the value to the acceptable limit.
 3. Mechanical Surface Preparation:
 - a. Shot blast all surfaces to receive flooring system with a mobile steel shot, dust recycling machine (Blastrac or equal). All surface and embedded accumulations of paint, toppings hardened concrete layers, laitance, power trowel finishes and other similar surface characteristics shall be completely removed leaving a bare concrete surface having a minimum profile of CSP 4-5 as described by the International Concrete Repair Institute.

URETHANE RESINOUS FLOORING

- b. Floor areas inaccessible to the mobile blast machines shall be mechanically abraded to the same degree of cleanliness, soundness and profile using diamond grinders, needle guns, bush hammers, or other suitable equipment.
 - c. Wherever a free edge will occur, including doorways, wall perimeters, expansion joints, columns, doorways, drains and equipment pads, a 1/4 inch deep by 3/16 inch wide keyways shall be cut in.
 - d. Cracks and joints (non-moving) greater than 1/4 inch wide are to be chiseled or chipped-out and repaired per manufacturer's recommendations.
4. At spalled or worn areas, mechanically remove loose or delaminated concrete to a sound concrete and patch per manufactures recommendations.

3.3 APPLICATION

A. General:

- 1. The system shall be applied in three distinct steps as listed below:
 - a. Substrate preparation
 - b. Topping/overlay application with quartz aggregate broadcast.
 - c. Topcoat application, with a anti-slip aggregate broadcast if required
- 2. Immediately prior to the application of any component of the system, the surface shall be dry and any remaining dust or loose particles shall be removed using a vacuum or clean, dry, oil-free compressed air.
- 3. The handling, mixing and addition of components shall be performed in a safe manner to achieve the desired results in accordance with the Manufacturer's recommendations.
- 4. The system shall follow the contour of the substrate unless pitching or other leveling work has been specified by the Architect.
- 5. A neat finish with well-defined boundaries and straight edges shall be provided by the Applicator.

B. Topping:

- 1. The topping shall be applied as a self-leveling system as specified. The topping shall be applied in one lift with a nominal thickness of 3/16 inch.
- 2. The topping shall be comprised of three components, a resin, hardener and filler as supplied by the Manufacturer.
- 3. The hardener shall be added to the resin and thoroughly dispersed by suitably approved mechanical means. Aggregate shall then be added to the catalyzed mixture and mixed in a manner to achieve a homogenous blend.
- 4. The topping shall be applied over horizontal surfaces using a pin rake, trowels or other systems approved by the Manufacturer.
- 5. Immediately upon placing, the topping shall be degassed with a 15/16 inch spiked roller.
- 6. Quartz aggregate shall be broadcast to excess into the wet material at the rate of 1 lbs/sf.
- 7. Allow material to fully cure. Vacuum, sweep and/or blow to remove all loose aggregate.

C. Topcoat:

- 1. The topcoat shall be mixed and applied per manufacturer recommended procedure.
- 2. The topcoat shall be comprised of three components, a resin, hardener and filler as supplied by the manufacturer.
- 3. The topcoat will be applied at the rate of 100 sf per kit (1.1 gal).
- 4. Non-Skid if required is broadcast at the rate of 1 lb per 100 sf and back rolled into the coating.
- 5. The finish floor will have a nominal thickness of 1/4 inch.

URETHANE RESINOUS FLOORING

3.4 FIELD QUALITY CONTROL

- A. Tests, Inspection:
 - 1. The following tests shall be conducted by the Applicator:
 - a. Temperature.
 - 2. Air, substrate temperatures, relative humidity, and, if applicable, dew point.
 - b. Coverage Rates.
 - 1) Rates for all layers shall be monitored by checking quantity of material used against the area covered.

3.5 CLEANING AND PROTECTION

- A. Cure flooring material in compliance with manufacturer's directions, taking care to prevent their contamination during stages of application and prior to completion of the curing process.
- B. Remove masking. Perform detail cleaning at floor termination, to leave cleanable surface for subsequent work of other sections.

END OF SECTION

PAINTING

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Exterior Painting:
 - 1. Field finish exposed primed and galvanized steel, including:
 - a. Hollow metal doors.
 - b. Hollow metal door frames.
 - c. Coiling doors.
 - d. Coiling counter doors.
 - e. Steel columns.
 - f. Steel pipe downspouts.
 - g. Canopy soffit.
 - 2. Field paint exposed fire protection, plumbing, HVAC, and electrical equipment not factory finished except as may be noted on the Drawings.
- B. Interior Painting:
 - 1. Field finish exposed concrete masonry.
 - 2. Field finish exposed galvanized steel, including:
 - a. Hollow metal doors.
 - b. Hollow metal door frames.
 - 3. Field finish exposed gypsum board.
 - 4. Field finish plywood floor at Press Box.
 - 5. Field paint exposed fire protection, plumbing, HVAC, and electrical equipment not factory finished which is installed in areas scheduled for field finishing.
 - 6. Paint Lakeridge High School logo on interior wall of Concessions 101 as indicated on Drawings.
- C. Do Not Paint:
 - 1. Prefinished items, such as light fixtures, plumbing fixtures and finished door hardware.
 - 2. Finished metal such as anodized aluminum, stainless steel, finished brass or bronze.
 - 3. Moving parts of operating units, equipment identification, performance rating, name plates or code-required labels.
 - 4. Prefinished metal wall panels.
 - 5. Prefinished sheet metal and trim, including gutters and downspouts.
 - 6. Concrete masonry at exterior.
 - 7. Galvanized steel railings and handrails.
 - 8. Galvanized steel stairs and handrails.

1.2 REFERENCES

- A. Oregon Administrative Rules (OAR), Department of Human Services, Public Health Division: Chapter 333, Division 70 Renovation, Repair and Painting Activities Involving Lead-Based Paint.
- B. Code of Federal Regulations: 40 CFR: Protection of the Environment.

1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's literature on each coating proposed for this Project. Obtain approval of coatings prior to ordering. Include the manufacturer's recommended minimum dry film thickness for each coating system. Indicate where the material is to be used.

PAINTING

- B. Office Samples:
 - 1. Submit Samples: For the Architect's review of color and gloss.
 - 2. Resubmit Samples: As requested until required color and gloss is achieved.
 - 3. Opaque Finish: Provide three 8" x 8" minimum size samples of each color and gloss.

1.4 QUALITY ASSURANCE

- A. Painter: Provide local subcontractor experienced in painting commercial buildings. Painting subcontractor must have 5 years experience in projects of similar size.
- B. Field Samples:
 - 1. On actual building components, duplicate finishes on acceptable office samples.
 - 2. Provide wall and ceiling colors and finishes on minimum 50 square feet of in-place surfaces.
 - 3. Provide trim and equipment colors and finishes on minimum 10 lineal feet of in-place surfaces.
 - 4. The Architect will approve for color, texture and sheen only.
- C. Fire Protection: Provide sufficient fire extinguishers of a type suitable for the control of fire originating in paint materials. Remove and dispose of, or safely store, all waste, empty containers and oily cloths off of the premises daily.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver materials to each site in new, original and unopened containers bearing manufacturer's name, trade name, and label analysis.
- B. Storage: Store coatings in ventilated spaces with containers closed.
- C. Handling: Keep dust and open flame from coating materials while mixing and painting.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Benjamin Moore.
- B. Miller Paint Co. (Specification Standard)
- C. PPG.
- D. Rodda Paint Co.
- E. Rust-oleum Corporation.
- F. Sherwin Williams Co., Professional Coatings Division.
- G. Glidden Professional / Devoe.
- H. Or accepted substitute.

PAINTING

2.2 EXTERIOR MATERIALS

- A. Products listed below are approved for use in the Project. Other products may be used when approved by the Architect in writing.
- B. Ferrous Metal:
 - 1. Primer: Miller No. 310-2-10 Acrimetal DTM.
 - 2. Second and Third Coats: Miller No. 310-5-XX Acrimetal DTM Semi Gloss.
- C. Galvanized Metals:
 - 1. Primer: Miller No. 310-2-10 Acrimetal DTM.
 - 2. Second and Third Coats: 310-5-XX Acrimetal DTM Semi Gloss

2.3 INTERIOR MATERIALS

- A. Products listed below are approved for use in the Project. Other products may be used when approved by the Architect in writing.
- B. Ferrous Metal:
 - 1. Primer: Miller No. 310-2-10 Acrimetal DTM.
 - 2. Second and Third Coats: Miller No. 320-5-XX Acrimetal DTM Semi Gloss.
- C. Gypsum Drywall - Walls (Paint):
 - 1. Primer: Miller No. 220-0-11 P.V.A. Primer.
 - 2. Second and Third Coats: Miller No. 120-4-XX Premium Satin.;
- D. Gypsum Drywall and Plaster - Ceilings:
 - 1. Primer: Miller No. 620-0-11 Kril Primer Sealer.
 - 2. First and Second Coats: Miller No. 120-4-XX Premium Satin; roller application for light eggshell finish.
- E. Plywood Floor at Press Box: Use one of the following paint systems.
 - 1. Miller Paint Company:
 - a. Primer: Miller Paint Co. "Tuff Tread" (Velvet 280 Series. Thin 20% with water.
 - b. Finish Coat: Miller Paint Co. "Tuff Tread" (Velvet 280 Series).
 - 1) Provide with fine silica sand to provide slip resistance.
 - 2. Rustoleum:
 - a. Primer: 400W NT 100 Urethane Enhanced White Primer Bonder/Sealer by XIM.
 - b. Finish Coat: AS5600 System Anti-Slip Floor and Deck Coating by Rust-Oleum.
- F. New Concrete Masonry Units:
 - 1. Primer: Miller No. 6030 Kril Block Filler.
 - 2. First and Second Coats: Miller No. 120-4-XX Premium Satin.
- G. New Concrete at Storage 105:
 - 1. Primer: Miller No. 620-0-11 Kril Primer.
 - 2. First and Second Coats: Miller No. 130-1-XX Performance Plus Flat.

PAINTING

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examination of Surfaces: Examine areas and conditions under which painting work is to be applied. Correct conditions detrimental to proper and timely completion of work. Do not proceed with work until unsatisfactory conditions have been corrected.
- B. Contaminated Surfaces: Do not paint over dirt, rust, blistered paint, grease, wet substrates, or surface conditions detrimental to the formation of a durable paint film.
- C. Work Start: Start of painting work will be interpreted as the Applicator's acceptance of surfaces and conditions within any particular area.

3.2 PREPARATION

- A. Cleaning: Comply with coating the manufacturer's instructions for preparation and cleaning of each substrate.
- B. Protection:
 - 1. Cover and protect adjacent finished surfaces.
 - 2. Remove hardware, machined surfaces, cover plates, lighting fixtures and prefinished items in place and not scheduled for field finishing, or provide surface applied protection. Reinstall removed items after finishing adjacent surfaces.
- C. Priming:
 - 1. Seal wood required to be job painted. Prime edges, ends, face, undersides and backsides of millwork and exterior painted wood.
 - 2. Provide finish coats that are compatible with prime paints used. Provide barrier coats over incompatible primers where required. Notify the Architect in writing of anticipated problems using specified coatings with substrates primed by others.
 - 3. Apply prime coat or first coat to material that is scheduled or required to be painted or finished.
 - 4. Touch up shop primed surfaces scratched or chipped prior to field finishing.
- D. Existing Lead Base Paint: For renovations, repairs and painting (RRP) in "Child-Occupied Facilities" (where kids under the age of 6 regularly spend time and built before 1978), the General Contractor shall follow all Federal, State and local rules (including OSHA and US EPA rules and Oregon Administrative Rules Chapter 333, Division 70) associated with lead-based paints (LBP).
 - 1. The Contractor is responsible for the identification of LBP hazards and providing engineering controls for trigger activities that disturb LBP.
 - 2. Any time painted surfaces are disturbed, the work must be performed by a certified firm with a trained and certified "renovator" in accordance with *40 CFR (including Part 745.82 Lead)*.
 - 3. Post the areas of the building that will be affected with appropriate signage warning of the potential hazard.

PAINTING

3.3 APPLICATION

- A. Methods and Coverage:
 - 1. Apply painting and finishing materials in accordance with the manufacturer's directions. Use techniques best suited for the material and surfaces to which applied.
 - 2. For opaque finishes, apply additional coats when undercoats, stains or other conditions show through final paint coat, until paint film is of uniform finish, color and appearance.
 - 3. Where recommended by manufacturer, sand lightly between succeeding enamel or clear coats.
 - 4. Apply each material at not less than the manufacturer's recommended spreading rate, to provide a total dry film thickness of not less than amount recommended by coating manufacturer.
 - 5. Match approved office and field samples for color, texture and sheen.
 - 6. Paint exposed surfaces behind movable equipment and furniture same as adjacent surfaces.
 - 7. Paint surfaces behind permanently fixed equipment or furniture with prime coat only.
- B. Equipment Surfaces:
 - 1. Paint interior surfaces of ducts where visible through registers or grilles, flat black.
 - 2. Except where accent colors are scheduled, paint mechanical and electrical work in finished areas including exposed ducts, piping, conduit, louvers, and grilles to match adjacent surfaces except when factory finished to color matching adjacent surface.
 - 3. Paint exterior exposed equipment where noted on the Drawings.
- C. Workmanship: Tint undercoats slightly darker than finish coat to aid Inspector in verifying coverage of each coat. Assume all responsibility for paint coats applied over surfaces and undercoats that have not been inspected and approved by Architect. Apply any additional coats of paint, as directed by Architect where surface preparation and undercoats have not been approved before painting. Make finished work match approved samples.
- D. Drywall and Plaster Surfaces: Paint shall not be applied to any surface until it is thoroughly dry and cured. Prime surfaces that show hot spots or alkali in order to prevent such blemishes from showing through the paint. Brush off all loose particles or crystals that may have formed.
- E. Colors: Refer to the Color Schedule included at the end of this Section. Colors have been selected from color chips in the Architect's office. Match the colors to these chips. Job mixing and tinting will not be allowed.

3.4 ADJUSTING AND CLEANING

- A. Remove, refinish or repaint work not in compliance with specified requirements. Recoat work not meeting minimum dry film thickness.
- B. Correct any painting related damage by cleaning, repairing or replacing and refinishing as directed.
- C. Repaint lines between accent colors as directed to obtain clean straight lines.
- D. Remove paint splatters from plastic laminate, resilient flooring, anodized aluminum, glass and similar finished surfaced.
- E. Touch up factory finished surfaces damaged during construction.

PAINTING

3.5 EXTRA STOCK

- A. Deliver extra stock of finish paint equal to 10% (to the nearest gallon) of each color and gloss used. Do not exceed 5 gallons of each color and gloss.
- B. Deliver extra stock in 1 or 5 gallon unopened containers.
- C. Keep list of stock delivered to Owner and submit with Closeout Manuals.

3.6 EXTERIOR COLOR SCHEDULE

- A. Exterior Hollow Metal Doors: Match Miller Paint Company No. 0565W “Elk Skin”.
- B. Exterior Hollow Metal Door Frames: Match Miller Paint Company No. 0565W “Elk Skin”.
- C. Coiling Doors: Match Miller Paint Company No. 0565 W “Elk Skin”.
- D. Coiling Counter Doors: Match Miller Paint Company No. 0565 W “Elk Skin”.
- E. Galvanized Exterior Handrails and Guardrails: Do not paint.
- F. Acoustic Metal Deck: Match Miller Paint Company No. CW051 W “Solo White”.
- G. Exposed Steel Roof Structural Members: Match Miller Paint Company No. CW051 W “Solo White”.
- H. Steel Columns: Match AEP Span “Cool Metallic Silver”.
- I. Steel Railings and Handrails at Site Ramps and Site Stairs: Do not paint.
- J. Steel Pipe Downspouts: Match AEP Span “Cool Metallic Silver”.

3.7 INTERIOR COLOR SCHEDULE

- A. General Interior Wall Color: As selected by Architect.
- B. General Interior Ceiling Color: As selected by Architect.
- C. Interior Hollow Metal Doors: Match Miller Paint Company No. 0565W “Elk Skin”.
- D. Interior Hollow Metal Door Frames: Match Miller Paint Company No. 0565W “Elk Skin”.
- E. Galvanized Interior Handrails and Guardrails: Do not paint.
- F. Galvanized Steel Stairs and Handrails: Do not paint.
- G. Plywood Floor: As selected by Architect.
- H. Countertop Brackets: Paint to match adjacent wall color.
- I. Logo at Concessions 101: Colors as directed by Architect.

END OF SECTION

SIGNAGE

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide identification devices and signage in locations and as detailed on the Drawings and as specified herein. Includes:
 - 1. Door Frame Signs (Base Bid).
 - 2. Room Identification Signs (Base Bid).
 - 3. Restroom Signs (if Alternate No. 2 is exercised by the Owner).

1.2 SUBMITTALS

- A. Shop Drawings: Submit fabrication and erection drawings. Indicate sign layout, typical letter spacing, dimensions, elevations, and connection details. Indicate sign location and required connection to building structure. Furnish spacing templates for individual mounted letters and numbers.
- B. Product Data: Submit product information on each type of sign system.
- C. Office Samples: Submit sample of color and finish for sign letter and background materials. Furnish one full sized sample of a door sign.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Door Frame Signs:
 - 1. Fox Architectural Signs, or accepted substitute.
 - 2. Or accepted substitute.

2.2 DOOR FRAME SIGNS (BASE BID)

- A. Clear Matte Acrylic Face: 1/8" thick; non-glare acrylic.
- B. Subsurface Printing: Letter and Background subsurface painted.
- C. Plaque sizes: 1 1/2" high x 4" wide.
- D. Letter Style/Font: Match existing High School Building Signs; field verify prior to ordering.
- E. Text Sizes 1" high. (Field verify prior to ordering.)
- F. Letter Color: White.
- G. Letter Spacing: Normal.
- H. Copy Position: Centered.
- I. Mounting Method: 3M "VHB" Tape.
- J. Sign Corners: Square.

SIGNAGE

2.3 ROOM IDENTIFICATION SIGNS (ACRYLIC LAMINATED PLAQUE SIGNS) (BASE BID)

- A. Clear Matte Acrylic Face: 1/16" thick.
- B. Subsurface Printing: Letter and Background printed on clear face.
- C. White or Black Opaque Acrylic Base: 1/8" thick.
- D. Plaque sizes: 6" x 6".
- F. Background color: Black laminated to Base.
- H. Letter Style: Helvetica Medium.
- I. Letter Sizes:
 - 1. Room Number: ½" high.
 - 2. Room Name: ¾" high.
- J. Letter Color: White.
- K. Letter Spacing: Normal.
- L. Copy Position: Similar to layout shown on Drawing at the end of this Section.
- M. Mounting Method: Vinyl foam tape, magnetic tape, shim plate, pressure sensitive, silastic adhesive with vinyl foam tape or mechanical screws.
- N. Sign Corners: Square.

2.4 RESTROOM SIGNS (ALTERNATE NO. 2)

- A. Unisex Restroom Signs: ADA compliant signs with International Unisex Symbol with text reading "Restroom" and Type II Braille. White text and symbols on blue background.
 - 1. Approximate Size: 12" x 12".
- B. Unisex/Accessible Restroom Signs: Same as above, with added International Symbol of Access (ISA).

2.4 FASTENERS

- A. Mounting Tape: 3M "VHB" Tape.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Sign Location: As indicated on the Drawings.
 - 1. Door Frame Signs (Base Bid): Mount on face of hollow metal door frame. Locate on head of frame at jamb side corner.
 - 2. Room Identification Signs (Base Bid): Mount on wall at strike side of door. Locate 5'-0" above adjacent floor to center of sign unless otherwise noted.
 - 3. Restroom Signs (Alternate No. 2): Mount on wall at strike side of restroom stall door. Locate 5'-0" above adjacent floor to center of sign unless otherwise noted.

SIGNAGE

- B. Mounting of Door Frame Signs: Use 3M “VHB” Tape to mount signs to door frames.
- C. Mounting of Room Identification and Restroom Signs (Alternate No. 2): Use 3M “VHB” Tape to mount signs to wall surface.

3.2 ADJUSTING AND CLEANING

- A. Relocate misplaced letters, numbers, and signs.
- B. Replace defective or damaged signs.
- C. Clean substrate and sign face prior to Substantial Completion.

3.3 SIGN SCHEDULE – DOOR FRAME SIGNS (BASE BID)

A. Lower Level:

<u>Sign #</u>	<u>Copy</u>	<u>Location</u>
1	101	At Door 101A to Concessions 101
2	102	At Door 102A to Electrical Room 102
3	103A	At Door 103A to Riser Room 103
4	103B	At Door 103B to Riser Room 103

B. Main Level:

<u>Sign #</u>	<u>Copy</u>	<u>Location</u>
5	106B	At Door 106B to West Stair 106
6	107B	At Door 107B to East Stair 107

C. Press Box Level:

<u>Sign #</u>	<u>Copy</u>	<u>Location</u>
7	106A	At Door 106A to West Stair 106
8	107A	At Door 107A to East Stair 107
9	201	At Door 201A to Team Room 201
10	202	At Door 202A to Media Room 202
11	203	At Door 203A to TV Radio Internet Room 203
12	204	At Door 204A to Newspaper Media 204
13	205	At Door 205A to Team Room 205

SIGNAGE

3.4 SIGN SCHEDULE - ROOM IDENTIFICATION SIGNS (BASE BID)

A. Lower Level:

<u>Sign #</u>	<u>Copy</u>	<u>Location</u>
14	102 Electrical	At Door 102A to Electrical 102
15	103 Riser Room	At Door 103A to Riser Room 103

B. Press Box Level:

<u>Sign #</u>	<u>Copy</u>	<u>Location</u>
16	201 Team Room	At Door 201A to Team Room 201
17	202 Media Room	At Door 202A to Media Room 202
18	203 TV Radio Internet Room	At Door 203A to TV Radio Internet Room 203
19	204 Newspaper Media	At Door 204A to Newspaper Media 204
20	205 Team Room	At Door 205A to Team Room 205

3.5 SIGN SCHEDULE - RESTROOM SIGNS (ALTERNATE NO. 2)

- A. Unisex Restroom Signs:** Provide at each restroom stall (11 total locations). Locate at strike side of door.
- B. Unisex/Accessible Restroom Signs:** Provide at each accessible restroom stall (3 total locations). Locate at strike side of door.

END OF SECTION

TOILET ACCESSORIES

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. If Alternate No. 1 is exercised by the Owner, provide accessories as shown on Drawings and as specified herein.
- B. If Alternate No. 2 is exercised by the Owner, provide accessory fixtures specified and shown on the Drawings. Supply in type, size, number, and kind necessary to complete the work. Examine the Drawings for locations and special installation details.

1.2 SUBMITTALS

- A. Product Data: Submit one copy of manufacturer's product data for each type of accessory. Indicate mounting method and finishes.

1.3 SCHEDULING

- A. Install accessory items after painting and toilet partition work is completed within each work area.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Bobrick (Specification Base)
- B. Bradley
- C. McKinney
- D. ASI
- E. Or accepted substitute.

2.2 ACCESSORIES

- A. Contractor Furnished; Contractor Installed Accessories:
 - 1. Shelf with Mop and Broom Holders and Rag Hooks: Surface mounted stainless steel, 36" long, 4 cam mop holders, 3 hooks, rod for wet rags below shelf, Bobrick #B224-36.
 - 2. Mirrors: Glass mirrors with stainless steel frames. Standard sizes as shown on the Drawings. Bobrick 290 Series. Provide special sizes as shown on the Drawings as required.
 - 3. Waste Receptacle: Owner Furnished; Contractor Installed.
 - 4. Toilet Seat Cover Dispensers: Surface mounted, Type 304 stainless steel with satin finish. Designed to dispense 250 single or half-fold paper toilet seat covers. Bobrick #B221.
 - 5. Grab Bars:
 - a. Type 1: Side Wall - Horizontal: 18-gage, type 304 stainless steel; 1-1/2" diameter by 42" long; satin finish; concealed mounting. Bobrick #B6806 x 42.
 - b. Type 2: Side Wall - Vertical: 18-gage, type 304 stainless steel; 1-1/2" diameter by 18" long; satin finish; concealed mounting. Bobrick #B6806-18.
 - c. Type 3: Back Wall: 18-gage, Type 304 stainless steel; 1-1/2" diameter by 36" long; satin finish; concealed mounting. Bobrick #B6806 x 36.

TOILET ACCESSORIES

6. Napkin/Tampon Dispenser: Surface mounted with two dispensing mechanisms, one for 30 sanitary napkins, the other for 24 tampons minimum. 18-gage type 304 stainless steel door (satin finish); stainless steel full length piano hinge. Type 304 (satin finish) stainless steel cabinet and flange. 25¢ operation coin mechanisms. Tumbler type keys. Bobrick #B282.
 7. Sanitary Napkin Disposals: Surface mounted on toilet partition with self closing disposal door. 1.3 gal capacity. Bobrick #B254.
 8. Baby Changing Stations:
 - a. Type A - Baby Changing Station Horizontal: Supports static loads up to 400 pounds Steel-on-Steel hinges with 12-gage steel mounting supports ADA compliant with proper installation. Child protection straps and diaper bag hook. Molded-in liner dispenser will hold approximately 25 sanitary liners. FDA approved blow-molded high-density polyethylene with Microban Antimicrobial additive (resists odors and bacterial growth). Reinforced full-length steel-on-steel hinge mechanism, with 11-gage steel mounting plates and mounting hardware included. Molded in graphics and safety messages in six languages and Braille. Contoured changing surface area is 442 square inches (2873 sq mm). Dimensions: 36" L x 22" W x 4" H. Manufacturer: Koala KB100, or accepted substitute. Color (Crème, Grey, or White Granite) as selected by Architect.
- B. Owner Furnished; Contractor Installed (OFICI) Accessories:
1. Soap Dispensers.
 2. Paper Towel Dispensers.
 3. Roll Paper Towel Dispenser.
 4. Toilet Paper Dispensers.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Verify that walls and surfaces to which accessories are to be mounted are reinforced or provided with backing or blocking for solid anchorage. Provide additional support where required. Provide fasteners long enough to penetrate into solid anchorage. Fastening with toggle bolts, molly screws, or similar fittings not permitted.

3.2 INSTALLATION

- A. Install toilet accessory units in accordance with the manufacturer's instructions, using vandal-resistant fasteners appropriate to the substrate and recommended by the manufacturer of the unit.
- B. Install units plumb and level, firmly anchored in locations indicated on the Drawings and as directed by Architect. Mount accessories at heights recommended by manufacturer or as indicated on the Drawings. Verify required installation variations with the Architect prior to proceeding with the Work.

3.3 ADJUSTING AND CLEANING

- A. Bent, dented, or racked items are not acceptable. Field repairs are not permitted. Remove and replace damaged or improperly placed accessories.
- B. Adjust toilet accessories for proper operation and verify that mechanisms function smoothly.
- C. Clean and polish all exposed surfaces after removing protective coatings. Refinish scratched or abraded finishes equal to original finish and indistinguishable from adjacent surfaces.

TOILET ACCESSORIES

3.4 ACCESSORIES SCHEDULE

- A. Concessions 101 (Alternated No. 1):
 - 1. Soap Dispensers: 1 required; OFCI.
 - 2. Roll Paper Towel Dispenser: 1 required; OFCI.
- B. Unisex RR 103A (Alternate No. 2):
 - 1. Mirror: 3 required; size as indicated on the Drawings.
 - 2. Soap Dispensers: 3 required; OFCI.
 - 3. Paper Towel Dispenser: 3 required; OFCI.
 - 4. Toilet Paper Dispenser: 1 at each stall required (7 total); OFCI.
 - 5. Seat Cover Dispenser: 1 at each stall required (7 total).
 - 6. Napkin Disposals: 1 at each stall required (7 total).
- C. Unisex RR 104B (Alternate No. 2):
 - 1. Mirror: 4 required; size as indicated on the Drawings.
 - 2. Soap Dispensers: 4 required; OFCI.
 - 3. Paper Towel Dispenser: 2 required; OFCI.
 - 4. Toilet Paper Dispenser: 1 at each stall required (7 total); OFCI.
 - 5. Seat Cover Dispenser: 1 at each stall required (7 total).
 - 6. Grab Bars (at 2 ADA Stalls Only): Type 1 - 1 required at each ADA Stall; Type 2 - 1 required at each ADA Stall; Type 3 - 1 required at each ADA Stall.
 - 7. Napkin Disposals: 1 at each stall required (7 total).
 - 8. Napkin/Tampon Dispenser: 2 required at each ADA Accessible Stall.

END OF SECTION

FIRE PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide fire extinguishers where shown on Drawings and specified herein.

1.2 STANDARDS

- A. U.L. rated or Factory Mutual approved extinguishers for type, rating, and classification of extinguishers indicated, and as acceptable to Architect and Local Fire Marshal.

1.3 SUBMITTALS

- A. Submit product data showing finishes and door styles for review by Architect prior to fabrication.

PART 2 - PRODUCTS

2.1 APPROVED MANUFACTURERS

- A. Larsens Mfg. Co.
- B. J. L. Industries.
- C. Potter-Roemer, Inc.
- D. Or accepted substitute.

2.2 MATERIALS

- A. Fire Extinguishers: Provide fire extinguishers of type indicated.
 - 1. Dry Chemical Type: UL-rated 10-B:C, 5-lb. nominal capacity, enameled steel container. Type suitable for exterior locations.
- B. Fire Extinguisher Mounting Brackets: Manufacturer's standard, of proper size for type and capacity of extinguisher indicated. Provide mounting bracket for each extinguisher.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's directions for type of mounting required at height and locations indicated, or if not indicated, to comply with applicable regulations of governing authorities.

FIRE PROTECTION SPECIALTIES

3.3 SCHEDULE

- A. Provide at the following locations as indicated on Drawings:
 - 1. Concessions 101.
 - 2. Elec. 102.
 - 3. Team Room 201 (Exterior Wall).
 - 4. Team Room 205 (Exterior Wall).

END OF SECTION

MANUFACTURED METAL CASEWORK

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide stainless steel casework at Concessions 101 as indicated on the Drawings and as specified herein.

1.2 REFERENCES

- A. National Sanitation Foundation (NSF).

1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's product data.

1.4 QUALITY ASSURANCE

- A. Equipment shall meet the standards set by the National Sanitation Foundation (NSF), which tests public safety, health, and environment.

1.5 WARRANTY

- A. Provide manufacturer's lifetime 5-year warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Universal (as supplied by Elite Restaurant Equipment, Inc.) (Specification)

2.2 EQUIPMENT

- A. Front Units: 24" X 72" Stainless Steel Cabinet - Open Front - w/out Backsplash. 18 gauge stainless steel construction. Built on a Heavy Duty Stainless Steel Frame.
 - 1. Length: 24".
 - 2. Width: 72".
 - 3. Height: 36".
 - 4. Cabinet: Stainless steel cabinet includes one shelf, or 2 levels of storage.
 - 5. Table Top Material: Stainless steel.
 - 6. Door Style: Open front.
 - 7. Leg Style: Stainless steel.
 - 8. Legs: Adjustable ABS Bullet Feet.
 - 9. Manufacturer: Universal.
 - a. SKU: ST-324-72-O-BS.
 - 10. Quantity Required: As indicated on Drawings.
- B. Rear Units: 24" X 72" Stainless Steel Cabinet - Sliding Doors - w/ Backsplash. 18 gauge stainless steel construction. Built on a Heavy Duty Stainless Steel Frame.
 - 1. Length: 24".
 - 2. Width: 72".
 - 3. Height: 36".
 - 4. Cabinet: Stainless steel cabinet includes one shelf, or 2 levels of storage.

MANUFACTURED METAL CASEWORK

5. Table Top Material: Stainless steel.
6. Door Style: Sliding.
7. Leg Style: Stainless steel.
8. Legs: Adjustable ABS Bullet Feet.
9. Manufacturer: Universal.
 - a. SKU: ST-324-72-BS.
10. Quantity Required: As indicated on Drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install at locations indicated on Drawings.
- B. Adjust feet as required to level equipment align adjacent units.

END OF SECTION

GRANDSTANDS

PART 1 - GENERAL

1.1 SYSTEM DESCRIPTION

- A. Provide labor, material, equipment and supervision necessary to complete installation of permanent steel grandstand, including the following:
 - 1. Steel Substructure.
 - 2. Decking System.
 - 3. Concrete Foundation.
- B. Modify 3 rows of existing grandstand seating as indicated on Drawings to provide level platform for accessible wheelchair seating.
- C. Modify back row of existing bleachers as indicated on Drawings with new seat cover and back rest.

1.2 REFERENCES

- A. American Architectural Manufacturers Association (AAMA):
 - 1. AAMA 603.8-92: Pigmented Organic Coating on Extruded Aluminum.
 - 2. AAMA 2603: Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality.
- B. The Aluminum Association (AA):
 - 1. Aluminum Association Specification AA-M10C22A31.
- C. ASTM International (ASTM):
 - 1. ASTM A36: Standard Specification for Carbon Structural Steel.
 - 2. ASTM A123: Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - 3. ASTM A307: Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.
 - 4. ASTM A572: Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
 - 5. ASTM A529-50: Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality.
 - 6. ASTM A500: Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
- D. International Building Code (IBC).
- E. International Code Council (ICC):
 - 1. ICC 300: Bleachers, Folding and Telescopic Seating, and Grandstands.

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturers must have ten years of experience in the manufacture of bleachers and grandstands; manufacturer must exhibit proof of business existence for past five years with documentation; welders must be AWS certified.

GRANDSTANDS

- B. Installer Qualifications: Experienced in the proper installation of grandstands.
- C. Source Quality Control: Mill Test Certification.

1.4 SUBMITTALS

- A. Manufacturer's Product Data: Submit manufacturer's descriptive product data for project.
- B. Shop Drawings: Manufacturer to submit shop drawings sealed by a registered engineer and shall be of sufficient clarity to indicate the location, nature and extent of the work proposed and show in detail that it will conform to the applicable code and relevant laws.
- C. Product Sample: Submit one 18- inch seat sample.
- D. Color Sample: If applicable, submit sample.

1.5 SITE CONDITIONS

- A. Underground Utility Line: Owner to clearly mark all underground utilities and obstructions and Owner to relocate all that conflict with grandstand.
- B. Soil Test: Furnished by Owner.

1.6 BUILDING CODES

- A. Must meet or exceed all State and Local applicable codes and in compliance with the International Building Code adopted by the jurisdiction and CABO/ANSI A117.1 Barrier Free Subcode, and ICC 300.

1.7 WARRANTY

- A. Permanent Grandstand shall be under warranty for a period of five (5) years beginning at Date of Substantial Completion for Projects installed by Manufacturer. The warranty will provide for repair or replacement of failed components due to defect in materials and workmanship of installation for the specified period. This warranty excludes any other defects resulting from abnormal use in service, vandalism, weathering, oxidation, accidental or intentional damage or any occurrences beyond Manufacturer's control.

1.8 MAINTENANCE

- A. Owner is to conduct annual inspection and required maintenance of grandstand to assure safe conditions. It is also recommended that a professional engineer or registered architect perform inspections biennially.

GRANDSTANDS

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Southern Bleacher Company (800) 433-0912. Leg Truss Design.
- B. Or accepted substitute.

2.2 PERMANENT STEEL GRANDSTAND

- A. Product Description
 - 1. Leg Truss Design: Gross seating capacity of 600, 8 rows, and 112'-6" long.
 - 2. Vertical columns are placed 6 feet 0 inches on center laterally and as required on front to back.
 - 3. Stringers:
 - a. Stringers are wide flange with steel angle rise and depth fabrication and are placed 6 feet on center.
 - b. Rear of stringers to be attached to rear CMU wall and designed to transfer lateral loads to foundation.
 - c. Reaction loads of rear wall provided by others and included in design calculations for bleacher structure. See Structural Drawings.
 - 4. Front Walkway:
 - a. Width: 6'-3".
 - b. Elevated 3 feet above grade at benchmark.
 - 5. Entry stairs to be firmly anchored to uniformly poured concrete bases.
 - a. Stair Rise: 7 inches maximum with aluminum closure and contrasting aluminum stair nose.
 - b. Stair Tread Depth: 11 inches minimum.
 - c. Guardrails: As required by code.
 - d. Stairs to have handrail extension. The handgrip portion of handrails shall not be less than 1 1/2 inches or more than 2 inches in cross-sectional dimension or the shape shall provide an equivalent gripping surface. The handgrip portion of handrails shall have a smooth surface with no sharp corners. The top of handrails and handrail extensions shall be placed not less than 34 inches or more than 38 inches above the nosing of treads and landings. Where handrails are not continuous between flights, the handrails shall extend horizontally at least 12 inches beyond the top riser and continue to slope for the depth of one tread beyond the bottom riser. Ends shall be returned or shall terminate in newel posts or safety terminals.
 - 6. Aisles:
 - a. Aisles with seating on both sides to have discontinuous mid-aisle handrails. The handrails shall be discontinuous with breaks at intervals not to exceed five rows. These breaks shall have a clear width of at least 22 inches and not greater than 36 inches horizontally.
 - b. Anodized aluminum handrails with rounded ends to be provided with an intermediate handrail below the main handrail.
 - c. Aluminum tread nosing of contrasting color on aisle steps.
 - d. Halfsteps shall be provided for riser heights above 8 inches.

GRANDSTANDS

- e. Half steps shall provide equal rise and run throughout aisle. Each shall have aisle nosing with non-skid black powder coated finish or other paint system meeting AAMA 603.8-92 specifications with a hardness rating of 2H and riser closure with clear anodized finish.
- f. Aisles with a riser height of non-uniformity shall be indicated with distinctive markings as required by code.
- 7. Decking:
 - a. Rise per row 14 inches, depth per row 24 inches.
 - b. Each seat 17 inches above its respective tread.
 - c. Mill Aluminum Decking Arrangement:
 - 1) INTERLOCK Aluminum Decking System.
 - d. Seating Selection:
 - 1) Anodized Aluminum Bench Seat.
 - a) 2 x 10 (standard), Die #7758 with height of 1 1/2".
- 8. Guardrailing:
 - a. To be at front of bleacher and entry stairs landings. Railing to be anodized aluminum with end plugs at ends of straight runs and/or elbows at corner. All guardrails shall be secured to angle rail risers by galvanized fasteners. Railing shall be at heights as required by code for its location on the grandstand. Guardrailing shall include intermediate railing, fastened in place with galvanized fasteners and aluminum ties.
 - b. Side and rear of grandstand to have CMU walls provided by others.
- 9. Front Façade:
 - a. Anodized aluminum riser boards from front walk height to within 2" above grade.
 - b. Horizontal closure provided to close opening from back of risers to front of tread plank on front walk.
 - c. Façade to be full length at front and around sides of front landings and stairs.
- 10. Premium Stadium Seating at back row of existing grandstands:
 - a. Product: Elite Seat II with back rest.
 - b. Color: Royal Blue
 - c. Quantity: Provide a maximum of 40 seats with back rest.
- 11. Handicap Provision:
 - a. Quantity of wheelchair spaces: Existing wheelchair spaces in lower seating adequate for this addition.
- B. Materials/Finishes:
 - 1. Substructures:
 - a. Structural shapes meet one of the following ASTM specifications: A36, A36/A572 grade 50, A572 grade 50, A529-50, or A500 grade B.
 - b. Shop connections are seal welds.
 - c. After fabrication, all steel is hot-dipped galvanized to ASTM-A-123 specifications.
 - d. Painted steel finish is unacceptable.
 - 2. Extruded Aluminum:
 - a. Seat Planks, Backrests, Stanchions, Riser Planks, and Railing are extruded aluminum alloy, 6063-T6.
 - 1) Clear anodized 204R1, AA-M10C22A31, Class II finish.
 - b. Tread planks are extruded aluminum alloy 6063-T6 mill finish.
 - c. Railing: Extruded aluminum alloy, 6063-T6 clear anodized 204R1, AA-M10C22A31, Class II.
 - 3. Accessories:
 - a. Channel End Caps: Aluminum alloy 6063-T6, clear anodized 204R1, AA-M10C22A31, Class II.

GRANDSTANDS

- b. Hardware:
 - 1) Bolts, Nuts: Hot-dipped galvanized or mechanically galvanized.
 - 2) Hold-down Clip Assembly: Aluminum alloy 6005A-T6, mill finish.
 - 3) Structural Hardware: Equal to or greater than hot-dipped galvanized ASTM-A307. No connections utilizing high strength bolts are classed as slip critical.
- c. Aisle Nose and Stair Nose: Aluminum alloy, 6063-T6, non-skid black powder coated finish or other paint system meeting AAMA 603.8-92 specifications with a hardness rating of 2H.
- C. Fabrication:
 - 1. Design Load:
 - a. Tread and Seat Area: 100 psf uniform live load.
 - b. Seat (Vertical): 120 lbs/lf.
 - c. Seat (Horizontal Sway): 24 lbs/lf parallel and 10 lbs/lf perpendicular to seat.
 - d. Handrail and Guardrail: 50 lbs/lf in any direction.
 - e. Handrail and Guardrail: 200 lbs concentrated in any direction.
 - f. Snow Loads: As per State adopted code.
 - g. Wind Loads: As per State adopted code.
 - h. Seismic Loads: As per State adopted code.
 - i. Additional Loads from CMU Wall: Reference detail 15/S8.1.
 - 2. All manufactured connections to be shop welded.
 - a. Manufactured by certified welders conforming to AWS Standards.

2.3 EXISTING GRANDSTAND MODIFICATION MATERIALS

- A. Provide materials required to modify 3 existing rows of the existing grandstand as indicated on Drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. All work performed by technicians experienced in bleacher seating installation.
- B. Project as per approved shop drawings.

3.2 FIELD QUALITY CONTROL

- A. Foundation: Footings for the grandstand shall provide sufficient bearing area at bottom to support all loads of the grandstand. Depth and design of footings shall be determined by Owner supplied soil test. Hot-dipped galvanized anchor bolts shall be secured in the concrete footings. Concrete shall attain working strength of 3,000 psi.

3.3 MODIFICATIONS TO EXISTING GRANDSTAND

- A. Make modifications to 3 rows of existing grandstand as indicated on Drawings to provide level platform area for wheelchairs.

GRANDSTANDS

3.4 CLEAN-UP

- A. Clean up all debris caused by work of this section.
- B. The Owner, Architect and Contractor acknowledge and accept that mill finish aluminum as specified will have water stains present from transportation and storage during installation. Removal of these stains is not part of this Contract.
- C. Stand to be broom cleaned at completion.

END OF SECTION

WATER BASED FIRE SUPPRESSION SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Work included: Providing complete design and installation of automatic dry fire sprinkler system systems for the project in accordance with the latest edition of NFPA 13.
- B. Scope:
 - 1. Obtain water supply as located on the civil engineering drawings.
 - 2. Route sprinkler main into riser room and route distribution piping throughout the building.
 - 3. Provide 100% fire sprinkler protection for the areas of work noted on the architectural and mechanical drawings per NFPA and local fire bureau requirements.
 - 4. Clearly note all exposed piping on the design drawings and coordinate with the architect prior to fabrication.
 - 5. Provide complete coverage.

1.2 SUBMITTALS

- A. Include all required engineering of the fire sprinkler system.
- B. Transmit submittals for review per the architectural requirements.
- C. Include shop drawings with the submittals where necessary to determine clearance, where the contractor proposes alternate equipment or material arrangements, and when requested by the architect.
- D. Items transmitted for approval must be received in the architect's office within 45 days of contract award. The architect must approve all material and equipment prior to installation.
- E. Review of submittals or shop drawings by the architect does not relieve the contractor from the requirements of the contract documents unless specific approval has been requested for a given deviation.
- F. Submittals shall include:
 - 1. Manufacturer's catalog or technical data showing performance, dimensions, materials of construction, and recommended methods of installation.
 - 2. Submit locations of all inspector test stations, building drains, alarm bells and other visible appurtenances to the architect for review.
 - 3. Specifically note locations of exposed piping on the shop drawings for Architect review.
 - 4. Provide information and coordinate with electrical contractor as to locations and power requirements for all alarms, tamper switches, flow switches etc.
 - 5. After Architect's review, prepare fire protection system shop drawings as required by code showing location piping, alarm valves, piping sizes, test tees and valves, drain valves and other related items. Submit drawings to the governing fire bureau and appropriate insurance services for review per owner's requirements. After changes by the reviews are made, submit three sets of approved drawings to the Architect.
 - 6. Final submittals are to include the governing fire bureau stamp of design acceptance.

1.3 OPERATION AND MAINTENANCE DATA

- A. Provide O&M data in accordance with Section 22 00 00.
- B. O&M data shall include:
 - 1. Manufacturer's literature for all equipment and materials.

WATER BASED FIRE SUPPRESSION SYSTEMS

2. Maintenance instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Butterfly, gate, and swing check valves: Nibco, Kennedy, Stockham, Hammond, Tyco, or approved equal.
- B. Double check valve / detector check valve assemblies: Ames, Febco, Watts, Kennedy, Viking, or approved equal.
- C. Water flow indicators: Tyco, Gem, Reliable, Viking, Watts, or approved equal.
- D. Water motor gongs: Tyco, Gem, Reliable, Viking, or approved equal.
- E. Fire department connection: Potter-Roemer, Guardian, Powhatan, Elkhart Brass, or approved equal.
- F. Sprinkler heads: Tyco, Viking, Gem, Central, Reliable, or approved equal.
 1. Sprinkler Heads: Heads shall be UL listed standard product of the manufacturer.
 2. Non-Ceiling Area: Upright with standard brass finish.
 3. Sidewall Heads: Satin chrome finish.
 4. Provide the number of spare sprinklers required by NFPA code for each type in metal cabinet with sprinkler wrench.
 5. Provide hard wire sprinkler head guards in all:
 - a. Electrical rooms.
 - b. Mechanical mezzanines.
 - c. Janitors / IDF rooms.
 - d. Boiler room.
 - e. Storage rooms

2.2 DESCRIPTION

- A. Piping Material:
 1. Black Steel: Schedule 40 black steel or steel tubing with flanged, screwed or mechanical joint fittings.
 2. Galvanized (dry systems): Schedule 40 galvanized pipe with screwed fittings.
 3. Provide test orifices, miscellaneous valves, signing and appurtenances as required

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Provide only UL listed components.
- B. Provide complete hydraulically designed system(s) as required by the Uniform Building Code, NFPA Standard 13 and the governing fire bureau.
 1. Provide all piping, alarms, fire department connections, fire hose cabinets, test orifices, miscellaneous valves, signing and appurtenances as required.
 2. The exact number of heads and design required will be determined by the contractor based upon drawings approved by the local fire bureau. The contractor is to provide fully designed and functional sprinkler systems meeting the requirements of NFPA and the local fire bureau. Provide all design, heads and equipment required for the complete functional systems.
 3. Coordinate sprinkler mains with drain fixtures and verify adequate drain receptors are available for the system, inspectors test, etc.

WATER BASED FIRE SUPPRESSION SYSTEMS

4. Coordinate pipe routing with other trades requiring ceiling space for the installation of their equipment. Locate riser, valves, controls and accessories in the location approved and coordinated with the owner's representative. Coordinate with other trades and specialty drawings to determine exact riser location in room.
- C. Provide dry sprinkler coverage for all areas. Refer to architectural plans and details for location coordination. Provide complete protection for all covered exterior areas as required by applicable NFPA codes and the local fire bureau. Coordinate miscellaneous canopies, etc. with the architectural drawings and provide coverage as required. Verify all areas subject to freezing on the architectural drawings and provide dry type heads/systems, anti-freeze systems or coordinate with the appropriate sub-contractor to provide freeze protection in those areas.
 1. Dry systems shall be charged at all times with air.
 2. Oil-fueled compressors are shall be used and shall be capable of filling the system in less than 30 minutes.
 3. Dry system piping shall be galvanized or painted.
- D. The contractor is to provide as part of a design build scope all materials and labor required for a complete operating system in accordance with applicable NFPA codes, governing fire bureau and code jurisdictions.
- E. Provide hangers, brackets, supports, anchors and related appurtenances, as required, to support all piping and equipment provided under this section. Piping and equipment supports shall conform to NFPA Standard 13.
- F. Provide seismic bracing and support as required.
- G. Sprinkler head installation:
 1. Ceiling Tile Finishes: Heads are shall be installed in the middle of a square panel and the half panel of a 2 foot x 4 foot ceiling tile.
 2. Heads are shall be coordinated with speakers, smoke detectors, ceiling grilles and other ceiling mounted appurtenances.
 3. Spaces with multiple heads shall have the heads spaced symmetrically within the space. If more than the minimum head number is required for a symmetrical pattern within the space coordinated with other ceiling appurtenances, the symmetrical and coordinated appearance will govern the final layout and design.
 4. Corridors and similar elongated spaces shall have the heads installed in the middle of the space ceiling, not to one side in an asymmetrical pattern.
- H. Piping installation: Fire protection piping systems shall be installed in conformance with NFPA Standard 13. Install all piping in a true and even manner with lines pitched for drainage and system arranged so it can be entirely emptied of water.
- I. Coordinate electrical connections for all flow and tamper switches, alarms and other fire protection system electrical connections required and include the cost of those connections in the bid price. Include in the bid price provisions to bring power to all points of connection related to the sprinkler fire protection system.
- J. Ceiling areas:
 1. Piping shall be concealed in all areas except those that have no ceilings and then it shall be coordinated with the Architect.
 2. Review the architectural demolition plans to note points of ceiling access for piping installation.
 3. Review the ceiling and other site conditions prior to bid.

WATER BASED FIRE SUPPRESSION SYSTEMS

- 4. Areas that are deemed to not have access for piping installation will be required to have new openings cut into existing ceiling areas for piping and head installation. Coordinate these openings with the architect and general contractor.
 - 5. Include all required cutting and patching costs in the initial bid costs.
 - K. Non-ceiling areas: Piping locations shall be exposed and coordinated with lights, ducts and other equipment. Review all exposed sprinkler head locations with the architect prior to installation.
 - L. Perform all tests and arrange for required inspections of installed system as required by NFPA Standard 13. Submit certificates of inspection and tests to Architect.
 - M. The exact number of heads and design required will be determined by the contractor based upon drawings approved by the local fire bureau. The contractor is to provide fully designed and functional sprinkler systems meeting the requirements of NFPA and the local fire bureau. Provide all design, heads and equipment required for the complete functional systems.
 - N. Coordinate sprinkler mains with drain fixtures and verify adequate drain receptors are available for the system, inspectors test, etc.
 - O. Coordinate pipe routing with other trades requiring ceiling space for the installation of their equipment. Locate valves, controls and accessories in the locations approved and coordinated with the architect. Coordinate with other trades and specialty drawings to determine exact riser location in room.
 - P. Coordinate sprinkler pipe routing with the building expansion joints and provide piping and accessories as required.
- 3.2 FIRESTOPPING PENETRATIONS IN FIRE-RATED WALL/FLOOR ASSEMBLIES
- A. Contractors shall provide proper sizing when providing sleeves or core-drilled holes to accommodate their through penetrating items. All voids between sleeve or core-drilled hole and pipe passing through, shall be firestopped to meet the requirements of ASTM E-814.

END OF SECTION

BASIC PLUMBING REQUIREMENTS

PART 1 - GENERAL

1.1 OTHER REQUIREMENTS

- A. The Bidding, General and Supplementary of this project manual and specific sections as noted apply to the work specified in Plumbing Division 22 which encompasses Sections 22 00 00 through 22 42 00. This Section 22 00 00 applies to all sections of Division 22 Plumbing.

1.2 SCOPE

- A. It is the intent of these specifications and the accompanying drawings to describe complete plumbing systems installations for all building areas, new and renovation.
- B. Furnish and install all material, labor and equipment in accordance with these documents.
- C. Include all incidental items and work not specifically shown or specified but required by good practice in a complete system.
- D. The drawings and specifications are complementary. What is called for in one shall be called for in both.
- E. The drawings are diagrammatic but should be followed as closely as possible. Where required by jobsite conditions, relocate and provide fittings, etc., as required. Provide an allowance in the contract bid to furnish additional pipe and fittings required for coordination with structure and other construction trades.

1.3 DEFINITIONS

- A. Or approved equal: Requires approval prior to bid date.
- B. Indicated:
 - 1. The term "indicated" is a cross reference to details, notes, or schedules on the drawings, other paragraphs or schedules in the specifications, and similar means of recording requirements in the Contract Documents.
 - 2. Where terms such as "shown," "noted," "scheduled," and "specified" are used instead of "indicated," it is for the purpose of helping the reader locate the cross reference, and no limitation of location is intended except as specifically noted.
- C. Directed, Requested, Etc.: Where not otherwise explained, terms such as "directed," "requested," "authorized," "selected," "approved," "required," "accepted," and "permitted" mean "directed by the Engineer," "requested by the Engineer," etc. However, no such implied meaning will be interpreted to extend the Engineer's responsibility into the Contractor's area of construction supervision.
- D. Site or Project Site: The space available to the Contractor for the performance of the work, either exclusively or in conjunction with others performing the work as part of the project. The extent of the project site is shown on the plumbing drawings and is not identical with the description of the land upon which the project is to be built.
- E. Approved:
 - 1. Where used in conjunction with the Architect's response to submittals, requests, applications, inquiries, reports and claims by the Contractor, the meaning of the term "approved" will be held to the limitations of the Architect's responsibilities and duties as specified in the General and Supplementary Conditions.

BASIC PLUMBING REQUIREMENTS

2. In no case will "approval" by the Architect be interpreted as a release of the Contractor from responsibilities to fulfill requirements of the Contract Documents.

F. Provide: The term "provide" means to furnish and install, complete and ready for the intended use.

1.4 STANDARDS AND CODES

A. Provide all equipment and material and perform all work in accordance with all local, state and national codes and regulations.

B. For work on this project, comply with appropriate standards published by the following:

- | | | |
|--|-----|--------|
| 1. American Gas Association | AGA | |
| 2. Air Movement and Control Association | | AMCA |
| 3. American National Standards Institute | | ANSI |
| 4. Air-Conditioning and Refrigeration Institute | | ARI |
| 5. Acoustical Society of America | ASA | |
| 6. American Society of Heating, Refrigerating
and Air-Conditioning | | ASHRAE |
| 7. American Society of Mechanical Engineers | | ASME |
| 8. American Society for Testing and Materials | | ASTM |
| 9. City of Lake Oswego, Oregon | | |
| 10. Clackamas County, Oregon | | |
| 11. National Environmental Balancing Bureau | | NEBB |
| 12. National Electrical Manufacturers Association | | NEMA |
| 13. National Fire Protection Association | | NFPA |
| 14. Sheet Metal and Air Conditioning
Contractors' National Association | | SMACNA |
| 15. Underwriters' Laboratories | UL | |
| 16. 2007 International Building Code (w/State of Oregon Amendments) | | UBC |
| 17. International Mechanical Code (w/State of Oregon Amendments -
Oregon Mechanical Specialty Code) | | UMC |
| 18. Uniform Plumbing Code (w/State of Oregon Amendments -
Oregon State Plumbing Specialty Code) | | UPC |

1.5 APPROVAL OF EQUIPMENT AND MATERIALS

A. Manufacturer's trade names, catalog numbers and material specifications used in this specification are intended to establish the quality of equipment or materials expected. Materials and manufacturers not listed require approval prior to the bid date.

B. Approval of substitute equipment or materials will be based upon performance, quality and other factors deemed important by the Architect. The Contractor will be responsible for making all changes in this and other associated work required as a result of the substitution. Additional or modified structural calculations and roof penetrations required to accommodate the substitution will be the responsibility of the contractor.

BASIC PLUMBING REQUIREMENTS

1.6 SUBMITTALS

- A. Transmit five sets of submittals to the Architect for review. The submittals shall be bound in three-ring binders, have major topic tabs and an index. In order to expedite approval of certain items, it is not necessary to transmit complete submittals initially. The initial transmittal will include the binder, expected tabs and an index indicating which items are included, the date each is transmitted, and which items are yet to be transmitted. Future transmittals shall include a revised index.
- B. Furnish performance data and technical information on all materials and equipment to be used on the project.
- C. Include shop drawings with the submittals where necessary to determine clearance, where the Contractor proposes alternate equipment or material arrangements, and when requested by the Architect.
- D. Items transmitted for approval must be received in the Architect's office within 45 days of contract award. The Architect prior to installation must approve all material and equipment.
- E. Review of submittals or shop drawings by the Architect does not relieve the Contractor from the requirements of the Contract Documents unless specific approval has been requested for a given deviation.

1.7 QUALITY ASSURANCE

- A. Maintain the highest standards of workmanship throughout the project.
- B. Use the latest editions of applicable and specifically referenced standards.
- C. Inspect all material and equipment upon arrival at the site and return any which is not in new condition.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 COORDINATION

- A. Cooperate with other trades to assure that construction proceeds in an orderly and timely manner. Contract cost increases due to improperly sequenced work with other trades will not be allowed.
- B. Study the new and existing architectural, structural, electrical, shop and any specialty drawings as appropriate and specifications to determine required coordination.
- C. Prepare detailed shop drawings where necessary to assure proper fit and necessary clearance.
- D. Refer to electrical drawings to verify voltage and phase of plumbing equipment.

3.2 PERMITS, FEES AND INSPECTIONS

- A. Obtain all required permits and pay for all fees and connection charges.
- B. Schedule any required inspections.

BASIC PLUMBING REQUIREMENTS

3.3 MATERIALS AND WORKMANSHIP

- A. Furnish all materials and equipment in new condition, free from defects and of size, make, type and quality specified. Installation shall be in a neat and workmanlike manner.
- B. When two or more items of the same kind, type or class are required, use items of a single manufacturer.

3.4 MEASUREMENTS

- A. Take all measurements from reference datums established by the plumbing contractor.

3.5 DELIVERY, HANDLING AND STORAGE

- A. Receive all material and equipment at the jobsite or shop.
- B. Use proper and sufficient equipment to handle all products employed in the project.
- C. Where storage of material or equipment is necessary, it shall be a clean and weatherproof area. Seal any openings and cover the product to assure that there will be no corrosion or foreign matter introduced. Assure that it will be in new condition when placed in service.

3.6 EQUIPMENT INSTALLATION, BRACING AND SUPPORT

- A. Install all equipment in strict accordance with the manufacturer's instructions unless otherwise indicated.
- B. The drawings in general are based upon one of the specific manufacturers listed for a particular equipment item. The other specified manufacturers and additional approved manufacturers of equipment may require deviations from the drawings to properly install the particular equipment in accordance with the manufacturer's recommendations and to provide the system results required. Provide all work necessary in the base bid price to install this equipment.
- C. Where the installation shown or specified is contrary to the manufacturer's instructions, advise the Architect in writing of the differences before proceeding with the installation.
- D. Anchorage to Floors, Roofs, Etc., Sway Bracing and Seismic Restraints:
 - 1. Provide supports for all apparatus as specified, detailed, as required by the manufacturers of specific equipment and the project governing code authorities. Anchor all roof and base/floor mounted equipment with size and spacing of anchor bolts or other attachment means as recommended by the respective equipment manufacturer.
 - 2. Provide supports for all apparatus as specified, detailed, as required by the manufacturers of specific equipment and the project governing code authorities. Anchor all roof and base/floor mounted equipment with size and spacing of anchor bolts or other attachment means as recommended by the respective equipment manufacturer. Provide seismic restraints on all mechanical equipment in conformance with the 2009 Washington Structural Specialty Code Section 1613 Earthquake Loads. Costs for seismic calculations are to be included in the bid price.
 - 3. Provide deferred submittals directly to the governing code jurisdiction for anchorage to floors, roofs, etc., sway bracing and seismic restraints. Submittals to show locations and sufficient support details as required by the governing code jurisdiction.
 - 4. Maintain a copy of the manufacturer's installation instructions at the jobsite for all equipment.

BASIC PLUMBING REQUIREMENTS

3.7 SLEEVES AND INSERTS

- A. Provide sleeves at all locations where piping and ductwork passes through building construction.
- B. Sleeves for interior walls and floors shall be 22-gauge galvanized or heavier as required. Sleeves for exterior walls shall be cast iron, wall thickness as required.
 - 1. Wall sleeves shall be installed in all exterior walls and all interior masonry or fire-rated walls in a manner that preserves the fire-rated or watertight integrity of the wall.
 - 2. Interior wall sleeves for uninsulated pipe shall allow minimum 1/4-inch clearance all around pipe for pipe movement. Allow 1-inch clearance around pipe at building expansion joints.
 - 3. Interior wall sleeves for insulated piping shall be selected to encompass the pipe and insulation and allow minimum 1/4-inch clearance around insulation for pipe movement. Allow 1-inch clearance around pipe and insulation at building expansion joints.
 - 4. Floor sleeves shall extend 4-inches above the floor and shall be sealed watertight. Floor sleeves shall be oversized to allow 1/2-inch minimum space all around pipe or pipe and insulation where applicable. Seal space between pipe and sleeve with Dow Corning Fire Stop System, 3M brand CP25 or approved equal. Sealant must be between pipe and sleeve. Sealant between insulation and sleeve is not acceptable. Install firestop materials in complete accordance with the manufacturer's instructions and in compliance to applicable UL listings..
- C. Seal space between pipe and sleeve with Dow Corning Fire Stop System, 3M Brand CP25 or approved equal where piping penetrates firewall or floors. Sealant must be between pipe and sleeve; sealant between insulation and sleeve is not acceptable. Install firestop materials in complete accordance with the manufacturer's instructions and in compliance to applicable UL listings.
- D. Utilize Linkseals or similar closures on core-drilled penetrations through below grade walls. Repair existing below grade waterproofing systems as applicable.

3.8 FLOOR, WALL AND CEILING PLATES

- A. Provide escutcheon plates where all exposed piping passes through finished walls, floors and ceilings, including accessible cabinet spaces.
- B. Floor plates: deep recessed, cast brass, chrome plated.
- C. Wall and ceiling plates: spun aluminum, chrome plated.
- D. Secure plates to pipe or structure. Plates shall not penetrate insulation vapor barriers. Size plates to sufficiently cover pipe sleeves and openings in finish materials.

3.9 ACCESS DOORS AND PANESL

- A. Manufacturers: Cesco, Milcor, Elmdor. Cesco used as basis of selection.
- B. Non-rated panels: Style W, SR-1, SR-2, P, PX as required for wall or ceiling construction, 12 inch x 12 inch or larger as required for ease of access.
- C. Fire-rated panels: Style FB, U.L. listed for 1-1/2 hr for fire rated stud and masonry wall systems.
- D. Provide access panels where shown on the drawings or as required for proper access to mechanical appurtenances. Coordinate the installation of access panels is with the specific building construction penetrated. Coordinate access panel installation with Manufacturers instructions.

BASIC PLUMBING REQUIREMENTS

- E. Locate and size access doors to facilitate equipment service and optimize the safety of the maintenance personnel. Minimum access door size to be 18"x 18".

3.10 PROTECTION

- A. Protect all work, material and equipment from loss or damage until the Owner accepts the project.
- B. As the work progresses, keep all equipment covered and cap all piping that may temporarily be left unconnected.
- C. Notify all other trades of any required precautions necessary to protect the work.

3.11 ACCESSIBILITY

- A. Provide convenient access by location or access panel to all equipment requiring periodic service.

3.12 ELECTRICAL WORK

- A. Materials and work to be provided as a part of this Plumbing Division 22 are:
 - 1. Equipment control wiring.
 - 2. Interlock wiring.
 - 3. Motor starters.
- B. Wherever possible, provide all interconnect wiring within or on a piece of equipment with the equipment unless shown or specified otherwise. An electrician licensed to perform this type of work shall perform all field wiring.

3.13 RELATED WORK

- A. The following work and materials are specified elsewhere:
 - 1. Pipe chases, equipment pads and foundations, trenches, painting, air louvers, louvered penthouse and access panels except as otherwise specified in this division.
 - 2. Framed openings, wood grounds and nailing strips, masonry, concrete and other architectural and structural elements.
- B. The following work and materials are specified in Electrical Division:
 - 1. Power wiring.
 - 2. Disconnect switches.
 - 3. Furnishing and installation of disconnect switches.
 - 4. Installation of magnetic starters.

3.14 CLEANING

- A. Maintain premises and public properties free from accumulations of waste, debris and rubbish during construction.
- B. Clean all plumbing equipment of dust, grease, iron cuttings, unnecessary stamps or shipping labels, etc.
- C. Touch up factory-painted surfaces, as necessary, with paint of matching color.

BASIC PLUMBING REQUIREMENTS

3.15 RECORD DRAWINGS

- A. Maintain one set of construction drawings at the jobsite for the sole purpose of recording work of the plumbing contract, as actually installed. Upon request, the Architect will make the original tracings available to the plumbing contractor for printing the drawings. The Contractor shall pay the reproduction costs.
- B. Record all piping by dimensions from gridlines, below grade, above floor, etc. Show location of all access panels, cleanouts, rough-in for future, etc.
- C. Make record drawings available to the Architect for review or reproduction during construction. The Architect will pay any printing costs.
- D. Deliver record drawings to the Architect promptly upon completion of the project.

3.16 OPERATION AND MAINTENANCE MANUALS:

- A. Submit five copies of the Operation and Maintenance Manuals to the Architect for approval before project completion. Bind the instruction books with three-ring 8-1/2" x 11" side binders with plastic covers. Include an index and tabs for major systems and equipment. Operation and Maintenance Manuals shall include the following:
- B. Directories:
 - 1. Supplier Directory: Alphabetical list of principal subcontractors and suppliers of equipment giving names, addresses and telephone numbers.
 - 2. Equipment Directory: List of plumbing equipment installed such as, pumps, water heaters, plumbing fixtures, etc., giving drawing reference numbers, location, area served, manufacturer with model number and supplier.
- C. Manufacturer's Literature:
 - 1. Show name, address and phone number of the nearest service facility authorized by the manufacturer.
 - 2. Include illustrations, diagrams, and instructions for installation, startup, operation, inspections, maintenance, parts list, data sheets and other necessary materials.
 - 3. Include complete electrical, schematic and connection diagrams for each equipment item.
 - 4. Include the name, address and phone number of contractor(s) who furnished and who installed equipment and systems.
 - 5. Where the literature covers more than one model, check off neatly in ink correct model number and data for the model number including all specified options.
 - 6. In those instances where the equipment, its mode of control, or both, is job assembled for special functions, then provide written operating and maintenance instructions prepared by the assembler on 8-1/2" x 11" sheets.
- D. Maintenance Instructions:
 - 1. Where instructions for maintenance are not included in the manufacturer's literature, provide supplemental data to enable proper maintenance of the equipment installed.
 - 2. Include specific lubrication methods and recommended frequencies along with procedures and precautions for inspection and routine service.
- E. Copy of Written Guarantee.
- F. Recommended Spare Parts Stock.

BASIC PLUMBING REQUIREMENTS

3.17 OWNER MEETING

- A. Schedule a meeting between the Contractor's representative and the Owner for the purpose of reviewing operation and maintenance of the building mechanical systems. The Contractor's representative shall be well qualified and knowledgeable of the systems in this facility.
- B. The meeting shall be scheduled to allow the Owner and appropriate subcontractors and equipment suppliers to attend.
- C. The meeting shall be scheduled promptly upon completion of the project and approval of the Operation and Maintenance Manuals.
- D. The Contractor shall review the Operation and Maintenance Manuals and record drawings in detail with the Owner.

3.18 CUTTING AND PATCHING

- A. Cut work as required for installation and patch to match original conditions as directed and approved by Architect. Do not cut structural portion without Architect's approval.
- B. When masonry construction must be penetrated, provide a steel pipe sleeve in opening and grout in place in a neat manner. Leave grout surface to match existing finish.
- C. Prior to cutting any existing work, locate all concealed utilities to eliminate any possible service interruption or damage.

3.19 FIRESTOPPING PENETRATIONS IN FIRE-RATED WALL/FLOOR ASSEMBLIES

- A. Contractors shall provide proper sizing when providing sleeves or core-drilled holes to accommodate the through penetrating items. All voids between sleeve or core-drilled hole and pipe passing through, shall be firestopped to meet the requirements of ASTM E-814.
- B. Fire stop penetrations in accordance with the U.L. listed assemblies provided by the manufacturers of the products used.

3.20 CONTRACT COST DATA

- A. Furnish to the Architect a cost breakdown of the Plumbing Contract with major systems and equipment broken out with itemized costs.

3.21 CHANGE ORDERS

- A. All supplemental cost proposals by the Contractor shall be accompanied with a complete itemized breakdown of labor and materials cost without exception.
- B. Contractor's estimating sheets for the supplemental cost proposals shall be made available to the Architect. Labor must be separated and allocated for each item of work.

3.22 VERIFICATION OF EXISTING CONDITIONS

- A. Verify field conditions and measurements prior to the manufacture or order of materials and equipment.

BASIC PLUMBING REQUIREMENTS

- B. Produce shop drawings with details as required to verify proper installation of materials & equipment in conformance with applicable codes and the manufacturer's requirements.

3.23 SYSTEMS WIRING

	ITEM	FURNISHED BY	INSTALL BY	POWER WIRING	CONTROL WIRING
1.	Division 22 Equipment Motors	Div. 22	Div. 22	Div. 26	Div. 22
2.	Motor Starters, Contactors and Overload Heaters – Integral	Div. 22	Div. 26	Div. 26	Div. 22
3.	Motor Control Centers	Div. 26	Div. 26	Div. 26	Div. 22
4.	Fused & Unfused Disconnect Switches	Div. 26	Div. 26	Div. 26	-----
5.	Manual Operation Switches	Div. 26	Div. 26	Div. 26	Div. 26
6.	Control Relays & Transformers	Div. 22	Div. 22	Div. 22	Div. 22
7.	Energy Management Control Panels	Div. 22	Div. 22	Div. 22	Div. 22
8.	Motorized Solenoid Valves	Div. 22	Div. 22	Div. 22	Div. 22

END OF SECTION

GENERAL DUTY VALVES FOR PLUMBING

PART 1 - GENERAL

1.1 SUMMARY

- A. Work included: Providing of all required valves, cocks and faucets.

1.2 SUBMITTALS

- A. Provide submittals in accordance with Section 22-00-00.
- B. Submittals shall include manufacturer's catalog or technical data showing performance, dimensions, materials of construction and recommended methods of installation.

1.3 OPERATION AND MAINTENANCE DATA

- A. Provide O&M data in accordance with Section 22-00-00.
- B. O&M data will include manufacturer's literature and Maintenance instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Gate Valves, Ball Valves and Drain Valves: Hammond, Stockham, Nibco, Milwaukee or approved equal. Hammond used as basis of selection.

2.2 DESCRIPTION

- A. All valves used in potable water applications are to be third party certified by a state recognized certifying agency to comply with 2014 Federal Lead free act.
- B. Gate Valve (Domestic Water Service): Figure UP 647, Class 125, 200 PSI non-shock cold water rated solder type bronze body gate valve with solid wedge disc, integral seat, threaded bonnet, non-rising stem, iron handwheel.
- C. Ball Valves (Domestic Water Service): Ball valves for domestic water service shall be Figure 8604 (threaded ends) / 8614 (soldered ends), 150 SWP / 600 WOG, 400 PSI non-shock cold water rated 3-piece bronze body ball valve with full port, blow out proof stem, RTFE seats and PTFE packing, free floating chrome plated brass ball.
- D. Drain Valves: Hose end valve, 150 WWP, adjustable packing nut and stuffing box, Buna-N seats, iron handwheel. Provide cap & chain.
- E. Horizontal Swing Check Valves: Figure UP943, 125 lb. screwed, swing check valve with renewable Teflon composition disc.
- F. Vertical/Spring and Silent Check Valves: Acceptable Manufacturers: Metra-Flex or TRW Mission Duo Check II, ASA 150 Class, semi-steel or cast iron body, bronze trim
- G. Natural Gas Service: Hammond 875 ball valve AGA listed for use with natural gas at 5-psig minimum service pressure.

GENERAL DUTY VALVES FOR PLUMBING

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Provide valves at connections to equipment, where shown on the drawings or as required.
- B. Install all valves with stem horizontal or above, accessible and same size as connected piping.
- C. Provide separate support for valves where necessary.
- D. Install check valves in horizontal position only.

END OF SECTION

HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Work included: Providing of all required hangers and supports for piping, and equipment.

1.2 SUBMITTALS

- A. Provide submittals in accordance with Section 22-00-00.
- B. Submittals shall include:
 - 1. Manufacturer's technical literature for all products used indicating service for each type of hanger.
 - 2. Include proposed pre-manufactured piping and duct vibration isolation products.
 - 3. Submit literature or describe duct-supporting method.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. M-CO, Grinnell, Super Strut. M-CO used for selection.
- B. Vibration Isolators:
 - 1. Type of isolator, base, and minimum static deflection shall be as required for each specific equipment application as recommended by isolator or equipment manufacturer but subject to minimum requirements indicated herein.
 - 2. Uniform Loading: Select and locate isolators to produce uniform loading and deflection even when equipment weight is not evenly distributed.
 - 3. Mason Industries products used as basis of selection.

2.2 DESCRIPTION

- A. Pipe Attachments:
 - 1. Non-insulated ferrous pipe (1/2 to 1-1/2 inch): Figure 100.
 - 2. Non-insulated ferrous pipe (2 inch and larger): Figure 400.
 - 3. Non-insulated copper pipe: Figure 101.
 - 4. Insulated pipe: Figures 1031 and 4031.
 - 5. Riser clamp, ferrous pipe: Figure 510.
 - 6. Riser clamp, plastic DWV: Figure 515.
- B. Upper Attachments: Attachment to wood structures where weights permit shall be Figure 325 or 328.
- C. Structural Attachments: Provide all necessary structural attachments such as concrete anchors, beam clamps, hanger flanges and brackets. Hangers shall not be suspended from other piping, equipment, etc.
- D. Miscellaneous items such as hanger rod, rod couplings, turnbuckles, etc. shall be standard figure numbers of the same manufacturer as the attachments.
- E. All-threaded rods for pipe supports shall be no less than 3/8" diameter.
- F. All floor mounted equipment to be placed on a 4-inch high concrete housekeeping pad.

HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Provide hangers and supports in accordance with the instructions furnished by the manufacturers of these devices.
- B. For horizontal pipe lines install pipe hangers with maximum hanger spacing and maximum hanger rods as recommended in Table 6 of the 2000 edition of the ASHRAE Guide and Data Book, Systems and Equipment Chapter 41: Where concentrated loads of valves, fittings, etc. occur, closer spacing will be necessary and shall be based on the weight to be supported and the maximum recommended loads for the hanger components. Cast iron soil pipe shall be supported at every joint.
- C. Horizontal banks of piping for plumbing piping only, i.e. domestic hot and cold water, may be supported on a common steel channel strut member spaced not more than the shortest allowable span required on the individual pipe. Piping to be maintained at these relative lateral positions using clamps, slips or free to roll axially or slide using a Figure 125 insulated protector at all points of support for insulated lines.
- D. Provide additional structural members where required to support piping or ductwork.
- E. Provide hangers and support devices in accordance with the equipment manufacturer's instructions for all equipment.
- F. Anchorage to Floors, Roofs, Etc., Sway Bracing and Seismic Restraints:
 - 1. The contractor is responsible to determine the means and methods of equipment installation and support.
 - 2. Provide supports for all apparatus as specified, detailed, as required by the manufacturers of specific equipment and the project governing code authorities. Anchor all roof and base/floor mounted equipment with size and spacing of anchor bolts or other attachment means as recommended by the respective equipment manufacturer.
 - 3. Provide seismic restraints on all mechanical equipment in conformance with the 2009 Washington Structural Specialty Code Section 1613 "Earthquake Loads". Costs for seismic calculations are to be included in the bid price.
 - 4. Provide deferred submittals directly to the governing code jurisdiction for anchorage to floors, roofs, etc., sway bracing and seismic restraints. Submittals to show locations and sufficient support details as required by the governing code jurisdiction.
 - 5. Provide supplementary drawings and calculations as required by governing code jurisdictions noting seismic support data/calculations as required for permit purposes.

END OF SECTION

VIBRATION AND SEISMIC CONTROLS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work included: Providing of all seismic restraints and vibration isolation for plumbing equipment.

1.2 QUALITY ASSURANCE

- A. Equipment: All plumbing equipment mounted on vibration isolators shall be provided with seismic restraints capable of resisting a horizontal force of 100 percent of the weight of the equipment furnished.
- B. Piping: Refer to specification section 22 05 29, Hangers and Supports for Plumbing Piping and Equipment.

1.3 SUBMITTALS

- A. Provide submittals in accordance with Section 22 00 00.
- B. Submittals shall include:
 - 1. Manufacturer's technical literature for all products used including weights, dimensions and standard connections.
 - 2. Indicate service for each type of hanger.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. Type of isolator, base, and minimum static deflection shall be as required for each specific equipment application as recommended by isolator or equipment manufacturer but subject to minimum requirements indicated herein.
- B. Uniform Loading: Select and locate isolators to produce uniform loading and deflection even when equipment weight is not evenly distributed.
- C. Mason Industries products used as basis of selection.

2.2 VIBRATION ISOLATORS

- A. Piping Systems:
 - 1. Provide isolation by either floor mount or hangers with 3/4-inch deflection.
 - 2. Provide oversized wall penetrations, line with neoprene and seal with resilient caulk or firestop material as appropriate.
 - 3. Isolate domestic water piping from structure with Holdrite. Attach to one side of double stud wall.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Provide vibration isolation above for the noted plumbing systems. Install all vibration isolation devices in accordance with manufacturer's installation instructions. Provide additional support members, unistrut bracing, etc as required for proper installation of isolation devices.

VIBRATION AND SEISMIC CONTROLS FOR PLUMBING PIPING AND EQUIPMENT

- B. Inspection and Adjustments: Check for vibration and noise transmission through connections and floor. Adjust, repair, or replace isolators as required to reduce vibration and noise transmissions to specified levels.
- C. On all sides of suspended equipment, provide bracing for rigid supports and provide restraints for resiliently supported equipment. The slack cable restraint method, Mason Industries, or equal, is acceptable.

3.2 ADJUSTING

- A. Adjust vibration isolators after equipment is at operating weight.
- B. Adjust limit stops on restrained spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.
- C. Adjust active height of spring isolators.
- D. Adjust seismic restraints to permit free movement of equipment within normal mode of operation.
- E. Torque anchor bolts according to equipment manufacturer's recommendations to resist seismic forces.

END OF SECTION

IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Work included: Providing of all required identification systems for equipment and piping.

1.2 SUBMITTALS

- A. Provide submittals in accordance with Section 22 01 00.
- B. Submittals shall include:
1. List of proposed equipment and valve tags.
 2. Product information on piping markers.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. W. H. Brady Co. or Seton.

2.2 DESCRIPTION

- A. Equipment Identification: Equipment identification tags shall be three-ply, white center, black face plastic plates with 1/2" high letters for major and 1/4" high letters for minor equipment.
- B. Piping Markers:
1. All vinyl self-sticking labels.
 2. Markers shall comply with the district standard for width, size of letters, background colors, etc. Markers to comply with the following color convention:

<u>Service</u>	<u>Color</u>
Steam	Aluminum
Hot Water Heating	Tan
Cooling Water	White
Chilled Water	Green
Domestic Cold Water	Blue
Domestic Hot Water	Gold
Natural gas	Yellow
Compressed Air	Black
Fire Service Water	Red
Waste and Vent	Brown

3. Labels shall indicate "supply", return" or "recirculation" as applicable to the piping system.
- C. Valve Tags: Tags shall be not less than one inch in diameter, 0.64 brass. Information included on the tag will be:
1. Valve Type.
 2. Service Line (i.e. Hot Water).
 3. Sequential number associated with the project.
- D. Utility Markers: Brady Identoline plastic tape, 6 inch.

IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

- E. Ceiling Markers: Standard label tape type.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Provide each piece of roof equipment with a manufacturer's standard nameplate indicating manufacturer's name, model number, capacities and characteristics.
- B. In addition, provide each piece of equipment with a plastic tag indicating its designation on this project and the area served. Mount this tag with screws, where possible, in a clearly visible location.
- C. Affix piping markers to pipe or insulation in locations that make them clearly visible. Secure markers with two wraps of "Scotch Reinforced Tape" at each end.
- D. Locate markers at intervals of 15 to no more than 50 feet allowing visual identification of a line from any point along that line and as follows: At each valve, where a pipe passes through a wall, direction of flow on each leg of a "T" and on lower quarters of the line on horizontal runs where view is not obstructed.
- E. Provide arrow markers to indicate direction of flow away from each pipe identification marker.
- F. Affix valve tags to valves using brass chain.
 - 1. Provide an approved copy of the valve schedule in each Operation and Maintenance Manual.
 - 2. Furnish one copy of the schedule framed under glass to the owner's representative
 - 3. Information will include:
 - a. Valve locations by plan room number.
 - b. Function of the valve (i.e. equipment isolated).
 - c. Service Line (i.e. Hot Water).
- G. Provide plastic tape utility markers over all buried piping. Provide identification on tape. Install over the entire length of the underground piping utilities. Install plastic tape along both sides and the centerline of the trenches, at the elevation of approximately 12 inches above the top of utility.
- H. Provide ceiling labels for all equipment located above drop or hard ceilings. The markers shall indicate the equipment symbol associated with the contract documents and the type of equipment. Locate the labels per the following:
 - 1. Lay-in Ceiling - Locate the label on the ceiling grid member closest to the equipment location.
 - 2. Hard Ceiling - Locate the label on the access panel servicing the unit or closest access point.

END OF SECTION

TESTING OF PLUMBING

PART 1 - GENERAL

1.1 SUMMARY

- A. Work Included: Pressure testing of piping.

1.2 OPERATION AND MAINTENANCE DATA

- A. Provide O&M data in accordance with Section 22 00 00.
- B. O&M data shall include certificate of completion, inspection and test by authority having jurisdiction on required piping systems.

1.3 QUALITY ASSURANCE

- A. Code Compliance: Perform required tests in the presence of the authority having jurisdiction.

PART 2 - PRODUCTS

2.1 DESCRIPTION

- A. The Contractor shall furnish instruments, gauges, meters and necessary connection points for performance of the tests.

PART 3 - EXECUTION

3.1 GENERAL

- A. Piping: Test prior to concealment, insulation being applied, and connection to equipment, fixtures, or specialties. Conduct tests with all valves but those used to isolate the test section 10% closed.
- B. Leaks: Repair all leaks or replace defective pipe or fittings and retest until stipulated results are achieved.
- C. Notification: Advise the Architect 48 hours in advance of each test. Failure to so notify will require test to be rescheduled.
- D. Testing Equipment: Provide all necessary pumps, gauges, connections similar items required to perform the tests.

3.2 TESTING REQUIREMENTS

- A. Sanitary Systems: Test entire system or sections of system by closing all openings in piping except the highest opening and filling system with water to the point of overflow. If the system is tested in sections, plug each opening except the highest opening of the section under test and fill each section with water, but none with less than 6 feet head of water above the maximum estimated ground water level. Keep the water in system, or in portions under test, for 24 hours before testing begins. Test for six (6) hours with a maximum of 0.3 gallon per hour per inch diameter per 100 feet run of loss allowed. Locate and repair leaks. The maximum pressure on the lowest system invert is not to exceed 16 feet of head.

TESTING OF PLUMBING

- B. Piping - General: Test all piping as noted below, with no leaks or loss in pressure for the time indicated. Repair or replace defective piping until tests are completed successfully.

<u>System</u>	<u>Pressure</u>	<u>Medium</u>	<u>Duration</u>
Domestic Water Systems	150 psig	water	4 hours
Misc. Piping	1.5x normal oper. pressure	nitrogen or water as appropriate	4 hours

END OF SECTION

PLUMBING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Work included: Providing of all required insulation for equipment.

1.2 SUBMITTALS

- A. Provide submittals in accordance with Section 22 00 00.
- B. Submittals shall include:
 - 1. Data to show compliance with flame and smoke rating.
 - 2. Manufacturer's catalog or technical data showing performance, dimensions, materials of construction and recommended methods of installation.

1.3 QUALITY ASSURANCE

- A. Insulation materials and accessories such as adhesives, cement, etc. shall have composite fire and smoke hazard ratings, as tested by procedures indicated in NFPA 255 and U.L. 723, not to exceed a flame spread index of 25 and a smoke developed index of 50. Products or their shipping cartons shall have identification of the flame spread and smoke developed index.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Schuller, Knauf, Owens-Corning, Certain-teed, or approved equal. Schuller used as basis of selection.

2.2 DESCRIPTION

- A. Domestic Water Insulation
 - 1. Manville Micro-Lok AP-T molded fiberglass.
 - 2. Pipe fittings: Zeston one-piece premolded PVC covers with fiberglass blanket insulation.
 - 3. Foam filled elbows are not acceptable.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Piping:
 - 1. Domestic Cold Water: Provide 1/2-inch minimum pipe insulation on domestic cold water piping.
 - 2. Insulate fittings on piping utilizing preformed pipe covering.
 - 3. Insulate all valve bodies, fittings, unions, flanges and equipment with insulation equal to the attached service piping.
 - 4. Seal all insulation to maintain a vapor barrier.

END OF SECTION

FACILITY WATER DISTRIBUTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Work included: Providing of all required pipes and pipe fittings.

1.2 SUBMITTALS

- A. Provide submittals in accordance with Section 22 00 00.
- B. Submittals shall include manufacturer's catalog literature for all products used.

1.3 OPERATION AND MAINTENANCE DATA

- A. Submit certificates of inspections and tests to owner.

1.4 QUALITY ASSURANCE

- A. Piping material and installation to meet requirements of the local plumbing, fire and building codes and serving utility requirements.
- B. Pipe Cleaning: Should any pipe be plugged, the piping shall be disconnected, cleaned and reconnected without additional cost to Owner.
- C. Damage to the building or systems resulting from failure to properly clean the system shall be corrected without additional expense to the Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Pipe and fittings: Standard product of manufacturer.
- B. Flexible connectors: Anaconda, Aeroquip or approved equal.
- C. Seismic/expansion joint flex piping: Unisource, Metraflex, Mason. For other manufacturers, submit substitution request.

2.2 DESCRIPTION

- A. Copper Pipe - Plumbing:
 - 1. Pipe: Hard drawn copper type "L" above grade and hard drawn copper type "K" below grade, ASTM B88.
 - 2. Fittings: Wrought copper solder type.
 - 3. Solder
 - a. Above ground: 2" and smaller - Lead free, 95-5, tin silver and flux.
 - b. Below ground: 2 1/2" and larger - Lead free, brazing alloy and flux.
- B. Seismic/Expansion joint flex piping
 - 1. 150 psi rating, capable of + or - 4" movement in any direction.
 - 2. Sweat, weld or flanged ends as applicable to system connected.
 - 3. Copper for domestic piping.

FACILITY WATER DISTRIBUTION

4. FM and NFPA rating for fire service.
5. Domestic water piping expansion loops to be specifically UL listed for use in potable water systems.
6. Unisource V-SF21 seismic expansion. Materials and connections to match system piping material construction and size.

PART 3 - EXECUTION

3.1 PREPARATION - MEASUREMENTS, LINES AND LEVELS

- A. Check dimensions at the building site and establish lines and levels for the work specified in this Division.

3.2 PIPING INSTALLATION

- A. Install water distribution system sized in conformance with the drawings.
- B. Install unions in all non-flanged piping connections to apparatus and adjacent to all screwed control valves, traps, and appurtenances requiring removal for servicing, so located that piping may be disconnected without disturbing the general system.
- C. Provide easily accessible shut off valves on each branch of piping, to facilitate maintenance and repair without shutting down supply to large sections of the building.
- D. Install all piping as to vent and drain.
- E. Support all piping independently at apparatus so that the equipment shall not carry its weight.
- F. Dielectric Fittings: Provide dielectric couplings, unions or flanges between dissimilar metals. Additionally, provide dielectric couplings as required to isolate cathodically protected piping and equipment. Fittings shall be suitable for the pressure and temperature to be encountered.
- G. Domestic water piping joints
 1. Above ground:
 - a. 2" and smaller - soldered.
 - b. 2-1/2" and larger - brazed.
 2. Below ground: Brazed.
- H. Screwed Joints: Ream pipe ends. Apply dope or tape to male threads only. Brass joints shall be made with Teflon tape only. Make up fitting with not over two threads showing beyond the fitting end. Make junctions of galvanized pipe to cast iron with tapped spigots or half couplings screwed to the end of galvanized pipe to form a spigot end.
- I. Solder Type Joints:
 1. Clean the copper tubing and fittings thoroughly with steel wool before applying the flux. The copper tubing shall have all burrs removed, be reamed to full bore, and be true and round for all joints.
 2. Apply heat uniformly to secure penetration of the filler material. Leave full bead around the entire circumference of the joint to show proper penetration and sealing.
 3. Flux shall not be used for copper-to-copper joints. Flux shall be used for joining copper to brass or bronze. In those cases where flux is used, particular care shall be exercised in applying the flux to avoid leaving any excess inside the completed joints.

FACILITY WATER DISTRIBUTION

- J. Provide flexible connectors at all piping connections to mechanical equipment.
- K. Provide seismic bracing and support per SMACNA "Seismic Restraint Manual Guidelines for Mechanical Systems", see drawings for Seismic Hazard Level.
- L. Provide expansion loops/fittings as noted on the drawings and where piping passes through building expansion/seismic joints. Install the loops in accordance with the manufacturers instructions. Provide hangers and guides as recommended.
- M. Flush piping system of all construction dirt.
- N. Chlorination: Disinfect the domestic hot and cold water piping as follows:
 - 1. Fill systems with a solution of 50 ppm available chlorine for four hours
 - 2. During this time, open and close all valves at least twice.
 - 3. Flush the system with water until the residual chlorine content is not more than 1 ppm.
- O. Test piping system per Section 22 05 93.

3.3 SPECIALTIES INSTALLATION

- A. Install all piping specialties where shown on the drawings and in accordance with manufacturer's recommendations.

END OF SECTION

DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section prescribes the requirements for materials and methods of installation of piping specialties for piping systems where indicated required by code or as good practice dictates.

1.2 SUBMITTALS

- A. Catalog or technical data on automatic flow control valves for proposed manufacturer.
- B. Operating and maintenance data.

PART 2 - PRODUCTS

2.1 UNIONS

- A. Type: 150 malleable iron, brass to iron seat, ground joint, black or galvanized to match pipe. 200-psi wog bronze, ground joint, solder type for copper tubing. Where dissimilar metals join, dielectric unions, couplings or flanges shall be installed.

PART 3 - EXECUTION

3.1 INSTALLATION - GENERAL

- A. Provide unions at all mechanical equipment connections as required allowing equipment removal from piping without destruction or cutting of piping or pipe joints.

END OF SECTION

FACILITY SANITARY SEWERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Work included: Providing of all required sanitary waste and vent systems' piping, and utility connections for all services specified or shown on the drawings or required by demolition.

1.2 SUBMITTALS

- A. Provide submittals in accordance with Section 22 00 00.
- B. Submittals shall include manufacturer's catalog literature for all products used.

1.3 QUALITY ASSURANCE

- A. Piping material and installation to meet requirements of the local plumbing, mechanical, building codes and serving utility requirements.

1.4 OPERATION AND MAINTENANCE DATA

- A. Submit certificates of inspections and tests to owner.

1.5 QUALITY ASSURANCE

- A. Piping material and installation to meet requirements of the local plumbing, fire and building codes and serving utility requirements.
- B. Pipe Cleaning: Should any pipe be plugged, the piping shall be disconnected, cleaned and reconnected without additional cost to Owner.
- C. Damage to the building or systems resulting from failure to properly clean the system shall be corrected without additional expense to the Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Pipe and fittings: Standard product of manufacturer.
- B. Flexible connectors: Anaconda, Aeroquip or approved equal.

2.2 PIPE AND PIPE FITTINGS

- A. DESCRIPTION
 1. General: The following generally describes piping materials for plumbing and mechanical systems.
 2. Sanitary Waste Systems: Cast iron pipe above grade and below grade to five feet beyond building lines and below grade where depth of bury is less than 24 inches.
 3. Vent Systems: Cast iron or galvanized steel pipe.
 4. Miscellaneous Condensate and Indirect Drains: Type "L" hard drawn copper tubing for plumbing service.

FACILITY SANITARY SEWERS

2.3 MATERIAL DESCRIPTION:

- A. Galvanized Steel Pipe:
 - 1. Pipe: Schedule 40 galvanized steel pipe conforming to A120-82.
 - 2. Fittings: Galvanized screwed cast iron.

- B. Cast Iron Pipe:
 - 1. Pipe: Hubless cast iron soil pipe, CISPI 30-90 / ASTM A888.
 - 2. Fittings:
 - a. Hubless cast iron fittings - CISPI 30-901 or cast iron hub and spigot fittings ASTM A74.
 - b. Underground couplings - Clamp-all Corporation, Husky SD4000 or approved equal.
 - c. Aboveground couplings - couplings meeting CISPI designation 301-85 except rain drain couplings in systems greater than 25 feet of water column (use Huskey SD4000.)
 - d. Couplings to steel or plastic pipe - Fernco "lowflex" or approved equal.

- C. Copper Pipe - Plumbing:
 - 1. Pipe: Hard drawn copper type "L" above grade and hard drawn copper type "K" below grade, ASTM B88.
 - 2. Fittings: Wrought copper solder type.
 - 3. Solder
 - a. Above ground: 2" and smaller - Lead free, 95-5, tin silver and flux.
 - b. Below ground: 2 1/2" and larger - Lead free, brazing alloy and flux.

PART 3 - EXECUTION

3.1 PREPARATION - MEASUREMENTS, LINES AND LEVELS

- A. Check dimensions at the building site and establish lines and levels for the work specified in this Division.

3.2 PIPING INSTALLATION

- A. Install unions in all non-flanged piping connections to apparatus and adjacent to all screwed control valves, traps, and appurtenances requiring removal for servicing, so located that piping may be disconnected without disturbing the general system.
- B. Install all piping as to vent and drain.
- C. Cleanouts in underground or acid waste systems shall be line size for mains up to 4" diameter. For mains having a diameter of greater than 4", cleanouts shall be 4" diameter.
- D. Support all piping independently at apparatus so that the equipment shall not carry its weight.
- E. Dielectric Fittings: Provide dielectric couplings, unions or flanges between dissimilar metals. Additionally, provide dielectric couplings as required to isolate cathodically protected piping and equipment. Fittings shall be suitable for the pressure and temperature to be encountered.

FACILITY SANITARY SEWERS

- F. Screwed Joints: Ream pipe ends. Apply dope or tape to male threads only. Brass joints shall be made with Teflon tape only. Make up fitting with not over two threads showing beyond the fitting end. Make junctions of galvanized pipe to cast iron with tapped spigots or half couplings screwed to the end of galvanized pipe to form a spigot end.
 - G. Solder Type Joints:
 - 1. Clean the copper tubing and fittings thoroughly with steel wool before applying the flux. The copper tubing shall have all burrs removed, be reamed to full bore, and be true and round for all joints.
 - 2. Apply heat uniformly to secure penetration of the filler material. Leave full bead around the entire circumference of the joint to show proper penetration and sealing.
 - H. Flux shall be used for copper-to-copper joints. Flux shall be used for joining copper to brass or bronze. In those cases where flux is used, particular care shall be exercised in applying the flux to avoid leaving any excess inside the completed joints.
 - I. Provide flexible connectors at all piping connections to mechanical equipment.
 - J. Waste and Vent Systems
 - 1. Install waste, storm, overflow storm and vent piping system sized in conformance with the drawings.
 - 2. Grade horizontal waste runs 1/4 inch per foot where possible. Piping 3" and greater may be run at 1/8 inch per foot minimum when approved by the Administrative Authority.
 - 3. Make all changes in direction with appropriate fittings.
 - 4. Collect vents together in ceiling space and extend through roof for minimum penetrations.
 - 5. Flash and counterflash all vents through the roof.
 - 6. Verify exact location of all fixtures from architectural drawings.
 - 7. Test piping system per Section 22 05 93.
 - K. Miscellaneous Condensate and Drain Systems:
 - 1. Install condensate system sized in conformance with the drawings.
 - 2. Slope lines in direction of flow.
 - 3. Install indirect waste fittings as shown on the Drawings, providing access as required by code.
 - 4. Indirect drains in kitchen area are to spill to floor sinks above the flood level of the floor sink and in location that allows removal of grate and does not create splashing during discharge.
 - 5. Test piping system per Section 22 05 93.
- 3.3 FIRESTOPPING PENETRATIONS IN FIRE-RATED WALL/FLOOR ASSEMBLIES
- A. Contractors shall provide proper sizing when providing sleeves or core-drilled holes to accommodate their through penetrating items. All voids between sleeve or core-drilled hole and pipe passing through, shall be firestopped to meet the requirements of ASTM E-814.

END OF SECTION

FACILITY STORM DRAINAGE

PART 1 - GENERAL

1.1 SUMMARY

- A. Work included: Providing of all required facility storm drainage systems' piping, and utility connections for all services specified or shown on the drawings.

1.2 SUBMITTALS

- A. Provide submittals in accordance with Section 22 00 00.
- B. Submittals shall include manufacturer's catalog literature for all products used.

1.3 QUALITY ASSURANCE

- A. Piping material and installation to meet requirements of the local plumbing, mechanical, building codes and serving utility requirements.

1.4 OPERATION AND MAINTENANCE DATA

- A. Submit certificates of inspections and tests to owner.

1.5 QUALITY ASSURANCE

- A. Piping material and installation to meet requirements of the local plumbing, fire and building codes and serving utility requirements.
- B. Pipe Cleaning: Should any pipe be plugged, the piping shall be disconnected, cleaned and reconnected without additional cost to Owner.
- C. Damage to the building or systems resulting from failure to properly clean the system shall be corrected without additional expense to the Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Pipe and fittings: Standard product of manufacturer.
- B. Flexible connectors: Anaconda, Aeroquip or approved equal.

2.2 DESCRIPTION

- A. Cast Iron Pipe:
 - 1. Pipe: Hubless cast iron soil pipe, CISPI 30-90 / ASTM A888.
 - 2. Fittings:
 - a. Hubless cast iron fittings - CISPI 30-901 or cast iron hub and spigot fittings ASTM A74.
 - b. Underground couplings - Clamp-all Corporation, Husky SD4000 or approved equal.
 - c. Aboveground couplings - couplings meeting CISPI designation 301-85 except rain drain couplings in systems greater than 25 feet of water column (use Huskey SD4000.)
 - d. Couplings to steel or plastic pipe - Fernco "lowflex" or approved equal.

FACILITY STORM DRAINAGE

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Storm Systems:
 - 1. Install storm sized in conformance with the drawings.
 - 2. Grade horizontal waste runs 1/4 inch per foot where possible. Piping 3" and greater may be run at 1/8 inch per foot minimum when approved by the Administrative Authority.
 - 3. Make all changes in direction with appropriate fittings.
 - 4. Verify exact location of all drains from architectural drawings.
 - 5. Test piping system per Section 22 05 19.

3.2 FIRESTOPPING PENETRATIONS IN FIRE-RATED WALL/FLOOR ASSEMBLIES

- A. Contractors shall provide proper sizing when providing sleeves or core-drilled holes to accommodate their through penetrating items. All voids between sleeve or core-drilled hole and pipe passing through, shall be firestopped to meet the requirements of ASTM E-814, in accordance with Section 21 01 00 - Firestopping.

END OF SECTION

ELECTRIC DOMESTIC WATER HEATERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Work included: Providing domestic commercial electric domestic water heater, expansion tank and related appurtenances.

1.2 SUBMITTALS

- A. Provide submittals in accordance with Section 22 00 00.
- B. Submittals shall include: Manufacturer's catalog or technical data showing performance, dimensions, materials of construction, and recommended methods of installation.

1.3 OPERATION AND MAINTENANCE DATA

- A. Provide O&M data in accordance with Section 22 00 00.
- B. O&M data shall include:
 - 1. Manufacturer's literature.
 - 2. Maintenance instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Water Heaters: A.O. Smith, Rheem/Rhuud, Heat Transfer Products, Inc., **Bock** or approved equal.
- B. Expansion Tank: Amtrol, Bell & Gossett, Watts or approved equal.

2.2 DESCRIPTION

- A. Electric Water Heater (WH-1):
 - 1. A.O. Smith DEL-80 used as basis of design.
 - 2. Glass lined tank with 3-year warranty, 150 psi working pressure rating.
 - 3. Adjustable limit control.
 - 4. Equip heater with magnesium anodes.
 - 5. Baked enamel jacket, insulation to comply with applicable energy codes.
 - 6. ASME rated temperature and pressure relief valve and drain valve.
 - 7. Comply with State of Oregon Energy Code.
 - 8. See Drawings for size and capacity.
- B. Domestic Water Expansion Tank: Amtrol Model ST-12, Diaphragm type, pre-charged, steel outer shell with polypropylene liner

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install plumbing equipment where shown and make piping connections. Installation to be per manufacturers instructions.
- B. Pipe pressure/temperature relief valve to over service sink or floor drain.

ELECTRIC DOMESTIC WATER HEATERS

- C. Provide seismic bracing for water heaters as required by local jurisdiction.

END OF SECTION

COMMERCIAL PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Work included: Providing of all plumbing fixtures, fixture trim, cleanouts and appurtenances as shown or required.
- B. Product Certification: Provide only products certified for use in the State of Oregon.

1.2 SUBMITTALS

- A. Provide submittals in accordance with Section 22 00 00.
- B. Submittals shall include manufacturer's catalog literature for all products used.

1.3 OPERATION AND MAINTENANCE DATA

- A. Provide O&M data in accordance with Section 22 00 00.
- B. O&M data shall include:
 - 1. Manufacturer's literature.
 - 2. Maintenance instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Vitreous China Plumbing Fixtures: American Standard or Kohler.
- B. Flush Valves: Sloan.
- C. Toilet Seats: Bemis, Olsonite, Church or Beneke
- D. Fixture Trim: Chicago.
- E. Floor Drains: Jay R. Smith, Wade, Watts Ancon, or Zurn.
- F. Area Drains: Lynch or approved equal.
- G. Hose Bibbs: Jay R. Smith, Wade, Woodford or Zurn.
- H. Cleanouts: Jay R. Smith, Wade, Watts Ancon or Zurn.
- I. Carriers: Jay R. Smith, Wade, Watts Ancon or Zurn.
- J. Priming Valves: Precision Plumbing Products only.

2.2 DESCRIPTION

- A. Floor Drain (FD-1): J.R. Smith, Fig. 2005-02-A-NB-U-P050, Duco cast iron body, nickel bronze adjustable strainer head, 2" outlet, vandal proof screws and trap primer connection.

COMMERCIAL PLUMBING FIXTURES

- B. Area Drain (AD-1): Lynch Standard Area Drain, Model LYN-CB-AD4, 10 gauge mild steel, welded contrition, coated inside and out with asphaltic paint, 15"x15"x24-1/2" deep overall size, 15"x15", 3/16"x1" B.B. bar grate with cross bars at 4" o.c., with cleanout.
- C. Water Closets (WC-1)
 - 1. American Standard "Alfwall FlowWise" Model 3351.128, white vitreous china, wall mounted, elongated bowl, siphon jet action, 1.28 gpf high efficiency toilet.
 - 2. Sloan "Royal" model 111, diaphragm type, 1.6 gpf, flush valve, dual filtered by-pass, chloramine resistant rubber compounds, vandal resistant cap, ADA compliant handle, sweat solder adapter, cast set screw wall flange.
 - 3. Olsonite No. 10SSC, Heavy duty elongated, solid, white plastic open front seat less cover with stainless steel hinge post and self-sustaining hinge.
 - 4. Floor mounted wall carrier set for standard mounting height.
- D. Water Closets (WC-2)
 - 1. American Standard "Alfwall FlowWise" Model 3351.128, white vitreous china, wall mounted, elongated bowl, siphon jet action, 1.28 gpf high efficiency toilet.
 - 2. Sloan "Royal" model 111, diaphragm type, 1.6 gpf, flush valve, dual filtered by-pass, chloramine resistant rubber compounds, vandal resistant cap, ADA compliant handle, sweat solder adapter, cast set screw wall flange.
 - 3. Olsonite No. 10SSC, Heavy duty elongated, solid, white plastic open front seat less cover with stainless steel hinge post and self-sustaining hinge.
 - 4. Floor mounted wall carrier set for standard mounting height.
- E. Urinal (U-1):
 - 1. American Standard "Allbrook" Fig. 6541.132, white vitreous china, wall hung with floor mounted carrier, siphon jet action, with water saving trim.
 - 2. Sloan "Royal" model 186-1, diaphragm type, 1.0 gpf, flush valve, chloramine resistant rubber compounds, dual filtered by-pass, vandal resistant cap, ADA compliant handle, sweat solder adapter, cast set screw wall flange.
 - 3. Floor mounted wall carrier with wall hangers, set for standard mounting height, refer to Architectural drawings.
- F. Urinal (U-2):
 - 1. American Standard "Allbrook" Fig. 6541.132, white vitreous china, wall hung with floor mounted carrier, siphon jet action, with water saving trim.
 - 2. Sloan "Royal" model 186-1, diaphragm type, 1.0 gpf, flush valve, chloramine resistant rubber compounds, dual filtered by-pass, vandal resistant cap, ADA compliant handle, sweat solder adapter, cast set screw wall flange.
 - 3. Floor mounted wall carrier with wall hangers, set for ADA or accessible mounting height, refer to Architectural drawings.
- G. Lavatory (L-1):
 - 1. American Standard "Lucerne" model 0355.012, overall dimensions 20-1/2" x 18-1/4", wall hung, concealed arm support for floor mounted carrier, white vitreous china lavatory with front overflow, faucet ledge drilled for 4" centers.
 - 2. Chicago model 802A-665, chrome plated brass faucet, self-closing metering with adjustable time cycle, two push handles with color coded index buttons, 4" spout with E2805 vandal resistant 0.5 gpm aerator.
 - 3. Chrome plated brass or stainless steel grid drain.
 - 4. Pre-formed manufactured insulation kit for trap, waste and water supplies.

COMMERCIAL PLUMBING FIXTURES

- 5. In stud walls provide floor mounted wall carrier, in CMU walls provide concealed arm supports with steel plate, set for ADA or accessible mounting height, refer to Architectural drawings for height.
- H. Hose Bibb (HB-1): J.R. Smith, Fig. 5609QT, non-freeze exposed wall hydrant, all bronze nickel plated body, integral vacuum breaker, "T" handle key.
- I. Priming Valves (PV-1): Precision Plumbing Products, Inc., PTS series, atmospheric vacuum breaker, pre-set 24 hour clock, manual over ride switch/test button, 120 volt solenoid valve, 120 volt 3 wire connection, $\frac{3}{4}$ " FNPT connection, calibrated manifold (with connection for each trap primer line) calibrated for equal water distribution, $\frac{1}{2}$ " outlet fittings. Provide adaptors for copper to PEX connection for as required for connection to PEX trap primer lines.
- J. Priming Valves (PV-2): Precision Plumbing Products, Inc., Oregon P1 or P2.
- K. Supplies and Stops: Flexible supplies with loose key angle stops to wall with canopy flanges and all exposed surfaces chrome plated.
- L. Traps:
 - 1. Exposed Traps: 17-gauge chrome plated tubing adjustable P-trap with slip bushing.
 - 2. Concealed or Below Grade: Coated cast iron P-trap, recessed screw joint or to match cast iron pipe.
 - 3. Support Rims: Stainless steel rims, if sink not furnished with integral rim.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Provide plumbing fixture trim where applicable on fixture.
- B. Plumbing Fixtures:
 - 1. Plumbing Fixtures Mounting Heights: All fixtures standard rough-in catalogued heights unless specified or shown otherwise on the architectural drawings.
 - 2. Cleanout:
 - a. Where required for purposes intended.
 - b. Cover set flush with finished surface.
 - c. Urinal cleanouts to be below fixture on centerline.
 - 3. Floor Drain: Set top flush with finished floor unless otherwise noted on architectural drawings.
- C. Priming Valves:
 - 1. Floor drain and Area drain traps primed with priming valves with 1/2" PEX pipe. Provide adaptors if required to make connection to PEX primer lines.
 - 2. Six traps maximum primed from one priming valve or as recommended by manufacturer.
 - 3. Where priming valves are installed in finished rooms, conceal in wall and provide access door.
 - 4. Install shutoff valve ahead of priming valve.
 - 5. Provide metal trace wire for PEX pipe below grade.
- D. Drawings are diagrammatic and may not show all required cleanouts and fittings. Provide additional required items at no additional cost.

END OF SECTION

BASIC HVAC REQUIREMENTS

PART 1 - GENERAL

1.1 OTHER REQUIREMENTS

- A. The Bidding, General, and Supplementary of this project manual and specific sections as noted apply to the work specified in Mechanical Division 23 which encompasses Sections 23 00 00 through 23 82 39. This Section 23 00 00 applies to all sections of Mechanical Division 23.

1.2 SCOPE

- A. It is the intent of these specifications and the accompanying drawings to describe complete mechanical systems installations for all building areas, new and renovation.
- B. Furnish and install all material, labor and equipment in accordance with these documents.
 - 1. Include all incidental items and work not specifically shown or specified but required by good practice in a complete system.
 - 2. The drawings and specifications are complementary. What is called for in one shall be called for in both.
 - 3. The drawings are diagrammatic but should be followed as closely as possible. Where required by jobsite conditions, relocate and provide fittings, etc., as required. Provide an allowance in the contract bid to furnish additional pipe and ductwork fittings required for coordination with structure and other construction trades.

1.3 DEFINITIONS

- A. Or approved equal: Requires approval prior to bid date.
- B. Indicated:
 - 1. The term "indicated" is a cross reference to details, notes, or schedules on the drawings, other paragraphs or schedules in the specifications, and similar means of recording requirements in the Contract Documents.
 - 2. Where terms such as "shown," "noted," "scheduled," and "specified" are used instead of "indicated," it is for the purpose of helping the reader locate the cross reference, and no limitation of location is intended except as specifically noted.
- C. Directed, Requested, Etc.: Where not otherwise explained, terms such as "directed," "requested," "authorized," "selected," "approved," "required," "accepted," and "permitted" mean "directed by the Engineer," "requested by the Engineer," etc. However, no such implied meaning will be interpreted to extend the Engineer's responsibility into the Contractor's area of construction supervision.
- D. Site or Project Site: The space available to the Contractor for the performance of the work, either exclusively or in conjunction with others performing the work as part of the project. The extent of the project site is shown on the Mechanical drawings and is not identical with the description of the land upon which the project is to be built.
- E. Approved:
 - 1. Where used in conjunction with the Architect's response to submittals, requests, applications, inquiries, reports and claims by the Contractor, the meaning of the term "approved" will be held to the limitations of the Architect's responsibilities and duties as specified in the General and Supplementary Conditions.

BASIC HVAC REQUIREMENTS

2. In no case will "approval" by the Architect be interpreted as a release of the Contractor from responsibilities to fulfill requirements of the Contract Documents.

F. Provide: The term "provide" means to furnish and install, complete and ready for the intended use.

1.4 STANDARDS AND CODES

A. Provide all equipment and material and perform all work in accordance with all local, state and national codes and regulations.

B. For work on this project, comply with appropriate standards published by the following:

1.	Air Diffusion Council	ADC
2.	American Gas Association	AGA
3.	Air Movement and Control Association	AMCA
4.	American National Standards Institute	ANSI
5.	Air-Conditioning and Refrigeration Institute	ARI
6.	Acoustical Society of America	ASA
7.	American Society of Heating, Refrigerating and Air-Conditioning	ASHRAE
8.	American Society of Mechanical Engineers	ASME
9.	American Society for Testing and Materials	ASTM
10.	National Environmental Balancing Bureau	NEBB
11.	National Electrical Manufacturers Association	NEMA
12.	National Fire Protection Association	NFPA
13.	Sheet Metal and Air Conditioning Contractors' National Association	SMACNA
14.	Underwriters' Laboratories	UL
15.	Oregon Structural Specialty Code	OSSC
16.	Oregon Mechanical Specialty Code	OMSC
17.	Oregon State Energy Efficiency Specialty Code	OEESC
18.	Oregon Plumbing Specialty Code	OPSC

1.5 APPROVAL OF EQUIPMENT AND MATERIALS

A. Manufacturer's trade names, catalog numbers and material specifications used in this specification are intended to establish the quality of equipment or materials expected. Materials and manufacturers not listed require approval prior to the bid date.

B. Approval of substitute equipment or materials will be based upon performance, quality and other factors deemed important by the Architect. The Contractor will be responsible for making all changes in this and other associated work required as a result of the substitution. Additional or modified structural calculations and roof penetrations required to accommodate the substitution will be the responsibility of the contractor.

1.6 SUBMITTALS

A. Transmit five sets of submittals to the Architect for review. The submittals shall be bound in three-ring binders, have major topic tabs and an index. In order to expedite approval of certain items, it is not necessary to transmit complete submittals initially. The initial transmittal will include the binder, expected tabs and an index indicating which items are included, the date each is transmitted, and which items are yet to be transmitted. Future transmittals shall include a revised index.

BASIC HVAC REQUIREMENTS

- B. Furnish performance data and technical information on all materials and equipment to be used on the project.
- C. Include shop drawings with the submittals where necessary to determine clearance, where the Contractor proposes alternate equipment or material arrangements, and when requested by the Architect.
- D. Items transmitted for approval must be received in the Architect's office within 45 days of contract award. The Architect prior to installation must approve all material and equipment.
- E. Review of submittals or shop drawings by the Architect does not relieve the Contractor from the requirements of the Contract Documents unless specific approval has been requested for a given deviation.

1.7 QUALITY ASSURANCE

- A. Maintain the highest standards of workmanship throughout the project.
- B. Use the latest editions of applicable and specifically referenced standards.
- C. Inspect all material and equipment upon arrival at the site and return any which is not in new condition.

PART 2 – PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 COORDINATION

- A. Cooperate with other trades to assure that construction proceeds in an orderly and timely manner. Contract cost increases due to improperly sequenced work with other trades will not be allowed.
- B. Study the new and existing architectural, structural, electrical, shop and any specialty drawings as appropriate and specifications to determine required coordination.
- C. Prepare detailed shop drawings where necessary to assure proper fit and necessary clearance.
- D. Refer to electrical drawings to verify voltage and phase of mechanical equipment.

3.2 PERMITS, FEES AND INSPECTIONS

- A. Obtain all required permits and pay for all fees and connection charges.
- B. Schedule any required inspections.

3.3 MATERIALS AND WORKMANSHIP

- A. Furnish all materials and equipment in new condition, free from defects and of size, make, type and quality specified. Installation shall be in a neat and workmanlike manner.
- B. When two or more items of the same kind, type or class are required, use items of a single manufacturer.

BASIC HVAC REQUIREMENTS

3.4 MEASUREMENTS

- A. Take all measurements from reference datums established by the mechanical contractor.

3.5 DELIVERY, HANDLING AND STORAGE

- A. Receive all material and equipment at the jobsite or shop.
- B. Use proper and sufficient equipment to handle all products employed in the project.
- C. Where storage of material or equipment is necessary, it shall be a clean and weatherproof area. Seal any openings and cover the product to assure that there will be no corrosion or foreign matter introduced. Assure that it will be in new condition when placed in service.

3.6 EQUIPMENT INSTALLATION, BRACING AND SUPPORT

- A. Install all equipment in strict accordance with the manufacturer's instructions unless otherwise indicated.
- B. The drawings in general are based upon one of the specific manufacturers listed for a particular equipment item. The other specified manufacturers and additional approved manufacturers of equipment may require deviations from the drawings to properly install the particular equipment in accordance with the manufacturer's recommendations and to provide the system results required. Provide all work necessary in the base bid price to install this equipment.
- C. Where the installation shown or specified is contrary to the manufacturer's instructions, advise the Architect in writing of the differences before proceeding with the installation.
- D. Anchorage to Floors, Roofs, Etc., Sway Bracing and Seismic Restraints:
 - 1. The contractor is responsible to determine the means and methods of equipment installation and support.
 - 2. Provide supports for all apparatus as specified, detailed, as required by the manufacturers of specific equipment and the project governing code authorities. Anchor all roof and base/floor mounted equipment with size and spacing of anchor bolts or other attachment means as recommended by the respective equipment manufacturer.
 - 3. Provide seismic restraints on all mechanical equipment in conformance with the 2010 Oregon Structural Specialty Code, Section 1613 "Earthquake Loads" and ASCE 7. Costs for seismic calculations shall be included in the bid price.
 - 4. Provide deferred submittals directly to the governing code jurisdiction for anchorage to floors, roofs, etc., sway bracing and seismic restraints. Submittals to show locations and sufficient support details as required by the governing code jurisdiction.
 - 5. Provide supplementary drawings and calculations as required by governing code jurisdictions noting seismic support data/calculations as required for permit purposes.
 - 6. Mechanical seismic criteria is as follows:
 - a. Occupancy Classification II
 - b. Seismic Design Category D
 - c. Component Importance Factor (Ip) 1.0
- E. Maintain a copy of the manufacturer's installation instructions at the jobsite for all equipment.
- F. The presence of above ceiling equipment items shall be marked using label tape markers affixed to the ceiling grid. The markers shall indicate equipment category and equipment number. Coordinate color-coding and lettering requirements with the owner's representative.

BASIC HVAC REQUIREMENTS

3.7 SLEEVES AND INSERTS

- A. Provide sleeves at all locations where piping and ductwork passes through building construction.
- B. Sleeves for interior walls and floors shall be 22 gauge galvanized or heavier as required. Sleeves for exterior walls shall be cast iron, wall thickness as required.
 - 1. Wall sleeves shall be installed in all exterior walls and all interior masonry or fire-rated walls in a manner that preserves the fire-rated or watertight integrity of the wall.
 - 2. Interior wall sleeves for uninsulated pipe shall allow minimum 1/4-inch clearance all around pipe for pipe movement. Allow 1-inch clearance around pipe at building expansion joints.
 - 3. Interior wall sleeves for insulated piping shall be selected to encompass the pipe and insulation and allow minimum 1/4-inch clearance around insulation for pipe movement. Allow 1-inch clearance around pipe and insulation at building expansion joints.
- C. Seal space between pipe and sleeve with Dow Corning Fire Stop System, 3M Brand CP25 or approved equal where piping penetrates firewall or floors. Sealant must be between pipe and sleeve; sealant between insulation and sleeve is not acceptable. Install firestop materials in complete accordance with the manufacturer's instructions and in compliance to applicable UL listings.

3.8 FLOOR, WALL AND CEILING PLATES

- A. Provide escutcheon plates where all exposed piping and ductwork passes through finished walls, floors and ceilings, including accessible cabinet spaces.
- B. Floor plates: deep recessed, cast brass, chrome plated.
- C. Wall and ceiling plates: spun aluminum, chrome plated.
- D. Secure plates to pipe or structure. Plates shall not penetrate insulation vapor barriers. Size plates to sufficiently cover pipe sleeves and openings in finish materials.

3.9 ACCESS DOORS AND PANELS NOT SPECIFIED IN THE ARCHITECTURAL DOCUMENTATION

- A. Manufacturers: CESCO, Milcor, Elmdor. CESCO used as basis of selection.
- B. Non-rated panels: Style W, SR-1, SR-2, P, PX as required for wall or ceiling construction, 12 inch x 12 inch or larger as required for ease of access.
- C. Fire-rated panels: Style FB, U.L. listed for 1-1/2 hr for fire rated stud and masonry wall systems.
- D. Provide access panels where shown on the drawings or as required for proper access to mechanical appurtenances. Coordinate the installation of access panels is with the specific building construction penetrated. Coordinate access panel installation with Manufacturers instructions.
- E. Locate and size access doors to facilitate equipment service and optimize the safety of the maintenance personnel. Minimum access door size shall be 18 inches by 18 inches.

3.10 PROTECTION

- A. Protect all work, material and equipment from loss or damage until the Owner accepts the project.
- B. As the work progresses, keep all equipment covered and cap all ducts and piping that may temporarily be left unconnected.

BASIC HVAC REQUIREMENTS

- C. Notify all other trades of any required precautions necessary to protect the work.
- 3.11 ACCESSIBILITY
 - A. Provide convenient access by location or access panel to all equipment requiring periodic service.
- 3.12 ELECTRICAL WORK
 - A. Wherever possible, provide all interconnect wiring within or on a piece of equipment with the equipment unless shown or specified otherwise. An electrician licensed to perform this type of work shall perform all field wiring.
- 3.13 RELATED WORK
 - A. The following work and materials are specified elsewhere:
 - 1. Pipe chases, equipment pads and foundations, trenches, painting, air louvers, louvered penthouse and access panels except as otherwise specified in this division.
 - 2. Framed openings, wood grounds and nailing strips, masonry, concrete and other architectural and structural elements.
- 3.14 CLEANING
 - A. Maintain premises and public properties free from accumulations of waste, debris and rubbish during construction.
 - B. Clean all mechanical equipment of dust, grease, iron cuttings, unnecessary stamps or shipping labels, etc.
 - C. Touch up factory-painted surfaces, as necessary, with paint of matching color.
- 3.15 RECORD DRAWINGS
 - A. Maintain one set of construction drawings at the jobsite for the sole purpose of recording work of the mechanical contract, as actually installed. Upon request, the Architect will make the original tracings available to the mechanical contractor for printing the drawings. The Contractor shall pay the reproduction costs.
 - B. Record all piping and ductwork by dimensions from gridlines, below grade, above floor, etc. Show location of all access panels, cleanouts, rough-in for future, etc.
 - C. Make record drawings available to the Architect for review or reproduction during construction. The Architect will pay any printing costs.
 - D. Deliver record drawings to the Architect promptly upon completion of the project.
- 3.16 OPERATION AND MAINTENANCE MANUALS:
 - A. Submit three copies of the Operation and Maintenance Manuals to the Architect for approval before project completion. Bind the instruction books with three-ring 8-1/2" x 11" side binders with plastic covers. Include an index and tabs for major systems and equipment. Operation and Maintenance Manuals shall include the following:
 - B. Directories:

BASIC HVAC REQUIREMENTS

1. Supplier Directory: Alphabetical list of principal subcontractors and suppliers of equipment giving names, addresses and telephone numbers.
 2. Equipment Directory: List of equipment installed such as fans, air supply units, pumps, heating and cooling equipment, plumbing fixtures, etc., giving drawing reference numbers, location, area served, manufacturer with model number and supplier.
- C. Manufacturer's Literature:
1. Show name, address and phone number of the nearest service facility authorized by the manufacturer.
 2. Include illustrations, diagrams, and instructions for installation, startup, operation, inspections, maintenance, parts list, data sheets and other necessary materials.
 3. Include complete electrical, schematic and connection diagrams for each equipment item.
 4. Include the name, address and phone number of contractor(s) who furnished and who installed equipment and systems.
 5. Where the literature covers more than one model, check off neatly in ink correct model number and data for the model number including all specified options.
 6. In those instances where the equipment, its mode of control, or both, is job assembled for special functions, then provide written operating and maintenance instructions prepared by the assembler on 8-1/2" x 11" sheets.
- D. Maintenance Instructions:
1. Where instructions for maintenance are not included in the manufacturer's literature, provide supplemental data to enable proper maintenance of the equipment installed.
 2. Include specific lubrication methods and recommended frequencies along with procedures and precautions for inspection and routine service.
- E. Copy of Written Guarantee.
- F. Recommended Spare Parts Stock.

3.17 HVAC SYSTEMS TRAINING

- A. Training must be on fully operational system, or the training must be repeated when the system is fully operational at no additional cost to the Owner. Training must be scheduled through the David Douglas School District representative at a time that is convenient to district personnel. The David Douglas School District representative must be notified of any changes, re-scheduling or modifications to the training schedule
1. Maintain a start-up log notebook in the job trailer containing signed copies of the manufacturer's start-up sheets for all equipment.
 2. Training walk-throughs shall be performed by a contractor field project manager or technician who is fully knowledgeable with the project specifics and has had continuous involvement during the course of the project. The individual shall be knowledgeable in the specific installation details and maintenance of the project equipment.
- B. Custodial Training: At substantial completion prior to occupancy, this walk-through shall consist of a review of the project as-built drawings, the HVAC system layout and naming conventions, and a walk through of the facility to identify equipment and piping locations. This training will include Project Managers (as requested by the David Douglas School District) and custodial personnel per the David Douglas School District.

BASIC HVAC REQUIREMENTS

- C. Maintenance Training: Maintenance training will take place in two separate sessions: One session to occur within 30 days after substantial completion. This session to include a detailed review of the HVAC system record drawings and equipment installation instructions. The instructor shall then walk through the building identifying the location of the equipment installed and specific function(s) related to the overall mechanical systems. The training shall include answering maintenance personnel questions, troubleshooting and diagnostics procedures, repair instructions and preventive maintenance. This training will include all maintenance staff per the David Douglas School District.
- D. The maintenance training may occur consecutively with the operators training, but may not occur at the same time - The two sessions will be clearly separate and distinct.
- E. Provide a written agenda to the attendees outlining the general scope of the training session and the building equipment involved.
- F. The second session is to occur 10-months after substantial completion. The session shall be used to address observed operational issues. This training will include all maintenance staff per the David Douglas School District.

3.18 CUTTING AND PATCHING

- A. Cut work as required for installation and patch to match original conditions as directed and approved by Architect. Do not cut structural portion without Architect's approval.
- B. When masonry construction must be penetrated, provide a steel pipe sleeve in opening and grout in place in a neat manner. Leave grout surface to match existing finish.
- C. Prior to cutting any existing work, locate all concealed utilities to eliminate any possible service interruption or damage.

3.19 FIRESTOPPING PENETRATIONS IN FIRE-RATED WALL/FLOOR ASSEMBLIES

- A. Contractors shall provide proper sizing when providing sleeves or core-drilled holes to accommodate the through penetrating items. All voids between sleeve or core-drilled hole and pipe passing through, shall be firestopped to meet the requirements of ASTM E-814.
- B. Fire stop penetrations in accordance with the U.L. listed assemblies provided by the manufacturers of the products used.

3.20 CHANGE ORDERS

- A. All supplemental cost proposals by the Contractor shall be accompanied with a complete itemized breakdown of labor and materials cost without exception.
- B. Contractor's estimating sheets for the supplemental cost proposals shall be made available to the Architect. Labor must be separated and allocated for each item of work.

3.21 VERIFICATION OF EXISTING CONDITIONS

- A. Verify field conditions and measurements prior to the manufacture of shop fabricated materials and equipment.
- B. Produce shop drawings with details as required verifying proper installation of materials & equipment in conformance with applicable codes and the manufacturer's requirements.

BASIC HVAC REQUIREMENTS

3.22 SYSTEMS WIRING

	ITEM	FURNISHED BY	INSTALL BY	POWER WIRING	CONTROL WIRING
1.	Division 23 Equipment Motors	Div. 23	Div. 23	Div. 26	Div. 23
2.	Remote Motor Starters, Contactors and Overload Heaters – Integral	Div. 23	Div. 26	Div. 26	Div. 23
4.	Fused & Unfused Disconnect Switches	Div. 26	Div. 26	Div. 26	-----
5.	Manual Operation Switches	Div. 26	Div. 26	Div. 26	Div. 26
6.	Control Relays & Transformers	Div. 23	Div. 23	Div. 23	Div. 23
7.	Building Management Controls (DDC)	Div. 23	Div. 23	Div. 23	Div. 23

3.23 COMMISSIONING

- A. The equipment and systems referenced in this section shall be commissioned per Section 01 91 13 – General Commissioning Requirements and Section 23 08 00 – HVAC System Commissioning Requirements.
- B. The contractor has specific responsibilities for scheduling, coordination, startup, test development, testing and documentation. Coordinate all commissioning activities with the Commissioning Authority.

END OF SECTION

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Work included: Providing of all required hangers and supports for piping, ductwork and equipment

1.2 SUBMITTALS

- A. Provide submittals in accordance with Section 23 00 00.
- B. Submittals shall include:
 - 1. Manufacturer's technical literature for all products used indicating service for each type of hanger.
 - 2. Include proposed pre-manufactured piping and duct vibration isolation products.
 - 3. Submit literature or describe duct-supporting method.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Caddy, Grinnell, Super Strut. Caddy used for selection.

2.2 DESCRIPTION

- A. Pipe Attachments:
 - 1. Non-insulated ferrous pipe (1/2 to 1-1/2 inch): Figure 100.
 - 2. Non-insulated ferrous pipe (2 inch and larger): Figure 401.
 - 3. Non-insulated copper pipe: Figure 101.
 - 4. Insulated pipe: Figures 103 and 403.
 - 5. Riser clamp, ferrous pipe: Figure 510RO.
 - 6. Riser clamp, copper pipe: Figure 520.
- B. Upper Attachments: Attachment to wood structures where weights permit shall be Figure 325 or 328.
- C. Structural Attachments: Provide all necessary structural attachments such as concrete anchors, beam clamps, hanger flanges and brackets. Hangers shall not be suspended from other piping, equipment, etc.
- D. Miscellaneous items such as hanger rod, rod couplings, turnbuckles, etc. shall be standard figure numbers of the same manufacturer as the attachments.
- E. All-thread rod used for pipe supports shall be no less than 3/8 inch diameter.
- F. Support of piping or HVAC related conduit on roof surfaces shall be C-Port system manufactured by B-line or approved equal.
- G. All floor mounted equipment shall be placed on a four inch high concrete housekeeping pad.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Powder-actuated tools or devices are not acceptable for use at any school site.

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

- B. Provide hangers and supports in accordance with the instructions furnished by the manufacturers of these devices. Support ductwork as required by the UMC and per SMACNA recommendations.
- C. For horizontal pipe lines install pipe hangers with maximum hanger spacing and maximum hanger rods as recommended in Table 6 of the ASHRAE Guide and Data Book, Systems and Equipment Chapter 46: Where concentrated loads of valves, fittings, etc. occur, closer spacing will be necessary and shall be based on the weight to be supported and the maximum recommended loads for the hanger components.
- D. Provide additional structural members where required to support piping or ductwork.
- E. Provide hangers and support devices in accordance with the equipment manufacturer's instructions for all equipment.
- F. Anchorage to Floors, Roofs, Etc., Sway Bracing and Seismic Restraints:
 - 1. The contractor is responsible to determine the means and methods of equipment installation and support.
 - 2. Provide supports for all apparatus as specified, detailed, as required by the manufacturers of specific equipment and the project governing code authorities. Anchor all roof and base/floor mounted equipment with size and spacing of anchor bolts or other attachment means as recommended by the respective equipment manufacturer.
 - 3. Provide seismic restraints on all mechanical equipment in conformance with the Oregon Structural Specialty Code, Section 1613 "Earthquake Loads" and ASCE 7. Costs for seismic calculations shall be included in the bid price.
 - 4. Provide deferred submittals directly to the governing code jurisdiction for anchorage to floors, roofs, etc., sway bracing and seismic restraints. Submittals shall show locations and sufficient support details as required by the governing code jurisdiction.
 - 5. Provide supplementary drawings and calculations as required by governing code jurisdictions noting seismic support data/calculations as required for permit purposes.
 - 6. Mechanical seismic criteria are as follows:
 - a. Occupancy Classification II
 - b. Seismic Design Category D
 - c. Component Importance Factor (Ip) 1.0

3.2 COMMISSIONING

- A. The equipment and systems referenced in this section shall be commissioned per Section 01 91 13 – General Commissioning Requirements.
- B. The contractor has specific responsibilities for scheduling, coordination, startup, test development, testing and documentation. Coordinate all commissioning activities with the Commissioning Authority.

END OF SECTION

IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Work included: Providing of all required identification systems for HVAC equipment and piping.

1.2 SUBMITTALS

- A. Provide submittals in accordance with Section 23 00 00.
- B. Submittals shall include:
 - 1. List of proposed equipment and valve tags.
 - 2. Product information on piping markers.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. W. H. Brady Co. or Seton.

2.2 DESCRIPTION

- A. Equipment Identification: Equipment identification tags shall be three-ply, white center, black face plastic plates with 1/2 inch high letters for major and 1/4 inch high letters for minor equipment.
- B. Piping Markers:
 - 1. All vinyl self-sticking labels.
 - 2. Markers shall comply with the district standard for width, size of letters, background colors, etc. – Verify color convention with district representative.
 - 3. Label piping systems with appropriate descriptors such as supply, return, recirculation.
- C. Valve Tags: Tags shall be not less than one inch in diameter, 0.64 brass attached to the valve with a beaded chain. Information shall be engraved on the tag and will include:
 - 1. Valve Type.
 - 2. Service Line (i.e. Steam).
 - 3. Sequential number associated with the project.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Provide each piece of equipment with a manufacturer's standard nameplate indicating manufacturer's name, model number, capacities and characteristics.
- B. In addition, provide each piece of equipment with a plastic tag indicating its designation on this project (such as FC-1, HE-1) and the area served. Mount this tag with screws, where possible, in a clearly visible location.
- C. Affix piping markers to pipe or insulation in locations that make them clearly visible. Secure markers with two wraps of "Scotch Reinforced Tape" at each end.

IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

- D. Locate markers at intervals of 15 to no more than 50 feet allowing visual identification of a line from any point along that line and as follows: At each valve, where a pipe passes through a wall, direction of flow on each leg of a "T" and on lower quarters of the line on horizontal runs where view is not obstructed. Provide arrow markers to indicate direction of flow away from each pipe identification marker.
- E. Affix valve tags to valves using brass chain.
 - 1. Provide an approved copy of the valve schedule in each Operation and Maintenance Manual.
 - 2. Provide one copy of the schedule framed under glass on the wall in the custodial office - Coordinate the exact location with the owner's representative.
 - 3. Information will include:
 - a. Valve locations by plan room number.
 - b. Function of the valve (i.e. equipment isolated).
 - c. Service Line (i.e. Steam).

3.2 COMMISSIONING

- A. The equipment and systems referenced in this section shall be commissioned per Section 01 91 13 – General Commissioning Requirements.
- B. The contractor has specific responsibilities for scheduling, coordination, startup, test development, testing and documentation. Coordinate all commissioning activities with the Commissioning Authority.

END OF SECTION

TESTING, ADJUSTING AND BALANCING FOR HVAC

PART 1 – GENERAL

1.1 SUMMARY

- A. Work Included: Furnishing system balance work as specified.

1.2 OPERATION AND MAINTENANCE DATA

- A. Provide O&M data in accordance with Section 23 00 00.
- B. O&M data shall include copies of system balance data.

1.3 QUALITY ASSURANCE

- A. Contract with Pacific Coast Air Balancing, Neudorfer Engineers Inc., Accurate Balancing Agency Inc., Air Balancing Specialty Inc., Precision Test and Balance Inc. or approved equal to perform the system balance work on this project.

PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION

3.1 GENERAL

- A. Install new air filters in all fan coil units and blow-down all water strainers after the test run and before the start of testing and balancing.
- B. Operate heating, cooling, ventilating, and their corresponding control systems continuously during the testing and balancing.
- C. Provide ladders, scaffolding, and access to each system for proper testing and balancing.
- D. Provide and install sheaves, belts, additional volume dampers and pump adjustments as required by the testing and balancing agency.
- E. Confirm in writing that all wiring and controls for mechanical equipment have been installed, completed and tested.
- F. Operate all controls during the period as required by the balance testing and balancing agency.
- G. Preparation: Prior to test run, Contractor shall have performed a rough balance and the following:
 - 1. Verify correct rotation of all fans.
 - 2. Check for excessive vibration and noise.
 - 3. Verify filter installation in filter assemblies.
 - 4. Verify proper lubrication and lubricant for all times.
 - 5. Check proper calibration and settings of controls.
 - 6. Confirm that ductwork has been sealed.
- H. Fan Coil Units:
 - 1. Assure that air filters are clean, if not new, prior to beginning air balance work.

TESTING, ADJUSTING AND BALANCING FOR HVAC

2. Adjust fan speed as required for air volumes. Speed shall be set to the minimum to provide required air volume at furthest run without excessive static pressure.
 3. Adjust minimum outside air volume to that shown on the plans.
 4. Include the following in the logs:
 - a. Supply, return and outside air volumes.
 - b. Supply air temperatures on full heating and full outside air.
 - c. Static pressure drops across fan, filters and coil.
 - d. Total pressure drops for supply and return system.
 - e. Fan speed or RPM.
 - f. Actual motor voltage, amperage, RPM and overload heater sizes.
- I. Air Distribution System:
1. Adjust air volumes at diffusers and grilles to within plus or minus 5% of the values shown on the plans.
 2. Adjust diffusers and grilles for proper direction and throw.
 3. Log all readings taken.
 4. Mark final position of all balancing dampers.
- J. Hydronic Systems:
1. Adjust circuit setters to obtain flows noted on drawings.
 2. Adjust triple duty valves on circulating pumps to obtain scheduled flows.
 3. Include the following in the log:
 - a. Pump flow and pressure drops.
 - b. Actual pump motor voltage, amperage, RPM and overload heater sizes, as well as nameplate data.
 - c. Heat Exchanger pressure drop and temperatures in and out at full heating.
 4. Set differential pressure setpoint on variable flow pumping systems to obtain the scheduled flow at the farthest coil.
- K. Final Completion:
1. Controls and Sequence Verification – In addition to the Commissioning Agent's work scope.
 - a. Cycle the fan coil unit control systems through the entire range of functions and verify proper operation and sequencing of heating, outside air damper modulation, thermostat operation, etc.
 - b. Provide the following as a separate portion of the test and balance log: Written verification that the equipment controls and sequencing appears to be correct and functioning properly at the time of performance of the system test and balance work.

3.2 COMMISSIONING

- A. The equipment and systems referenced in this section shall be commissioned per Section 01 91 13 – General Commissioning Requirements.
- B. The contractor has specific responsibilities for scheduling, coordination, startup, test development, testing and documentation. Coordinate all commissioning activities with the Commissioning Authority.

END OF SECTION

HVAC DUCTS AND CASINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Work included: Providing of all required sheet metal ductwork specified or shown on the drawings.

1.2 SUBMITTALS

- A. Submittals shall include Shop Drawings of any proposed revisions to the ductwork as shown on the drawings.

PART 2 - PRODUCTS

2.1 DESCRIPTION

- A. Provide galvanized sheet metal ductwork for supply and return air systems except as specified or shown on the drawings. Provide minimum gauge and reinforcing in accordance with Chapter Sixteen, "Duct Construction" of the Chapter 19 of the ASHRAE "Systems and Equipment" Handbook and the appropriate chapters of the latest edition of the Oregon Mechanical Specialty Code.
- B. Round duct shall be sheet metal spiral duct.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Construct and assemble all supply, return, outside air and general exhaust duct systems in accordance with latest edition of the "HVAC Duct Construction Standards" published by SMACNA, Chapter Sixteen, "Duct Construction" of the Chapter 19 of the ASHRAE "Systems and Equipment" Handbook and the appropriate chapters of the latest edition of the Oregon Mechanical Specialty Code.
- B. Cover ductwork openings during construction after delivery to the field prior to and after installation. Seal ends, protect from moisture and running water, and adequately support to keep level and at least four inches off the ground. Store in clean dry space or if stored outdoors cover and protect from the elements
- C. Cross brace and reinforce ductwork and plenums with structural steel members to prevent breathing or ballooning.
- D. All joints in the air distribution system shall be sealed airtight with Hardcast CCWI-181 or similar LEED^R Compliant sealant.
- E. Provide acoustical lining where specified. All dimensions are inside net.
- F. Duct construction pressure classification (SMACNA):
 - 1. +2 inches for all supply air ductwork.
 - 2. -1 inch for all for return and relief air ductwork.
- G. Provide Durodyne flexible connectors, on both sides of wall, in ductwork passing through building seismic joints.

HVAC DUCTS AND CASINGS

3.2 COMMISSIONING

- A. The equipment and systems referenced in this section shall be commissioned per Section 01 91 13 – General Commissioning Requirements.
- B. The contractor has specific responsibilities for scheduling, coordination, startup, test development, testing and documentation. Coordinate all commissioning activities with the Commissioning Authority.

END OF SECTION

AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Work included: Providing of all required air duct accessories specified or shown on the drawings.

1.2 SUBMITTALS

- A. Provide submittals in accordance with Section 23 00 00.
- B. Submittals shall include: Manufacturer's catalog or technical data showing performance, dimensions, materials of construction, and recommended methods of installation.

1.3 OPERATION AND MAINTENANCE DATA

- A. Provide O&M data in accordance with Section 23 00 00.
- B. O&M data shall include: Manufacturer's literature and maintenance instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Damper regulators and end bearings: Duro-Dyne, Ventlock or approved equal. Duro-Dyne used as basis of selection.
- B. Turning vanes: Duro Dyne, Elgen All-Tight, General Sheet Metal ,or approved equal.
- C. Flexible connections: Duro-Dyne, or approved equal. Duro-Dyne used as basis of selection.
- D. Flexible Ductwork: Thermaflex, Glass-Flex, Flexmaster. Thermaflex used for selection.
- E. Spin-in fitting: Glass-Flex, Flexmaster, or approved equal. Glass-Flex used as basis of selection.
- F. Control Dampers (Motorized): Greenheck, Ruskin, Cesco, Nailor, or approved equal with Belimo actuators.

2.2 DESCRIPTION

- A. Volume Dampers:
 - 1. Damper regulators and end bearings: 3/8 inch Figure SRH-288 for accessible ductwork and Figure SRC-380 for concealed ductwork.
 - 2. Volume dampers shall be fabricated of 18 gage galvanized steel and have a continuous galvanized steel shaft.
- B. Turning vanes: Airfoil turning vanes. Shop fabricated turning vanes are not acceptable except for supply diffuser plenums, see detail on drawings.
- C. Flexible connections: Duro-Dyne "Insulflex" insulated flexible duct connector.

AIR DUCT ACCESSORIES

- D. Flexible ductwork:
 - 1. Flexible ductwork shall be insulated type G-KM with polymeric lining and polyolefin outer jacket vapor barrier.
 - 2. Joint seals shall be Ventfabrics C-520 duct tape and "Panduit" straps or approved equal.
- E. Spin-in fittings: SM-1DEL (with insulation guard for internally lined ducts) spin-in fitting for sheet metal ductwork with 45° extractor and damper.
- F. Control Dampers: Greenheck VCD-23 Low-Leakage Control Dampers.
 - 1. 16-gauge galvanized hat channel with corner braces.
 - 2. Galvanized steel, V-groove blade construction. Extruded vinyl blade seals.
 - 3. Edge seals and flexible metal compressible jamb seals.
 - 4. Synthetic bearings.
 - 5. Square or hex plated steel axles.
 - 6. Opposed blade operation.
 - 7. Frame mounted actuator support.
 - 8. Factory installed jackshaft for all multiple section dampers.
 - 9. Maximum leakage rate of 4 CFM/sq. ft. at 1.0 inches w.g. when tested in accordance with AMCA Standard 500-1998.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Cover ductwork openings during construction after delivery to the field prior to and after installation.
- B. Install volume dampers in all branch ducts to outlets and where shown on drawings. Provide regulators on all dampers. Assure that all dampers are aligned with their regulator pointers and left open for the air balance contractor. Permanently mark full open and full closed positions.
- C. Install turning vanes in all mitered elbows.
- D. Install flexible connections between all fans and connected ducts or plenums. Install with 2-inch space between the fan and connecting duct. Fabric should be snug, but not tight. Secure with flanged connections with accurate alignment between fan and duct.
- E. Flexible Ductwork:
 - 1. Construct and assemble all ductwork and duct systems in accordance with the latest edition of the "HVAC Duct Construction Standards" published by SMACNA, Chapter 19 of the ASHRAE "Systems and Equipment" Handbook and the appropriate chapters of the latest edition of the Oregon Mechanical Specialty Code.
 - 2. All joints in the air distribution system shall be sealed airtight.
 - 3. Support all flexible ductwork on two-foot centers by a minimum one-inch galvanized sheet metal strap running around the duct.
 - 4. Extend ducts to full length prior to hanging.
 - 5. Maximum developed length to six feet.
 - 6. Minimum flexible duct bending radius is twice the duct diameter.
 - 7. When suspending duct by wire from an overhead support, duct shall be level with minimum sagging and wire should be as nearly vertical as possible.
- F. Install spin-in fittings where shown on the drawings in accordance with the manufacturer's instructions. Locate the extractors in the airstream as appropriate for direction of supply airflow.

AIR DUCT ACCESSORIES

- G. Install control dampers with actuators in accordance with manufacturer's instructions as required to complete the control sequences. Provide all low voltage / control wiring required for complete operating systems. Mount actuator to be accessible for service and replacement without removal of other mechanical components.
- H. All joints in the air distribution system shall be sealed airtight with Hardcast CCWI-181 or similar LEED^R compliant sealant.

3.2 COMMISSIONING

- A. The equipment and systems referenced in this section shall be commissioned per Section 01 91 13 – General Commissioning Requirements.
- B. The contractor has specific responsibilities for scheduling, coordination, startup, test development, testing and documentation. Coordinate all commissioning activities with the Commissioning Authority.

END OF SECTION

HVAC FANS

PART 1 - GENERAL

1.1 SUMMARY

- A. Work Included: Providing of all required fans as noted in the contract documents.

1.2 SUBMITTALS

- A. Provide submittals in accordance with Section 23 00 00.
- B. Submittals shall include: Manufacturer's catalog or technical data showing performance, dimensions, materials of construction and recommended methods of installation.

1.3 OPERATION AND MAINTENANCE DATA

- A. Provide O&M data in accordance with Section 23 00 00.
- B. O&M data shall include manufacturer's literature and maintenance instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Fans: Greenheck, Cook, ACME, or approved equal.

2.2 DESCRIPTION

- A. Direct Drive Cabinet Fans: Packaged forward curved, direct driven inline cabinet fan designed for vertical application. Internally isolated fan and motor assembly. Removable access panel with 1/2 inch thickness fiberglass type insulation securely fastened to inside surfaces of cabinet.
- B. Provide solid-state speed controllers factory mounted and wired to ceiling fan cabinets shall be accessible for service and adjustment through the removable grille. Fan shall have single point electrical connection.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. All installations shall be in accordance with manufacturer's instructions.
- B. Mount the ceiling fans where noted on the drawings. Coordinate with electrical sub-contractor for power and control switch installation. Connect ductwork.

3.2 COMMISSIONING

- A. The equipment and systems referenced in this section shall be commissioned per Section 01 91 13 – General Commissioning Requirements.
- B. The contractor has specific responsibilities for scheduling, coordination, startup, test development, testing and documentation. Coordinate all commissioning activities with the Commissioning Authority.

END OF SECTION

AIR OUTLETS AND INLETS

PART 1 - GENERAL

1.1 SUMMARY

- A. Work included: Providing of all required grilles specified or shown on the drawings.

1.2 SUBMITTALS

- A. Provide submittals in accordance with Section 23 00 00.
- B. Submittals shall include manufacturer's catalog or technical data showing performance, dimensions, materials of construction, and recommended methods of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Price, Krueger, Anemostat, Titus, Nailor, or approved equal. Price used as a basis for selection unless specified.

2.2 DESCRIPTION

- A. Supply air diffusers:
 - 1. Ceiling surface mount: Model SMCD louver face diffuser with outer frame, duct collar and modular inner core assembly allowing directional blade assembly revisions by rotating core modules. Diffuser shall be of steel construction and standard white powder finish with Border 6 beveled mount frame for flat surface mounting.
 - 2. Lay-in T-bar mount: Model SMCD louver face diffuser with outer frame, duct collar and modular inner core assembly allowing directional blade assembly revisions by rotating core modules. Diffuser shall be of steel construction and standard white powder finish with Border 36 for flush mounting in standard 24 inch x 24 inch lay-in T-bar ceiling.
- B. Return and exhaust air grilles:
 - 1. Ceiling surface mount: Model 10 grille with perforated face of neck size shown on the drawings with standard finish with Border F for flush mounting hard ceiling.
 - 2. Lay-in T-Bar mount: Model PDDR grille with perforated face of neck size shown on the drawings with standard finish with Border 3 for flush mounting in standard 24 inch x 24 inch lay-in T-bar ceiling.
- C. Sidewall supply air grilles: Model 520 rectangular steel construction grille, double deflection with horizontal face bars, spaced at 3/4 inch, 1-1/4 inch margins and standard finish.
- D. Sidewall return and exhaust air grilles: All return or exhaust air grilles lower than seven feet off finished floor shall be of heavy duty construction.
 - 1. Standard construction: Model 535 rectangular steel construction grille, 45-degree blade setting on 1/2 inch centers, 1-1/4 inch margins and standard finish.
 - 2. Heavy duty construction: Series 96 heavy-duty rectangular steel construction grille, 45° blade setting on 1/2 inch centers, 1-1/4 inch margins and standard finish. Provide opposed blade dampers (OBD) as noted on the drawings.

AIR OUTLETS AND INLETS

- E. Spiral duct sidewall supply air register: Model SDG steel duct with closed cell foam seal for installation directly into a round duct, horizontal and vertical adjustable blades, with standard finish. Provide air scoop and/or opposed blade dampers as noted on the drawings.
- F. Provide opposed blade dampers (OBD) as noted on the drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install grilles where shown on the drawings and in accordance with manufacturer's instructions.
- B. Install a gasket to assure an airtight seal between ductwork or ceiling and grille.
- C. Install all grilles tight to their respective mounting surfaces.
- D. Install plumb and true with room dimensions and accurately centered on projections as shown on architectural reflected ceiling plans.

END OF SECTION

ELECTRIC HEATING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

- A. Provide required electric heating devices.

1.2 SUBMITTALS

- A. Provide submittals in accordance with Section 23 00 00.
- B. Submittals shall include manufacturer's catalog or technical data showing performance, dimensions, materials of construction, installation requirements and control diagrams.

1.3 OPERATION AND MAINTENANCE DATA

- A. Provide O&M data in accordance with Section 23 00 00.
- B. O&M data shall include manufacturer's literature and maintenance instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Electric Heaters: Qmark, Berko, Markel, Dimplex or approved equal.

2.2 DESCRIPTION

- A. Wall heaters: QMark CWH 1000 Series
 1. UL listed.
 2. Factory rated at 120V.
 3. Heavy gauge steel with powder paint finish.
 4. Surface mounting can with knockouts.
 5. The back box shall be heavy gauge galvanized steel with knockouts for power leads.
 6. 80/20 nickel-chromium resistance wire heating element enclosed in a steel sheath to which plate fins are copper brazed. The element shall cover the entire air discharge area to ensure uniform heating of all discharged air.
 7. The fan motor shall be impedance protected, permanently lubricated. Fan control shall be of the bi-metallic, snap-action type and shall activate fan after heating element reaches operating temperature, and continue to operate the fan after the thermostat is satisfied and until all heated air has been discharged.
 8. Control devices / relays for remote thermostat operation.
 9. The fan shall be four-bladed aluminum.
 10. A back-up (End of Life) thermal fuse shall be provided for additional safety.
- B. Wellhouse heaters: QMark CWH 1000 Series
 1. UL listed.
 2. factory rated at 120, 208 or 240 VAC.
 3. 24 gauge steel with powder paint finish.
 4. The heating element shall be of non-glowing resistance wire enclosed in a steel sheath.
 5. The heater housing shall contain an enclosed tamper proof control box to isolate all live electrical parts from the remainder of the heater.

ELECTRIC HEATING DEVICES

6. An integral thermostat with a temperature range of 40 °F to 70 °F shall be completely contained in the control box.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Coordinate with the electrical contractor for installation of the electric heaters in accordance with the manufacturer's installation instructions.
- B. Locate remote thermostat on wall opposite heater. Provide all accessory wiring and components for a complete, operating system.

END OF SECTION

GENERAL PROVISIONS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The General and Supplemental Conditions apply to this Division, including but not limited to:
 - 1. Drawings and Specifications.
 - 2. Public ordinances, permits. Including but not limited to electrical and fire alarm permits.
 - 3. Payments and fees required by governing authorities for work included in this Division.
 - 4. Change orders.
- B. Division 1, General Requirements apply to this Division, including but not limited to:
 - 1. Summary of Work, Section 01010.
 - 2. Coordination, Section 01040.
 - 3. Cutting and Patching, Section 01045.
 - 4. Alternates, Section 01100.
 - 5. Submittals, including Shop Drawings, Product Data and Samples, Section 01300.
 - 6. Construction facilities and Temporary Controls, Section 01500.
 - 7. Materials and Equipment, Section 01600: Substitution and Product Options.
 - 8. Contract Closeout, Section 01700:
 - a. Project Record Documents.
 - b. Operating and Maintenance Data.
 - c. Systems Demonstrations.

1.2 MECHANICAL WIRING

- A. The following schedule is intended to summarize the division of work and responsibilities between Division 23 (formerly Division 15) and Division 26 (formerly Division 16.)

	ITEM		FURNISHED BY	INSTALL BY	POWER WIRING	CONTROL WIRING
1.	Division 23 Equipment Motors		Div. 23	Div. 23	Div. 26	Div. 23
2.	Motor Starters, Contactors and Overload Heaters – Integral		Div. 23	Div. 26	Div. 26	Div. 23
3.	Variable Frequency Drives (VFD's)		Div. 23	Div. 26	Div. 26	Div. 23
4.	Motor Control Centers		Div. 26	Div. 26	Div. 26	Div. 23
5.	Fused & Unfused Disconnect Switches		Div. 26	Div. 26	Div. 26	-----

GENERAL PROVISIONS

	ITEM	FURNISHED BY	INSTALL BY	POWER WIRING	CONTROL WIRING
6.	Manual Operation Switches	Div. 26	Div. 26	Div. 26	Div. 26
7.	Control Relays & Transformers	Div. 23	Div. 23	Div. 23	Div. 23
8.	Energy Management Control Panels	Div. 23	Div. 23	Div. 26	Div. 23
9.	Motorized Solenoid Valves	Div. 23	Div. 23	Div. 23	Div. 23
10.	Duct Mounted smoke Detectors	Div. 23	Div. 23	Div. 26	Div. 23 – Equipment Shutdown Div. 28 – Fire Alarm
11.	Fire/Smoke and Smoke Dampers	Div. 23	Div. 23	Div. 26	Div. 26 Div. 28 – Fire Alarm

1.3 CONTRACT DOCUMENTS

- A. The Electrical Drawings and Specifications are complementary and what is called for by one shall be as binding as if called for by both. Items shown on the Drawings are not necessarily included in the Specifications. All directives and instructions to furnish, provide, install, complete, test and methods described in these Specifications and Drawings shall be interpreted as directives to the Electrical Contractor unless clearly specified otherwise. It is the intent of these specifications and the accompanying drawings to describe complete and functional electrical systems. If errors or discrepancies are discovered, notify the Architect immediately.

1.4 SITE VISITATION

- A. The contractor shall visit the site prior to bidding to familiarize themselves with existing conditions and all other factors which may affect the execution of the work.

1.5 CODES, ORDINANCES AND REGULATIONS

- A. The completed installation shall conform to all applicable Federal, State and Local Codes, Ordinances and Regulations.
- B. Obtain all necessary permits and inspections required by the governing authorities having jurisdiction over this work.
- C. Furnish to the Architect a certificate of approval from the inspection authority at the completion of the work, prior to the application for final payment.

GENERAL PROVISIONS

1.6 SCOPE OF WORK

- A. The work covered by this Specification shall include furnishing all labor, materials, equipment and services to construct and install the complete electrical system as shown on the Drawings and specified herein. Verify all conditions on the job site and lay out work accordingly.
- B. The work shall include, but is not necessarily limited to, the following systems:
 - 1. Secondary service and distribution systems.
 - 2. Lighting systems, complete and operational
 - 3. Lighting control modifications
 - 4. Power systems, complete and operational.
 - 5. Grounding continuity
 - 6. Connection of electrical equipment furnished under other Divisions of work.
 - 7. Telecommunication system provisions, provide all equipment as indicated on drawings and specified herein. The system will be warrantied, manufacturer will be ComScope
 - 8. Television provisions.
 - 9. Security provisions.
 - 10. Speaker modifications as noted on drawings
 - 11. Fire alarm system modifications. Fire alarm system is shown on drawings. Electrical contractor will provide all labor and material including but not be limited to junction boxes, mud rings, conduit, and supports. The FA devices will not be installed at this time. Provide a blank WP cover with a #12 cu pull wire in all conduits
 - 12. Provide fire sprinkler monitoring system.
 - 13. Connection of electrical equipment furnished under other Divisions of work
 - 14. Electrical contractor on site Project foreman will be the same person the entire duration of the project. A \$500 / day penalty will be assessed to the contractor for each day the project foreman is not on site when electrical work is being performed.
 - 15. Demolition as required, electrical drawings are diagrammatic, demolition information has been shown on the architectural & electrical construction drawings, or in the specifications. Electrical devices and equipment are from existing record drawings and / or site observations. Their accuracy is not guaranteed. It will be the electrical contractors responsibility to visit the site prior to bid and verify all existing conditions prior to bid and include all labor and material required for the work indicated in the construction set
 - a. The purpose of the demolition information is to provide a general direction of what needs to be removed to accomplish the renovation work. The work is diagrammatic in nature and is not intended to be all inclusive. The contractor is responsible to verify existing conditions at the site and include all work evident by site inspection whether or not shown on the drawings, to achieve the desired results indicated on the documents for the finished spaces.
- C. The following equipment and work will be furnished under other Divisions of Work:
 - 1. Mechanical equipment motors and heaters, unless otherwise noted on drawings.
 - 2. Equipment control wiring beyond the provisions shown on the Electrical Drawings.

1.7 WARRANTY

- A. Provide a written one-year warranty covering the work done under this Division as required by the General Conditions. Incandescent lamps will be excluded from this warranty.
- B. Systems and Apparatus:
 - 1. Free of defects of material and workmanship and in accord with the Contract Documents.
 - 2. Built and installed to deliver its full rated capacity at the efficiency for which it was designed.
 - 3. Operate at full capacity without objectionable noise or vibration.

GENERAL PROVISIONS

1.8 SUBMITTALS

- A. Refer to Division 1 requirements.
- B. Submit all electrical data in 3-point covered binders, indexed by section number, covering all items of equipment and systems. Submit all electrical items at one time.
- C. The installation and Record Drawings called for under submittals shall show all outlets, devices, terminal cabinets, conduits, wiring and connections required for the complete system described. Drawings will be at the same sheet size and scale as the construction documents. Prints of these drawings shall be submitted prior to starting installation. The Contractor submitted drawings, when approved, will then form the basis for installation.
- D. Submittals will not be reviewed unless equipment is specifically indicated. Information not marked with all options will be rejected. Owner / engineer will not interpret the contractors intent

PART 2 - PRODUCTS

2.1 APPROVALS AND SUBSTITUTIONS

- A. The use of manufacturer's names, models and numbers in this Specification is intended to establish style, quality, appearance and usefulness. Items noted "or equal" do not require prior approval. Items noted "approved equivalent" or "approved substitute" require prior approval.
- B. Submit for the Architect's approval, manufacturer's detailed specifications and data sheets for all proposed substitutions. Submittals shall consist of a single sheet, or sheets, if required, for each piece of equipment and shall give the specific data needed for consideration of approval. All pertinent data listed in the Specifications and in Schedules shall be furnished, including all special features. See that all submittals are in proper order, and that all equipment will fit in the space provided.
- C. The Architect reserves the right to require the submission of an actual sample before the acceptance of any product as an equal to that specified.

2.2 MATERIAL APPROVALS AND SHOP DRAWINGS

- A. Submit all electrical data in PDF format and one (1) 3-point covered binders, indexed by Section number, covering all items of equipment and systems. Include wiring diagrams where called for.
- B. Review and recommendations by the Architect or Engineer are not to be construed as change authorizations. If discrepancies between the shop drawings submitted and the Contract Documents are discovered either prior to or after the data is processed, the Contract Documents will govern. Shop drawing review will not occur without contract cost data as outline below.

PART 3 - EXECUTION

3.1 CONTRACT COST DATA

- A. Furnish to the Architect a cost breakdown of the Electrical Contract.
- B. The cost breakdown shall include separate amounts for material and labor for each category listed below. Include costs data with the shop drawings submittal.
 - 1. Secondary panels.
 - 2. Switchgear and transformers
 - 3. Feeders.

GENERAL PROVISIONS

4. Disconnects, starters and equipment connections.
5. Branch circuit wiring and devices.
6. Telecommunication provisions.
7. Television provisions.
8. Security provisions.
9. Fire alarm system
10. Luminaires.
11. Lighting controls

3.2 CHANGE ORDERS

- A. All supplemental cost proposals by the Contractor shall be accompanied with a complete itemized breakdown of labor and materials cost without exception. Contractor's estimating sheets for the supplemental cost proposals shall be included. Labor must be separated and allocated for each item of work. Material cost, as used in this section, to be Contractor's actual "invoice" cost. All discounts shall be detailed and shown on the invoice. Labor cost shall be the actual cost per manhour including all taxes and fees. The total estimated cost for any change will be considered a not-to-exceed price. The supplemental cost approval will be based on this estimate but actual change order request for payment will be based on the contractor's actual cost to perform this work and shall be accompanied with a complete itemized breakdown of labor and materials cost with backup invoices, without exception.

3.3 OPERATING AND MAINTENANCE DATA

- A. The Contractor shall provide operating instructions and maintenance data, in 3-point covered binders, for all equipment and materials called for under this Division.
- B. Submit in PDF format and one (1) copy of the Operating and Maintenance data books for review at least four weeks before final review of the Project. Assemble all data in a completely indexed volume or volumes and identify the size, model, and features indicated for each item.
- C. Maintenance instruction manuals shall include complete cleaning and servicing data compiled in clearly and easily understandable form. Data shall show serial numbers of each piece of equipment and complete lists of replacement parts.

3.4 ELECTRONIC INFORMATION

- A. Electronic record information in AutoCAD format will be provided to the electrical contractor upon request. A drawing release form will be sent to the contractor and upon its return a compact disk will be made available to be picked up at System Design Consultants, Inc office. One (1) copy of the base project construction document files will be made available to the contractor at no charge, each additional request will be provided at a cost of \$250 per request.
- B. All contractors and sub contractors requiring electrical plans will make their request for the construction documents through the electrical contractor.

3.5 RECORD INFORMATION

- A. Maintain one set of construction documents marked up (red-lined) on a daily basis as the work progresses, showing all changes, deviations, change orders, omissions, or other variations from the contract drawings.
- B. Record all conduits, stubups and equipment by dimensions from gridlines, below grade, above floor, etc. Show location of all access panels, rough-in for future, etc.

GENERAL PROVISIONS

- C. Make record documents available to the Architect for review or printing during construction.
- D. On acceptance of the contractor record drawings by the Architect, the contractor will transfer the record information in "AutoCAD" format to the electronic "AutoCAD" drawing files. Refer to 26 00 00-3.4(A) for obtaining documents and applicable charges.
- E. Deliver record drawings files to the Architect promptly upon completion of the project. Record information added to the "AutoCAD" drawing files is to have compatible format, linework and lettering as the original files. All new work done by the contractor on the original drawing files is to be on a single layer noted in the revised drawing file as "RECORD".

3.6 ALTERNATES

- A. Refer to Division 1.
- B. Refer to Architectural & Electrical Drawings for information relating to the appropriate alternates.

3.7 PROTECTION OF WORK

- A. Protect all electrical work and equipment installed under this Division against damage by other trades, weather conditions or any other causes. Equipment found damaged or in other than new condition will be rejected as defective.
- B. Switchgear, transformers, panels, light fixtures and all electrical equipment shall be kept covered or closed to exclude dust, dirt and splashes of plaster, cement or paint and shall be free of all such contamination before acceptance. Enclosures and trims shall be in new condition, free of rust, scratches and other finish defects. Properly refinish in a manner acceptable to the Architect, if damaged.

3.8 MAINTENANCE OF SERVICE

- A. Electrical service shall be maintained to all functioning portions of the building throughout construction, except as noted below, during all normal working hours of the building occupants. Outages to occupied areas shall be kept to a minimum and be prearranged with the Architect or Owner's Representative. This Contractor will be liable for any damages resulting from unscheduled outages or for those not confined to the pre-arranged times.
- B. Signal and communication systems and equipment shall be kept in operation wherever these serve occupied or functional portions of the building. Outages of these facilities shall be treated the same as electrical power outages.
- C. Telephone services where required during the construction work will be maintained by the telephone company. This work shall be coordinated with the telephone company in such a manner that service, as required by the building occupants, can be readily installed and maintained.
- D. Include all costs for temporary facilities, overtime labor and necessary provisions to maintain electrical services in the initial bid proposal. Temporary wiring and facilities, if used, shall be removed and the site left clean before final acceptance.

END OF SECTION

BASIC MATERIALS AND METHODS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Conditions of the Contract and Section 26 00 00 apply to this Section.

1.2 COORDINATION OF WORK

- A. Conduct work in a manner to cooperate with all other trades for proper installation of all items of equipment. Consult the Drawings of all other trades or crafts to avoid conflicts with cabinets, counters, equipment, structural members, etc. In general, the architectural drawings govern but conflicts shall be resolved with the Architect prior to rough-in.
- B. Verify the physical dimension of each item of electrical equipment to fit the available space. Coordination of the equipment to fit into the available space and the access routes through the construction shall be the Contractor's responsibility.
- C. Coordinate rough-in and wiring requirements for all mechanical equipment with mechanical contractor and equipment supplier. Make installation in accordance with rough-in and wiring diagrams provided by equipment supplier for Contractor's use. Report immediately to architect any deviation between contract documents and actual equipment requirements.
- D. Coordinate all aspects of the electrical, telephone and other utility services with the appropriate serving utility. No additional compensation will be allowed the Contractor for connection fees or additional work or equipment not covered in the Drawings or Specifications which are a result of policies of the serving utility.
- E. Coordinate underground work with other contractors working on the site. Particular coordination shall be performed with contractors installing storm sewer, sanitary sewer, water and irrigation lines, to avoid conflicts. Common trenches may be used with other trades, providing clearances required by codes and ordinances are maintained.

1.3 ELECTRICAL DRAWINGS

- A. The Electrical Drawings accompanying these Specifications are design drawings and generally are diagrammatic indicating approximate locations of outlets and wiring. They do not show every offset, bend, junction box, etc., which may be required for installation to complete the system. Minor deviations in methods, circuiting and branch circuit distribution or arrangements to suit construction conditions are permissible.
- B. The intent of the branch circuiting and control shown shall not be changed nor homeruns combined without the approval of the Architect. Feeder runs shall not be combined or changed.
- C. Cross or hash marks on conduit runs indicate quantity of No. 12 copper branch circuit conductors, in addition to a grounding conductor, unless otherwise noted. Where such marks do not appear, provide minimum of two conductors with ground, minimum No. 12, size as required for loads and/or equipment being served. **Contractor is responsible to assure that the limiting branch circuit voltage drop to 3% and to 2% on feeders at design loads as required by CEC.** The contractor shall review panel schedule to verify wire/conduit size required.
- D. Conduit sizes shown or listed on the drawings are for reference only. It is the responsibility of the contractor to provide and install conduit sized per current NEC requirements.

BASIC MATERIALS AND METHODS

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Electrical products installed in this project shall be listed by a recognized testing laboratory or approved in writing by the local inspection authority as required by governing codes and ordinances.
- B. Materials shall be new, of the best quality. The materials shall be manufactured in accordance with NEMA, ANSI, UL or other applicable standards.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Provide a completely properly operating system for each item of equipment called for under this work. Installations shall be in accord with the equipment manufacturer's instructions, the best industry practices and the contract documents. Where a conflict in these guides appear, the Architect shall be requested to provide proper clarification before work is roughed in and his decision will be final. Work installed without such clarification shall be removed and corrected by the Contractor at no cost to the Owner.
- B. Make installation in a neat, finished and safe manner, according to the latest published NECA Standard of Installation under competent supervision.

3.2 EXCAVATION AND BACKFILL

- A. Perform all necessary excavation and backfill for the installation of electrical work in compliance with Section 02220.
- B. For direct burial cable or non-metallic conduit, a minimum 3-inch cover of sand or clean earth fill shall be placed all around the cable or conduit on a leveled trench bottom. Lay all steel conduit on a smooth level trench bottom, so that contact is made for its entire length. Water shall not be present in the trench when electrical conduit is being laid.
- C. Place backfill in layers not exceeding 8-inches deep and compact to 95% of maximum density at optimum moisture to preclude settlement.
 - 1. Interior: Bank sand or pea gravel.
 - 2. Exterior: Excavated material with final 8-inches clean soil.
- D. Following backfilling, grade all trenches to the level of surrounding soil. All excess soil shall be disposed of at the site as directed.
- E. Provide 6-inch wide vinyl tape marked "ELECTRICAL" in backfill, 12-inches below finished grade, above all conduit runs.
- F. Coordinate patching of all asphalt or concrete surfaces disturbed by this work with General Contractor.

3.3 NOISE CONTROL

- A. Outlet boxes at opposite sides of partitions shall not be placed back-to-back nor straight through boxes be employed, except where specifically permitted on the Drawings by note, to minimize transmission of noise between occupied spaces.

BASIC MATERIALS AND METHODS

- B. Contactors, transformers, starters and similar noise producing devices shall not be placed on walls which are common to occupied spaces unless specifically called for on the Drawings. Where such devices must be mounted on walls, common to occupied spaces, they shall be shock mounted or isolated in such a manner as to effectively prevent the transmission of their inherent noise to the occupied space.
- C. Ballasts, contactors, starters, transformers and like equipment which are found to be noticeably noisier than other similar equipment on the project will be deemed defective and shall be replaced.

3.4 EQUIPMENT CONNECTIONS

- A. Provide complete electrical connections for all items of equipment requiring such connections, including incidental wiring, materials, devices and labor necessary for a finished working installation.
- B. Verify the location and method for connecting to each item of equipment prior to roughing-in. Check the voltage and phase of each item of equipment before connecting.
- C. Make motor connections for the proper direction of rotation. Minimum size flex for mechanical equipment shall be 1/2-inch except at small control devices where 3/8-inch may be used. Exposed motor wiring shall be jacketed metallic flex with 6-inches minimum slack loop. Pump motors shall not be test run until liquid is in the system.
- D. Control devices and wiring relating to the HVAC systems will be furnished and installed under Division 15 except for provisions or items specifically shown on the Electrical Drawings or specified herein.
- E. Furnish all code required disconnects under this work, whether specifically shown or not.

3.5 EQUIPMENT SUPPORT

- A. Anchoring and bracing to the building structural elements in accord with all codes and regulations regarding seismic design conditions. The contractor is responsible to determine the means and methods of equipment installation and support. Seismic restraints for electrical and communication equipment shall bear the seal and signature of a structural engineer registered in the state of the project, and shall be submitted to the Architect prior to fabrication. Calculations are to be included for all connections to the structure, considering localized effects.
- B. Each fastening device and support for electrical equipment, fixtures, panels, outlets and cabinets shall be capable of supporting not less than four times the ultimate weight of the object or objects fastened or suspended from the building structure.
- C. Properly and adequately support fixtures installed under this work from the building structure. Supports shall provide proper alignment and leveling of fixtures. Flexible connections where permitted to exposed fixtures shall be neat and straight, without excess slack, attached to the support device.
- D. Support all junction boxes, pull boxes or other conduit terminating housings located above the suspended ceiling from the floor above, roof or penthouse floor structure to prevent sagging or swaying.
- E. Conduits:
 - 1. Support suspended conduits 1-inch and larger from the overhead structural system with metal ring or trapeze hangers with threaded steel rod having a safety factor of 4.
 - 2. Conduit installed in poured concrete shall be anchored to the reinforcing steel with No. 14 black iron wire.

BASIC MATERIALS AND METHODS

3.6 ALIGNMENT

- A. Install panels, cabinets and equipment level and plumb, parallel with structural building lines. Switchgear panels and all electrical enclosures shall fit neatly without gaps, openings or distortion. Properly and neatly close all unused openings with approved devices.
- B. Fit surface panels, devices and outlets with neat, appropriate trims, plates or covers, without overhanging edges, protruding corners or raw edges, to leave a finished appearance.

3.7 CUTTING AND PATCHING

- A. Include cutting, patching and restoration of finishes necessary for this work. Surfaces damaged by this work and spaces around conduits passing through floors and walls shall be neatly patched and finished to match the adjacent construction, including painting or other finishes. Clean up and remove all dirt and debris. This work shall all be performed to the satisfaction of the Architect. Refer to Section 01045.

3.8 FIRESTOPPING PENETRATIONS IN FIRE-RATED WALL/FLOOR ASSEMBLIES

- A. Contractors shall provide proper sizing when providing sleeves or core-drilled holes to accommodate their through penetrating items. All voids between sleeve or core-drilled hole and pipe passing through, shall be firestopped to meet the requirements of ASTM E-814, in accordance with Section 07270 - Firestopping.
- B. Provide properly sized expansion fittings for all conduits crossing over building expansion joints.

END OF SECTION

CONDUCTORS AND CONNECTORS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included:
 - 1. Deliver conductors to the job site in cartons, protective covers or on reels.
 - 2. Conductors for special systems shall be as recommended by the equipment manufacturer except as noted
 - 3. All conductors will be copper only.

1.2 RELATED WORK

- A. Section 26 00 00: General Provisions
- B. Section 26 05 00: Basic Materials and Methods.

1.3 SUBMITTALS

- A. Shop Drawings.
- B. Product Data.

PART 2 - PRODUCTS

2.1 CONDUCTORS - 600 V

- A. Type:
 - 1. No. 12 AWG minimum size unless noted otherwise.
 - 2. No. 8 and larger, stranded, Class B.
- B. Stranding: Copper, concentric or compressed
- C. Insulation: THHN, THWN, XHHW unless noted or specified otherwise.
- D. Through wiring in fluorescent fixtures shall be rated for 90 degree C.
- E. Manufacturers: G.E., Hatfield, Anaconda, Rome or equal.

2.2 CORD DROPS AND PORTABLE CORDS

- A. Copper type "S" or "SO" heavy duty, rubber insulated unless otherwise noted.

2.3 CONNECTORS

- A. Branch Circuit Conductor Splices: Live spring type, Scotch-Lok, Ideal Wing Nut or self-stripping type, 3M Series 560.
- B. Cable Splices: Compression tool applied sleeves, Kearney, Burndy or equal with 600V heat shrink insulation.
- C. Lugs: Conductors no. 6 and larger, except on molded case circuit breakers, two hole, long barrel pressure tool set Thomas & Betts No. 54,000 series, Burndy "Hydent", Anderson Electric VCEL, or approved.

CONDUCTORS AND CONNECTORS

PART 3 - EXECUTION

3.1 CONDUCTORS

- A. Pulling compounds may be used with the residue cleaned from the conductors and raceway entrances after the pull is made.
- B. Pulleys or blocks shall be used for alignment of the conductors when pulling. Pulling shall be in accordance with manufacturer's specifications regarding pulling tensions, bending radii of the cable and compounds.
- C. Conductors entering terminal or junction boxes mounted on hermetically sealed refrigeration compressor motors shall be copper.
- D. Make up and insulate wiring promptly after installation of conductors. Wire shall not be pulled in until all bushings are installed and raceways terminations are completed. Wire shall not be pulled into conduit embedded in concrete until after the concrete is poured and forms are stripped.
- E. Conductor sizes shown on the Drawings are for copper only.

3.2 CONNECTORS

- A. Control and special systems wires shall be terminated with a tool applied spade flared lug when terminating at a screw connection.
- B. All screw and bolt type connectors shall be made up tight and retightened after an eight-hour period.
- C. All tool-applied compression connectors shall be applied per manufacturer's recommendations and physically checked for tightness.

3.3 COLOR CODING

- A. Phase color code to be consistent at all feeder terminations, A-B-C left-to-right or A-B-C top-to-bottom.
- B. Switchlegs, travelers, etc. to be consistent with the phases to which connected or a color distinctive from that listed.
- C. Under 250 Volts Phase-to-Phase:

Phase A - Black	Neutral - White
Phase B - Red	Ground - Green
Phase C - Blue	
- D. Over 250 Volts Phase-to-Phase:

Phase A - Brown	Neutral - White with tracer
Phase B - Orange	Ground - Green
Phase C - Yellow	

END OF SECTION

GROUNDING AND BONDING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included:
 - 1. Provide complete building grounding system.
 - 2. Provide ground bus bar at each telephone demarcation and data distribution location.

1.2 RELATED WORK

- A. Section 26 00 00: General Provisions,
- B. Section 26 05 00: Basic Materials and Methods,
- C. Section 26 05 19: Conductors and Connectors
- D. Section 26 27 26: Wiring Devices and Plates

PART 2 - PRODUCTS

2.1 GROUND CONDUCTORS

- A. Bare or green insulated copper.

2.2 GROUND ROD CONNECTORS

- A. Cast, set screw or bolted type.

2.3 ELECTRODES

- A. Copper clad steel minimum 3/4-inch diameter by 8 feet long.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Grounding system will consist of the following:
 - 1. Minimum of 20' bare no. 4 copper concrete-encase grounding conductor.
 - 2. Provide bond to building steel.
 - 3. Provide bond to cold water piping within 5' of building entry.
 - 4. Provide bond to minimum of 2 ground rods.
- B. Establish a ground for each separately derived system, e.g., transformers and generators, per NEC 250-30.
- C. All grounding conductors shall be sized in accord with the National Electrical Code.
- D. Grounding conductor connectors shall be made up tight and located for future servicing and to ensure low impedance.
- E. Ground the electrical system, the cold-water service, structural steel, and transformers to the building ground grid.
- F. All feeder and service raceways shall be grounded.

GROUNDING AND BONDING

- G. All plug-in receptacles shall be bonded to the boxes, raceways and grounding conductor.
- H. Provide equipment-grounding conductor in all branch circuit, feeder and service raceways.
- I. Provide insulated grounding conductor in all branch circuit wiring serving Classrooms, Administration offices and all data locations.
- J. Provide bonding jumper between ground and neutral bus at main service.

3.2 GROUND BUS BAR (TELEPHONE DEMARCATION AND DATA DISTRIBUTION)

- A. Provide & install copper ground bus bar on isolators, 6" x 2" minimum. Install 1 - #6 insulated conductor to the building grounding connection at the main distribution panel.

END OF SECTION

CONDUITS, RACEWAYS, BOXES AND FITTINGS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included:
 - 1. Provide raceways and conduits of specified types for all electrical systems wiring, except where clearly shown or specified otherwise. All fittings, boxes, hangers and appurtenances shall be included.
 - 2. Size raceways and conduits as indicated on the Drawings. Where no size is indicated, conduit may be the minimum code permitted size for the quantity of type THW conductors installed. Minimum size is 3/4"
 - 3. MC cable is not approved for use on this project.

1.2 RELATED WORK

- A. Section 26 00 00: General Provisions
- B. Section 26 05 00: Basic Materials and Methods

1.3 SUBMITTALS

- A. Shop Drawings.
- B. Product Data.
- C. Operational Instructions and Maintenance Data.

PART 2 - PRODUCTS

2.1 METALLIC CONDUITS

- A. GRC: Threaded rigid heavy wall galvanized steel.
- B. IMC: Threaded intermediate galvanized steel.
- C. EMT: Zinc coated steel electrical metallic tubing.
- D. ARC: Threaded rigid heavy wall aluminum.
- E. Flex: Flexible metal with polyvinyl chloride jacket, at speakers and no longer than 3'-0".
- F. Liquidtight flexible conduit: Zinc steel core with smooth gray abrasion-resistant, liquid-tight PVC cover with integral ground wire wound in steel core, at speakers and no longer than 3'-0".

2.2 NON-METALLIC CONDUITS

- A. Rigid non-metallic conduit: Type II PVC schedule 40, suitable for use with 90 degrees C rated wire. Conduit shall conform to UL Standard 651 and carry appropriate UL listing for above and below ground use.

2.3 SURFACE RACEWAYS

- A. Acceptable manufacturer(s): Wiremold, Panduit or as noted on drawings.

CONDUITS, RACEWAYS, BOXES AND FITTINGS

- B. Type, size with quantity and spacing of outlets as shown on drawings. Provide with snap-on cover, connectors, fittings and incidental items required for a complete installation. Raceway shall be in continuous length as indicated on drawings.

2.4 WIREWAYS

- A. Troughs: Steel, painted, square in cross section, preformed knock-outs on standard spacing, hinged cover.
- B. Fittings: Tees, elbows, couplings as required for configuration shown on the Drawings.
- C. Supports: U-shaped, 1/4-inch by 1-1/2-inch steel strap, bent and prime painted.

2.5 FITTINGS

- A. GRC, IMC AND ARC:
 - 1. The conduit itself must be threaded, threaded couplings attached by any means are not allowed.
 - 2. Threaded locknuts.
 - 3. Threaded bushings: 1-1/4 inch and larger shall be of the insulated, grounding type as required under Section 26 05 26.
 - 4. Expansion fittings: O-Z/Gedney Electrical Mfg. Co. type E expansion coupling with bonding jumper for up to four inches of movement.
- B. EMT:
 - 1. Connectors: Steel set screw or compression ring type for conduit termination, with insulated throat, suitable for conditions used.
 - 2. Couplings: Steel set screw or compression ring type, concrete tight.
- C. Weatherproof Connectors: Threaded pipe connections with waterproofing compound.

2.6 METALLIC BOXES

- A. Flush and Concealed Outlet Boxes: Galvanized stamped steel with screw ears, knock-out plugs, mounting holes, fixture studs if required, RACO or equal.
- B. Surface Outlet Boxes: Galvanized stamped steel same as above for use on ceilings; cast steel or aluminum with threaded hubs for use on walls.
- C. Large Boxes: Boxes exceeding 4-11/16 inches square when required shall be welded steel construction with screw cover and painted, steel gauge as required by physical size, Hoffman, Circle AW or equal.
- D. Floor Boxes:
 - 1. Fully adjustable, Walker 880 series, Hubbell or approved substitute.
 - 2. Equip all floor outlets with Lexan polycarbonate flanges, black finish, Walker 817, 827 or 837 series with cover plate, Hubbell or approved substitute. Verify floor type.
- E. Floor Boxes (Power and Data):
 - 1. Fully adjustable flush concrete box, Walker "Resource RFB" series, model RFB4.
 - 2. Equip all floor outlets with recessed carpet trim plate with mire management blocks, Walker RAKMII. Verify floor type.

CONDUITS, RACEWAYS, BOXES AND FITTINGS

2.7 NON-METALLIC BOXES

- A. PVC, molded enclosures, threaded hubs.

2.8 OTHERS

- A. Any conduits, fittings, etc. specifically not mentioned above are not approved for use.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Conceal all conduits in finished spaces and elsewhere so far as practicable. Concealed conduits shall run in a direct line with long sweep bends and offsets. GRC and IMC embedded in concrete below grade or in damp locations shall be made water-tight by painting the entire male thread with Rustoleum metal primer, or equal, before assembly.
- B. Route exposed conduit parallel or at right angles to structural building lines, and neatly offset into boxes. Conduits attached directly to building surfaces shall closely follow the surfaces. Conduit fittings shall be used to "saddle" under beams.
- C. Conduits, whether exposed or concealed, shall be securely supported and fastened at intervals of nominally every 8 feet and within 18 inches of each outlet, ell, fitting, panel, etc.
- D. Keep conduit and raceways closed with suitable plugs or caps during construction to prevent entrance of dirt, moisture, concrete or foreign objects. Raceways shall be clean and dry before installation of wire and at the time of acceptance.
- E. Pack spaces around conduits with oakum and seal to prevent entrance of moisture where conduits are installed in sleeves or block-outs penetrating moisture barriers.
- F. Where conduits penetrate fire rated concrete walls or floors, provide non-combustible caulking or putty 3M-fire barrier material of thickness required to equal or exceed the fire rating of wall or floor.

3.2 CONDUIT

- A. Install GRC or IMC galvanized steel conduits for wiring underground, in-cast-concrete construction, in damp locations, in hazardous areas and where subject to mechanical injury, with threaded fittings made up tight.
- B. EMT may be employed in all other dry protected locations.
- C. ARC may be used wherever EMT is acceptable, with no restriction on size.
- D. Flex is required where flexibility is necessary as at motors, transformers and recessed lighting fixtures, etc. Flex shall be jacketed type, except where concealed in dry locations and spaces such as ceiling cavities.
- E. PVC may be used underground, under interior slabs or where scheduled or noted on the Drawings. Make connections with waterproof solvent cement. Provide GRC at 60 degree and larger bends and where penetrating slabs or elling up above grade in exterior locations. PVC conduit shall not be installed less than 30" under roadways or areas subject to heavy traffic. Provide a ground wire sized per code in all PVC conduits. Conductor quantities indicated in conduits do not include ground wires unless otherwise noted.

CONDUITS, RACEWAYS, BOXES AND FITTINGS

- F. Conduit stubbed from a concrete slab or wall to serve an outlet under a table or to supply a machine shall have a rigid conduit coupling flush with the surface of the slab. Provide plug where conduit is to be used in future.
- G. Conduits in above-grade slabs shall be located in the middle of the slab. The maximum size, spacing, and location of conduits in post-tensioned slabs shall be subject to approval by the structural engineer. Conduits larger than one inch shall not be run in slabs.

3.3 RACEWAYS

- A. Surface metal raceway with snap-in cover may be used in finished spaces only as specified, or shown on Drawings.
- B. Surface metal wireways may be installed at locations to serve motor starters or other control devices where required by a multitude of wiring interconnections or physical layout.
- C. Expansion Joints:
 - 1. All conduits crossing expansion joints where cast in concrete shall be provided with expansion-deflection fittings, equivalent to OZ/Gedney AXDX, installed per manufacturers recommendations.
 - 2. All conduits three inches and larger where not cast in concrete shall be rigidly secured to the building structure on opposite sides of a building expansion joint with an expansion-deflection fitting across the joint, equivalent to OZ/Gedney AXDX, installed per manufacturer's recommendations.
 - 3. All conduits less than three inches where not cast in concrete shall be provided with junction boxes securely fastened on both sides of the expansion joint, connected together with 15 inches of slack (a minimum of 15 inches longer than the straight line length) flexible conduit with copper green ground bonding jumper. In lieu of this flexible conduit, an expansion-deflection fitting, as indicated for conduits three inch and larger, may be installed.
- D. Seismic Joints
 - 1. No conduits cast in concrete shall be allowed to cross a seismic joint.
 - 2. All conduits shall be provided with junction boxes securely fastened on both sides of the expansion joint, connected together with 15 inches of slack (a minimum of 15 inches longer than the straight line length) flexible conduit with copper green ground bonding jumper. Prior to installation, verify with Architect that the 15 inches is adequate for the designed movement, and if not, increase this length as required.

3.4 SURFACE RACEWAYS

- A. The raceway system shall provide a complete enclosure that protects the wires installed therein against damage.
- B. There shall not be any openings that exceed 1/16 inch (1.59 mm) in width on surfaces that are accessible following installation of the system.

3.5 FITTINGS

- A. Metallic raceways and conduits shall be assembled continuous and secured to boxes, panels, etc., with appropriate fittings to maintain electrical continuity. All conduit joints shall be cut square, reamed smooth with all fittings drawn up tight.

CONDUITS, RACEWAYS, BOXES AND FITTINGS

3.6 BOXES

- A. Outlet boxes shall be of code required size to accommodate all wires, fittings and devices. Provide multi-gang boxes as required to accept devices installed with no more than one device per gang. Equip all metallic boxes with grounding provisions.
- B. Flush wall switch and receptacle outlets used with conduit systems shall be 4 inches square, 1-1/2 inches or more deep, with one or two-gang plaster ring mounted vertically. Where three or more devices are at one location, use one piece multiple gang tile box or gang box with suitable device ring.
- C. Wall bracket and ceiling surface mounted lighting fixture outlets shall be 4-inch octagon, 1-1/2-inches deep with 3/8-inch fixture stud where required. Wall bracket outlets to have single gang opening where required to accommodate fixture canopy. Provide larger boxes or extension rings where quantity of wires installed requires more cubic capacity.
- D. Boxes for the special systems shall be suitable for the equipment installed. Coordinate size and type with the system supplier.
- E. Provide pull boxes where shown, or in conduit runs greater than 100 feet, or where required to limit the number of bends in any conduit to not more than three 90 degree bends or equivalent. Use galvanized boxes of code-required size with removable covers installed so that covers will be accessible after work is completed. Do not locate pull boxes or junction boxes in finished areas unless specifically shown or special permission is obtained from Architect.
- F. Boxes shall be flush with finished surfaces or not more than 1/8-inch below surface and be level and plumb. Long screws with spacers or shims for mounting devices will not be acceptable. No combustible material shall be exposed to wiring at outlets.

END OF SECTION

IDENTIFICATION

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Clearly and properly identify the complete electrical system to indicate the loads served or the function of each item of equipment connected under this work.

PART 2 - PRODUCTS

2.1 LABELS

- A. Panels: Typed or pre-printed white permanent materials labels with adhesive backing, Specified Products, Inc. or equal.
- B. Switchgear, Panelboards and Transformers: "Lamicoid", 3-ply laminated plastic, black with white letters, Minimum 1/4" letters.
 - 1. Provide label on MDP to read:

THIS INSTALLATION DESIGNED BY SYSTEM DESIGN CONSULTANTS, INC. PORTLAND, OR 503-248-0227 (year installed)
--

- C. Equipment: Dymo-Tape, plastic tape with adhesive backing, field printed with proper tool.

PART 3 - EXECUTION

3.1 SWITCHGEAR

- A. Label the main and feeder protective devices in all distribution panels with laminated plastic labels indicating the function or the load served.
- B. Provide labels for all bussed spaces indicating size of future breaker or switch that may be installed in the space reserved.

3.2 BRANCH CIRCUIT PANELBOARDS

- A. Indicate panel number with laminated plastic labels. Indicate voltage phase and feeder source, feeder wire size, and feeder breaker or fuse size with white permanent labels on the inside of the panel door.
- B. Provide machine-printed panel directories with protective, clear transparent covers, accurately accounting for every breaker installed, including spares. Schedules shall use the actual room designations assigned by name or number near completion of the work and not the space designation on the Construction Drawings.

3.3 EQUIPMENT

- A. Label all disconnect switches, motor starters, relays, contactors, time switches indicating voltage, amperage, circuit number and equipment served with white permanent labels.
- B. Label all transformers and busways with black and yellow 4-1/2 inch high pre-printed adhesive backed materials.

IDENTIFICATION

3.4 SYSTEMS

- A. Complex control circuits may utilize any combination of colors with each conductor identified throughout, using wraparound numbers or letters. Use the number or letters shown where the Drawings or operation and maintenance data indicate wiring identification.
- B. Label the fire alarm and communication equipment zones, controls, indicators, etc. with machine printed labels or indicators appropriate for the equipment installed, as supplied or recommended by the equipment manufacturer.

END OF SECTION

ELECTRICAL DISTRIBUTION SYSTEM

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included:
 - 1. Furnish and install the materials for the secondary service and distribution system as specified herein and shown on the Drawings.
 - 2. Provide switches of proper characteristics as disconnecting means as shown on drawings.
 - 3. System will be rated as shown on One Line for available fault current, coordinate with Power Company.
 - 4. Provide fault study as part of the shop drawings indicating bracing at all locations, Verify available fault current with utility company.

1.2 METERING

- A. Provide metering facilities as indicated on the Drawings, complying with the established serving utility requirements.
- B. Include all metering charges or connection costs charged by the serving utility in the original proposal. Refer to section 26 05 00-1.2, Coordination of Work, of these Specifications.

1.3 RELATED WORK

- A. Section 26 00 00: General Provisions
- B. Section 26 05 00: Basic Materials and Methods
- C. Section 26 28 00: Circuit Protective Devices

1.4 SUBMITTALS

- A. Shop Drawings, include dimensional layout of equipment.
- B. Product Data.
- C. Operation Instruction and Maintenance Data.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Siemens, Square D, Cutler-Hammer, GE.
 - 1. Note: Space on project is critical. Equipment shown on plans was designed around Siemens. It is the contractor's responsibility to verify that equipment used fits into the allotted space.

2.2 MAIN DISTRIBUTION PANEL

- A. The main distribution panel shall be metal clad units containing circuit protection devices as shown on the drawings. Panel shall be listed by Underwriters' Laboratories and shall bear a U. L. Label as suitable for use as service equipment.

ELECTRICAL DISTRIBUTION SYSTEM

- B. The bus work shall be copper or aluminum, sized as required by code but in no case smaller than that shown on the Drawings, with a maximum hot-spot temperature rise of 65 degrees C. above an ambient of 40 degrees C. under continuous full load current and braced for the available fault current but in no case less than 65,000 A.I.C. Provide ground bus in bottom of enclosure, full length of assembly.
- C. Ensure all equipment bussing, bracing and devices have short-circuit rating exceeding that of available fault current.
- D. Fusible switches shall be quick-make, quick-break, horsepower rated and certified for 100,000 A.I.C.
- E. No main circuit breakers shall be permitted, unless specifically indicated on drawings.
- F. Where main circuit breakers are used, they shall be rated for the available fault current and in no case less than 22,000 A.I.C. minimum. Contractor shall be responsible for coordinating available fault current with serving utility.
- G. Assemblies shall be primed and finished with not less than two coats of light gray enamel.
- H. Care shall be taken when selecting coordinated equipment to supply branch panels with proper A.I.C. breaker ratings.

2.3 SUB-DISTRIBUTION PANELS

- A. Sub-distribution panels shall be free standing, front operated fused switch type, fully enclosed with bussing provisions for future extension. Fuse sizes shall be as noted on the Drawings.
- B. The bus work shall be sized as shown on the Drawings, with a maximum hot-spot temperature rise of 65 degrees C. above an ambient of 40 degrees C. under continuous full load current and braced for the available fault current but in no case less than 65,000 A.I.C. Provide ground bus in bottom of enclosure.
- C. Assemblies shall be primed and finished with not less than two coats of light gray enamel.
- D. Arrange loads from the panel to balance the load currents as equally as possible between the phases.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install the distribution assemblies as shown on the Drawings, parallel and square with the building lines.
- B. Neatly lace and secure the conductors of the feeder circuits individually at maximum 2-foot intervals. The cable lugs shall not support the weight of the cables.

3.2 CONCRETE PADS

- A. Provide 4-inch deep concrete pads under all freestanding pieces of switchgear.

END OF SECTION

DRY TYPE TRANSFORMERS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Furnish and install all dry type transformers to provide 208Y/120V power from the 480Y/277V system.

1.2 QUALITY ASSURANCE

- A. Case to be totally enclosed with louvers to prevent entry of foreign objects into the interior, manufacture in accordance with all NEMA and UL approval standards.
- B. Manufacturers: Match distribution equipment, or approved equal.

1.3 RELATED WORK

- A. Section 26 00 00: General Provisions
- B. Section 26 05 00: Basic Materials and Methods
- C. Section 26 20 00: Electrical Distribution System.

1.4 SUBMITTALS

- A. Shop Drawings with nameplate data
- B. Product data

PART 2 - PRODUCTS

2.1 INDOOR LOW VOLTAGE TRANSFORMERS

- A. Enclosed and ventilated, air cooled type, Class H insulation, designed for 115 degrees C. temperature rise above 40 degrees C. ambient temperature at full load continuous operation. Equip with two 2-1/2% ANFC taps and four 2-1/2% BNFC taps. Maximum sound level shall be NEMA standard with isolation dampers between the core and coil assembly and case.

DRY TYPE TRANSFORMERS

- B. All distribution transformers shall meet the minimum efficiency levels specified in current state energy codes and DOE CFR title 10 Chapter II Part 431 (DOE 2016 Efficiency levels)

NEMA CLASS 1 EFFICIENCY LEVELS FOR DRY-TYPE DISTRIBUTION TRANSFORMERS^{1,2}

SINGLE PHASE EFFICIENCY			THREE PHASE EFFICIENCY		
kVa	Low Voltage	Medium Voltage	kVa	Low Voltage ²	Medium Voltage
15	97.7%	97.6%	15	97.89%	96.8%
25	98.0%	97.9%	30	98.23%	97.3%
37.5	98.2%	98.1%	45	98.40%	97.6%
50	98.3%	98.2%	75	98.60%	97.9%
75	98.5%	98.4%	112.5	98.74%	98.1%
100	98.6%	98.5%	150	98.83%	98.2%
167	98.7%	98.7%	225	98.94%	98.4%
250	98.8%	98.8%	300	99.02%	98.5%
333	98.9%	98.9%	500	99.14%	98.7%
500	-	99.0%	750	99.23%	98.8%
667	-	99.0%	1,000	99.28%	98.9%
833	-	99.1%	1,500	-	99.0%
			2,000	-	99.0%
			2,500	-	99.1%

¹ Efficiency is calculated per conditions stated in NEMA Standard TP 1

² Efficiency is calculated per conditions stated in DOE CFR Title 10 Chapter 11 Part 431.

2.2 DRY TYPE TRANSFORMERS: 30 KVA AND LARGER

- A. Provide dry type, enclosed and ventilated transformers as indicated herein.
- B. Transformers shall be designed, constructed and rated in accordance with UL, CSA, NEMA, ANSI, IEEE, and OSHA standards.
- C. Enclosed and ventilated, air cooled type, Class H insulation, designed for 115 degrees C. temperature rise above 40 degrees C. ambient temperature at full load continuous operation. Equip with two 2-1/2% ANFC taps and four 2-1/2% BNFC taps. Maximum sound level shall be NEMA standard with isolation dampers between the core and coil assembly and case.
- D. Transformer enclosure finish must be ASA 61 gray powder polyurethane paint. Transformer enclosure temperature shall not exceed 50 degrees C plus the ambient under any condition of loading at any specified temperature rise at or below 150 degrees C.

DRY TYPE TRANSFORMERS

- E. Transformer enclosure shall be UL/NEMA Type 2 and UL 3R Listed with the addition of a weather shield and shall be so marked on the transformer.
- F. Transformer shall incorporate an electrostatic shield for the attenuation of voltage spikes, line noise, and transients.
- G. Single-phase transformers up to 100 KVA and three phase transformers up to 112.5 KVA shall terminate in copper bus bar.
- H. Transformer coils must be wound with aluminum strip conductors for increased insulation life, cooler operation, and lower losses.
- I. Transformers must operate at audible sound levels below NEMA Standard ST-20. Sound levels will not exceed the following:

<u>KVA Range</u>	<u>Maximum Sound Level</u>
up to 9 KVA	40 dB
10 to 50 KVA	45 dB
51 to 150 KVA	50 dB
151 to 300 KVA	55 dB
301 to 500 KVA	60 dB

- J. Transformers must incorporate vibration isolation pads in their construction located between the transformer core and coil assembly and the transformer case. External vibration isolation pads will not be used as they tend to increase audible noise. Transformers shall be floor mounted on a concrete pad. All connections to the transformer will be made by means of flexible metallic conduit.
- K. Transformer enclosure shall be grounded per the National Electric Code.
- L. Transformers shall be 60 Hz, 208, 240, 480 or 600 volts delta primary; 208Y/120, 240 delta or 480Y/277 secondary. KVA rating as indicated. Contractor to provide all necessary lugs for all transformers.
- M. Complete shop drawings must be submitted for approval on all dry type transformers.
- N. Typical performance data must be submitted for approval on all transformers. Factory tests must be made in accordance with the latest revisions of ANSI Test Code C57.12.91 for Dry Type Transformers. Performance data provided must contain but not be limited to:
 - 1. No load losses.
 - 2. Full load losses.
 - 3. Polarity and phase rotation.
 - 4. Impedance at reference temperature.
 - 5. Efficiencies at 25, 50, 75, and 100% load.
 - 6. Regulation at 100% and 80% power factor.
 - 7. Audible sound level.
 - 8. Dimensions and weight.
 - 9. Applied potential test.
 - 10. Induced potential test.
 - 11. Excitation current.
 - 12. IP, IX, and IZ percentages.
 - 13. Reference and ambient temperature.

DRY TYPE TRANSFORMERS

- O. Warranty: Transformers must be warranted against defects in materials, workmanship, and performance for ten years from date of manufacture.
- 2.3 **NON-LINEAR DRY TYPE TRANSFORMERS. In addition to the requirements specified for dry type transformers, the following requirements apply to non-linear dry type transformers:**
- A. Provide dry type, enclosed, and ventilated transformers as indicated and specified herein. Transformers must be UL listed for non-sinusoidal current loads of a specified K Factor (UL Standard 1561), CSA certified and labeled as such.
 - B. Transformers must be designed to handle non-linear loads and the adverse effects of harmonics. Transformer coils will be wound with foil to minimize the heating effects caused by harmonic currents.
 - C. Transformers must be able to power non-linear loads with a K-Factor as high as 20.
 - D. Transformers shall incorporate a neutral conductor sized at 2 times rated phase current. Transformer cases shall be grounded per the National Electric Code.

PART 3 - EXECUTION

3.1 **INSTALLATION**

- A. Install the indoor low voltage transformer with flexible conduit connections to housing. Make all cable and ground wire connections.
- B. In general, transformers will be floor mounted. When necessary to wall mount, securely anchor to wall structure using a safety factor of 4.

END OF SECTION

SWITCHBOARDS AND PANELBOARDS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Provide branch panels as shown.

1.2 RELATED WORK

- A. Section 26 00 00: General Provisions
- B. Section 26 05 00: Basic Materials and Methods
- C. Section 26 20 00: Electrical Distribution System
- D. Section 26 28 00: Circuit Protective Devices

1.3 SUBMITTALS

- A. Shop Drawings.
- B. Product Data.
- C. Operation Instruction and Maintenance Data.

PART 2 - PRODUCTS

2.1 BRANCH PANELBOARDS

- A. Branch circuit panels shall be bolt-in circuit breaker type with aluminum or copper bussing. Panels shall be fitted with flush lift latches and locks keyed alike. Deliver all panel keys to the Owner at completion of the project.
- B. Panelboard bussing and breakers shall be rated to withstand available fault current.
- C. Provide full size ground bus in all panelboards.
- D. Lugs: Conductors no. 6 and larger, except on molded case circuit breakers, two hole, long barrel pressure tool set Thomas & Betts No. 54,000 series, Burndy "Hydent", Anderson Electric VCEL, or approved.
- E. Wiring gutters shall be a minimum of 4 inches wide except where feeder conductors enter where a minimum of 6 inches clear shall be provided. Feeder conductors to enter directly in line with lug terminals wherever practicable. Provide separate feeder lugs and studs for each feeder conductor.
- F. Branch circuit breakers shall be identified with individual circuit numbers adjacent to each breaker with a typewritten card to identify the load controlled by that breaker. Circuit breakers shall be nominally one inch on centers to allow for easy operation of the handles. Arrange breakers in the panels as scheduled on the Drawings. Where no schedule is listed, arrange with the one-pole breakers at the top of the panel, followed by the two-pole and three-pole breakers with blank spaces at the bottom.
- G. Surface panels shall have metal face trims with no sharp edges or corners. Finish surface panel tubs to match face trim. Access panel on front may be screw type for access to interior.

SWITCHBOARDS AND PANELBOARDS

- H. Flush panels shall have flush doors with concealed hinges and mounting clamps equal to Square D Mono Flat, or ITE Decor trim.
- I. Acceptable manufacturers: Panelboards shall match Secondary Distribution Equipment, see section 26 20 00.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install panelboards plumb and level, located as shown on the Drawings.
- B. Arrange loads from served by the panel to balance the load currents as equally as possible between the phases.

3.2 SPARE CONDUITS

- A. Install a spare 3/4-inch conduit from flush panels for each three single pole breakers or spaces provided, minimum three conduits per panel. Terminate conduits above an accessible ceiling or as directed.

END OF SECTION

WIRING DEVICES AND PLATES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Provide wiring devices and plates or blank plates only for all outlet boxes shown.

1.2 RELATED WORK

- A. Section 26 00 00: General Provisions
- B. Section 26 05 00: Basic Materials and Methods

1.3 SUBMITTALS

- A. Shop Drawings.
- B. Product Data.
- C. Operation Instructions and Maintenance Data.
- D. Warranty.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Wiring devices shall be specification grade with special devices as noted on the Drawings. Should the Drawings indicate a device other than those listed herein without reference to catalog number, such device shall be of same grade and manufacture as specified below. Furnish a matching cap for all special purpose devices that do not have the common 120-volt NEMA 5-15R or 5-20R configuration.
- B. Comparable grade devices to those listed as manufactured by Leviton and Pass & Seymour, are approved. All lighting switches and duplex receptacles installed shall be by the same manufacturer and have identical appearance characteristics, unless noted otherwise.

2.2 WALL SWITCHES

- A. Line voltage switches, 20 ampere, 120 volt, quiet type, Hubbell 1221 series, and white exposed finish.
- B. Switch with pilot, lighted clear toggle, Hubbell 1221-PL.
- C. Keyed security switches: Pass & Seymour 20AC1-KL

2.3 WALL BOX DIMMERS:

- A. White finish, size for loads.
- B. Incandescent:
 - 1. Modular full wave solid-state unit with integral quiet on-off switch and audible and electromagnetic noise filters.
 - 2. Thin profile white finish.
 - 3. 1,000 watt (unless noted otherwise)
 - 4. 120/277 volt rated.
 - 5. Lutron Nova T (NT-1000), Lutron Vareo (V-1000) or approved.

WIRING DEVICES AND PLATES

- C. Fluorescent:
 - 1. Modular full wave solid-state unit with integral quiet on-off switch and audible and electromagnetic noise filters.
 - 2. Thin profile with white finish.
 - 3. 1,000 watt (unless noted otherwise)
 - 4. 120/277 volt rated.
 - 5. Lutron Nova T, Lutron Vareo or approved. Verify compatibility of dimmer switch with ballast being served.

2.4 EMERGENCY LIGHTING SWITCHING BYPASS

- A. Provide and install Emergency Shunt Relay (NC contact) where indicated on drawing or herein. Emergency shunt relays are to be UL 924 listed devices.
- B. Products: (or approved substitute)
 - 1. Lighting Control & Design, Inc. part number GR2001ES-120-3
 - 2. Nine 24, Inc. part number BTLC-R
 - 3. Bodine part number GTD20A
- C. Operation: Upon loss of Normal (non-emergency) power, the contactor will close, bypassing the room lighting switch and illuminating the luminaire.

2.5 RECEPTACLES

- A. Duplex, 20 ampere, 3-wire, 2-pole grounding, NEMA 5-20R, Hubbell 5352 series, white exposed finish.
- B. Ground Fault Circuit Interrupting (GFCI/GFI): 20 ampere, 3-wire, 2-pole grounding, NEMA 5-20R, white exposed finish, Hubbell GF5352 series or approved substitute.
- C. Tamperproof Duplex, 20 ampere, 3-wire, 2-pole grounding, NEMA 5-20R, Hubbell HBL8300SGGY series, white exposed finish.
- D. Clock outlets, Hubbell No. 5235, gray receptacle, plate with clock hanger.
- E. Special purpose receptacles as noted on Drawings.

2.6 PLATES AND COVERS

- A. Flush Finish Plates: .040-inch thick, type 302, stainless steel, brush finish, Leviton or Pass & Seymour.
- B. Surface Covers: Galvanized or cadmium plated steel, 1/2-inch raised industrial type with openings appropriate for device installed.
- C. Weatherproof:
 - 1. Damp locations: Hubbell HBL5205WO cover mounted horizontally with hinges up.
 - 2. Wet locations: Hubbell WP26M, Thomas & Betts Red-Dot series CKNM

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Devices and finish plates to be installed plumb with building lines.

WIRING DEVICES AND PLATES

- B. Finish plates and devices not to be installed until final painting is complete. Scratched or splattered finish plates and devices will not be accepted.
- C. Wall-mounted receptacles shall be installed vertically at centerline height shown on the Drawings.
- D. Receptacles shall be tested for line to neutral, line to ground and neutral to ground faults. Correct any defective wiring.
- E. All special plugs provided with the receptacles shall be given to the Owner in their cartons and a letter stating the date and the Owner's representative that received the materials.

END OF SECTION

CIRCUIT PROTECTIVE DEVICES (OVERCURRENT DEVICES)

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included:
 - 1. Provide overcurrent protective devices of the proper characteristics for the load served.
 - 2. Coordinate fuse size and circuit breaker combinations for selective tripping with minimum interruption of service.
 - 3. Provide fuses as indicated on the drawings, sized per NEC and appropriate for the load served as required for a fully operational system.
 - 4. All fuses shall be furnished of the same manufacturer.
 - 5. All circuit breakers shall be furnished of the same manufacture as the distribution panel and branch panelboards.
 - 6. All fuses shall be installed by the electrical contractor at job-site and only when equipment is to be energized. Fuses shall not be installed during shipment.

1.2 RELATED WORK

- A. Section 26 00 00: General Provisions,
- B. Section 26 05 00: Basic Materials and Methods,
- C. Section 26 20 00: Electrical Distribution System
- D. Section 26 24 00: Switchboards and Panelboards

1.3 SUBMITTALS

- A. Shop Drawings.
- B. Product Data.
- C. Operation and Maintenance data.

PART 2 - PRODUCTS

2.1 FUSES

- A. Provide 100,000 AIC, Current Limiting, UL, Time Delay Fuses.
- B. For Feeders 601 amps to 6000 amps: Class L, KRP-C()SP Time Delay.
- C. For Feeders 600 amps and less:
 - 1. Class RK-1, LPS-RK()SP for 600 Volt, Dual Element.
 - 2. Class RK-1, LPN-RK()SP for 250 Volt, Dual Element.
 - 3. Class J, LPJ()SP for 600 Volt & below, Dual Element.
- D. For Motor Circuits 600 Volts and Below: Class RK-1 and Class J Sized @ 125% FLC of Motor.
- E. Manufacturer: Bussmann System 300 Low-Peak, Littelfuse.

CIRCUIT PROTECTIVE DEVICES (OVERCURRENT DEVICES)

2.2 CIRCUIT BREAKERS

- A. Circuit breakers shall be molded case, thermal magnetic type. Breakers shall have short circuit capacity rating to withstand the maximum short circuit duty, which can be expected at the breaker location in the electrical system. Breakers mounted in branch panelboards shall be of the bolt-in type.
- B. Minimum short circuit rating for any circuit breaker: 10,000 A.I.C. for 120V and 208V breakers, 22,000 A.I.C. for 277V and 480V breakers. It is the responsibility of the electrical contractor to verify the fault current with the serving utility and provide the AIC rating required.
- C. Provide HACR circuit breakers in all panels for circuits serving mechanical equipment.
- D. Provide circuit breaker lock-on handle guards to prevent accidental shut-off of equipment for breakers supplying time clocks, refrigeration, fire alarm, unswitched egress lighting and like systems.
- E. Provide Type HID circuit breakers for all circuits feeding fluorescent and HID lighting.

2.3 SPARE FUSES AND SPARE FUSE CABINET

- A. Provide 10% spare fuses, but not less than (3) of any one size and type.
- B. Provide Bussmann spare fuse cabinet(s) #SFC as required for spare fuses. Install cabinet in electrical room.

2.4 SUBSTITUTION APPROVALS

- A. If the electrical contractor wishes to furnish materials other than those specified, a written request, along with a complete short circuit and selective coordination study, shall be submitted to the engineer for evaluation at least 10 days prior to bid date. If the engineer's evaluation indicates acceptance, a written addendum will be issued listing the other acceptable manufacturer.

PART 3 - EXECUTION

3.1 FUSES

- A. Install fuses for motor protection to best protect the motor without nuisance tripping.
- B. Provide one complete set of spare fuses of each amperage used on this project. Store spare fuses in a metal, hinged door cabinet located adjacent to the Main Distribution Panel. Label cabinet.
- C. Provide pullers for fuses, stored with fuses in cabinet.

END OF SECTION

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included:
 - 1. Provide manual or magnetic motor starters of the proper characteristics for equipment as listed on the Drawings or not provided by Mechanical Division 23 00 00, i.e. overhead door operators.
 - 2. Provide switches of proper characteristics as disconnecting means.

1.2 QUALITY CONTROL

- A. All motor starters and disconnects shall be of the same manufacture as service equipment or panelboards.

1.3 RELATED WORK

- A. Section 26 00 00: General Provisions
- B. Section 26 05 00: Basic Materials and Methods
- C. Section 26 28 00: Circuit Protective Devices

1.4 SUBMITTALS

- A. Shop Drawings.
- B. Product Data.
- C. Operation Instruction and Maintenance Data.

PART 2 - PRODUCTS

2.1 MOTOR STARTERS

- A. Manual starters, toggle type, quick-make, quick-break with thermal overload protection and suitable enclosures.
- B. Enclosures shall be NEMA 1 for indoor use and NEMA 3R where installed exposed to the weather or designated by the subscript "WP".
- C. Magnetic starters, full voltage across the line non-reversing type, 120 volt coils, overload relays in each leg, H-O-A selector switches, red running pilot lights, auxiliary contacts, 120V control transformers and suitable enclosures. The starters shall be combination type with fusible switches where shown adjacent to the disconnect switch.

2.2 DISCONNECTS

- A. Safety and disconnect switches shall be NEMA type HD (heavy duty), quick-make, quick-break, dual rated with electrical characteristics as required by the system voltage and the load served. Switches shall be equipped with a defeatable cover interlock.

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

- B. Enclosures shall be NEMA 1 for indoor use and NEMA 3R where installed exposed to the weather or designated by the subscript "WP".
- C. Disconnects shall be fusible or non-fusible as designated on Drawings and/or required by code.

PART 3 - EXECUTION

3.1 CLEARANCES

- A. Maintain all code-required clearances under this work.

3.2 MOTOR STARTERS

- A. Provide the motor starting equipment as shown on the Drawings and coordinate all motor "overload" starter relays.
- B. Install the starters at the respective equipment unless shown otherwise.

3.3 DISCONNECT SWITCHES

- A. Provide all code required disconnect switches under this work whether specifically shown or not.
- B. Disconnect switches required when equipment is not in sight of the branch circuit panel or starter may be horsepower rated, toggle type in suitable enclosure, mounted at or on the equipment.

END OF SECTION

LIGHTING LUMINAIRES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included:
 - 1. Provide all lighting outlets indicated on the Drawings with a fixture of type designated and appropriate for the location. Outlet symbols on the Drawings without a type designation shall have a fixture the same as those used in similar or like locations.
 - 2. Where a fixture type designation has been omitted and cannot be determined by the Contractor, request a clarification from the Architect and provide a suitable fixture type as directed at no additional cost.
 - 3. Coordinate installation of lighting fixtures with the ceiling installation and all other trades to provide a total system that is neat and orderly in appearance.
 - 4. Verify ceiling types with architectural specifications and drawings.
 - 5. Provide luminaires complete with lamps, ballasts, reflectors, diffusers, lenses, shielding, hangers, accessories and fittings.
 - 6. Store and handle so as not to subject materials to corrosion or mechanical damage from environment and/or construction.

1.2 RELATED WORK

- A. Section 26 00 00: General Provisions
- B. Section 26 05 00: Basic Materials and Methods
- C. Section 26 05 33: Conduits, Raceways, Boxes and Fittings

1.3 QUALITY ASSURANCE

- A. Luminaires shall be U.L. listed and be manufactured in accordance with appropriate U.L. and ANSI standards and shall bear U.L. label appropriate for intended use.
- B. The lighting designated for this project was based on fixture types and manufacturers as specified. If substitution of other than those specified is proposed for an alternate, provide the data and the operating fixtures both as specified and alleged equal. The Architect/Engineer reserves the right to request full photometric analysis of area affected by the proposed substitution prior to acceptance or denial.
- C. Equality shall be determined by comparisons of actual fixtures and the following fixture characteristics.
 - 1. Performance:
 - a. Distribution
 - b. Utilization
 - c. Average brightness/maximum brightness
 - d. Spacing to mounting height ratio
 - e. Comfort probability
 - f. Energy life-cycle analysis.
 - 2. Construction:
 - a. Engineering
 - b. Workmanship
 - c. Rigidity
 - d. Permanence of materials and finishes; Durability
 - 3. Installation Ease:
 - a. Captive parts and captive hardware

LIGHTING LUMINAIRES

- b. Provision for leveling
 - c. Through-wiring ease
- 4. Maintenance:
 - a. Relamping ease
 - b. Replacement of ballast and lamp sockets
- 5. Appearance:
 - a. Light tightness
 - b. Neat, trim styling
 - c. Aesthetic architectural value
- 6. Availability:
 - a. Lead time
- 7. Sustainable Design Performance Indicators:
 - a. Environmental performance in manufacturing
 - b. Manufacturing sustainability policies
 - c. ISO 14001 certification or equivalent environmental management systems.
 - d. ISO 9001 certification for quality assurance
 - e. Annual environmental performance or sustainability reports.
 - f. Environmentally responsible materials and resources.
 - g. Regional availability of materials and resources.
 - h. Regional production and manufacturing.

1.4 SUBMITTALS

- A. Shop Drawings.
- B. Product Data.
- C. Operation Instruction and Maintenance Data.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Recessed luminaires shall have trims which fit neatly and tightly to the surfaces in which they are installed without leaks or gaps. Contractor to verify ceiling types at all locations and provide appropriate trim kit for each fixture. Where necessary, install heat resistant non-rubber gaskets to prevent light leaks or moisture from entering between fixture trim and the surface to which they are mounted.
- B. Luminaires installed under canopies, roof or open porches, and similar damp or wet locations shall be UL listed and labeled as suitable for damp or wet locations.

2.2 LUMINAIRE REQUIREMENTS, GENERAL

- A. Recessed luminaires shall be IC-rated when installed at locations where insulation will come in direct contact with fixture. Contractor to verify ceiling assembly makeup at all fixture locations.

2.3 DRIVERS, LED

- A. LED drivers shall be electronic-type, labeled as compliant with radio frequency interference (RFI) requirements of FCC Title 47 Part 15, and comply with NEMA SSL 1 "Electronic Drivers for LED Devices, Arrays, or Systems". LED drivers shall have a sound rating of "A", have a minimum efficiency of 85%, and be rated for a THD of less than 20 percent at all input voltages.

LIGHTING LUMINAIRES

- B. Dimmable LED drivers shall be 0-10V type. Dimmable LED drivers shall be capable of dimming without LED strobing or flicker across their full dimming range.
- C. Drivers shall be rated for the ambient temperatures in which they are located. Outdoor fixtures shall be equipped with ballasts or drivers rated for reliable starting to 0 degrees F. Indoor fixtures located in areas with direct sunlight or above normal ambient temperatures shall have ballasts or drivers rated at 65 degrees C minimum.
- D. Provide fixtures of lengths as shown on drawings. For continuous fixtures, furnish joiner plates, end plates and all required fittings.

2.4 LED

- A. CRI minimum 85, color 3500 K. unless noted otherwise
- B. Provide shop drawing documentation on all lamps being utilized on project. Information shall include but not limited to wattage, CRI, life, color and manufacturer.

2.5 BATTERY BACKUP BALLASTS

- A. Luminaire battery backups will have a minimum initial output of 1400 lumens, except as noted below.
- B. Recessed downlights and similar: Luminaire battery backups will have a minimum initial output of 10 watts.

2.6 POLES AND BASES

- A. Each pole shall have adequate strength and rigidity to withstand wind rating at site, not less than 100 mph winds without damage to the poles and attached fixtures and lamps. Pole bases shall be equipped with handholes with matching covers, and base bolt covers.
- B. Anchor bolts shall be hot-dip galvanized after fabrication and threads cleared. Nuts, washers, and other hardware and fittings shall be corrosion resistant alloy material of adequate strength. Unless otherwise indicated, Indicated pole heights are above the top of the concrete base.
- C. Provide reinforced concrete base for all poles and bollards as indicated on drawings. If not shown on drawings, submit detail indicating base. Provide unreinforced concrete base for ground-mounted/stanchion-mounted landscape or floodlight fixtures.

2.7 LIGHTING LUMINAIRE SCHEDULE

- A. See Drawings.

PART 3 - GENERAL

3.1 INSTALLATION

- A. Determine ceiling types in each area and provide suitable mounting frames where required for recessed fixtures.
- B. Fixtures shall be left clean at the time of acceptance of the work with every lamp in operation. If fixtures are deemed dirty by the Architect at completion of the project, the Contractor shall clean them at no additional cost to the Owner.

LIGHTING LUMINAIRES

- C. Fixtures shall be carefully aligned, leveled in straight lines, and located as shown on the architectural reflected ceiling plan. The final decision as to adequacy of support and alignment, shall be given by the Architect. The fixtures shall be supported by separate means from the building structure per applicable seismic requirements and not from the ceiling system, ductwork, piping or other systems.
- D. Fixtures shall be aimed or installed to provide the lighting pattern for which the fixture is designed.
- E. Fixtures recessed into fire-rated ceiling assemblies shall include system maintaining such rating around fixture.
- F. Fixtures located in Mechanical rooms and storage/utility rooms to be coordinated with duct work, piping and structural members. Adjust stems as required for proper illumination of the area.
- G. Set poles straight and plumb and grout around pole base as required.

3.2 WIRING

- A. Recessed fixtures served from a junction box above the ceiling may be connected with 3/8-inch flex, 2 No. 18. Provide 3 No. 18 wires where dual circuiting is called for. Provide ground continuity.

END OF SECTION

PATHWAYS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work included: Provide a concealed raceway system, including raceways, outlet boxes, pull boxes, backboards sleeves, power outlets as shown and specified for the following limited power or communication systems. Provide raceway from each outlet shown for the following systems to an accessible location above a removable ceiling. Devices, wiring and installation of equipment shall be "Furnished by Owner, Installed by Owner".
 - 1. Telephone
 - 2. Data
 - 3. Telephone/Data
 - 4. Cable TV

1.2 RELATED WORK

- A. Section 26 00 00: General Provisions
- B. Section 26 05 00: Basic Materials and Methods
- C. Section 26 05 33: Conduits, Raceways, Boxes and Fittings

1.3 SUBMITTALS

- A. Product Data.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. OUTLET BOXES: Bowes, Raco.

2.2 MATERIALS

- A. Minimum raceway size shall be 1" unless otherwise noted. Raceways shall be EMT unless otherwise noted and shall be installed with a minimum of bends. Bends where used, shall have 12" minimum radius. Raceways exceeding 100 feet or having more than two right angle bends shall have a pullbox in an accessible location approximately in the center of the run.
- B. All free raceway ends shall have plastic bushings.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Outlets and finish plates to be installed plumb with building lines.
- B. Provide pull string in all raceways.
- C. Finish plates will not to be installed until final painting is complete. Scratched or splattered finish plates and devices will not be accepted.
- D. Wall mounted outlets shall be installed vertically at centerline height shown on the Drawings.

PATHWAYS FOR COMMUNICATIONS SYSTEMS

- E. Provide blank cover plates for all outlets not utilized, coordinate with system installer.

3.2 OUTLETS

- A. Provide minimum of 1-inch conduit or size as shown on drawings for single data and telephone outlets. Provide with pull string, 4 square junction box, double gang mud ring and plate as required, plates to match receptacle plates in style and quality. Provide insulated bushing at end of conduits and route all raceways to an accessible ceiling space, maintain 12-inch clearance from cable trays.
- B. Provide minimum of 1 1/4-inch conduit or size as shown on drawings for combination data and telephone outlets. Provide with pull string, 4 square junction box, double gang mud ring and plate as required, plates to match receptacle plates in style and quality. Provide insulated bushing at end of conduits and route all raceways to an accessible ceiling space, maintain 12-inch clearance from cable trays.

END OF SECTION

EXTERIOR PUBLIC ADDRESS SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

- A. Work Included: Provide a design-build audible signal distribution throughout the grand stands and playing field area from sound rack to speakers. System includes, but is not limited to, new and relocated existing speakers, speaker mounting, conduit, wiring and relocated all controls, power supplies, amplifiers, mixers, volume controls, modules, relays and all other equipment necessary for a complete and operating system.

1.2 SYSTEM DESCRIPTION

- A. System Scope:
1. Maintain (8) existing poletop speakers at north side of field.
 - a. Maintain existing speaker locations and conduit. Provide new homerun wiring from each speaker to relocated sound rack.
 2. Maintain (8) existing speakers on the south side of the field.
 - a. Relocate (5) existing speakers to canopy. Utilize existing conduit where possible, extend to new locations as required. Provide new homerun wiring from each speaker to relocated sound rack.
 - b. Mount speakers horizontally with high frequency horns rotated 90 degrees. Reuse existing U-brackets on canopy.
 - c. Relocate (1) existing speaker from Owner's possession to canopy. Utilize existing conduit where possible, extend to new location as required. Provide new homerun wiring from speaker to relocated sound rack.
 - d. Mount speaker horizontally with high frequency horns rotated 90 degrees. Reuse existing U-bracket on canopy.
 - e. Maintain (2) existing poletop speakers. Provide new System-3 pole mounting brackets. Provide new homerun wiring from each speaker to relocated sound rack.
 - f. Provide (1) new additional speaker, One Systems 112IM, and U-bracket horizontally mounted. Provide new conduit and wiring to sound rack.
 - g. Reuse existing male/female speaker connectors and flex. Shorten flex from existing speaker to male connector. Provide all new wiring complete.
 3. Replace existing One Systems 115RW speaker with new One Systems 115TW speaker with new U-bracket. Utilize existing conduit, provide new homerun wiring to relocated sound rack. Salvage existing speaker and return to Owner.
 4. Provide new eye-bolt for redundant safety leash for all new and reused speakers.
 5. Relocate existing sound rack including controls, power supplies, amplifiers, mixers, volume controls, modules, relays and all other equipment necessary for a complete and operating system. Field verify exact requirements.

EXTERIOR PUBLIC ADDRESS SYSTEM

1.3 RELATED WORK

- A. Section 26 00 00: General Provisions
- B. Section 26 05 00: Basic Materials and Methods.
- C. Section 26 05 33: Conduits, Raceways, Boxes and Fittings

1.4 SUBMITTALS

- A. Produce Data: Provide technical literature for all equipment items and cables.
- B. Shop Drawings: Provide schematic block diagram identifying each equipment item and interconnecting cable to same.
- C. Project Record Documents: Include technical literature and Shop Drawings in Record Documents.
- D. Operation and Maintenance Data: Provide manuals to Owner at completion of project defining operating features and procedures and maintenance and troubleshooting guides.

1.5 WARRANTY

- A. The Contractor shall provide a warranty for the following systems:
 - 1. All new equipment.
 - 2. Wiring system.
 - 3. Physical installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. One Systems, Inc.

2.2 EQUIPMENT

- A. One Systems Pole Mount System-3 tilting pole mounting bracket.
- B. One Systems 112IM all-weather loudspeaker.
- C. One Systems 112IM U Bracket.
- D. One Systems 115TW 15" weather resistant, two-way high output sound reinforcement speaker.
- E. One Systems 115TW U Bracket.
- F. One Systems Eye Bolt Kit.
- G. Speaker Cable. Cables shall be of the gauge required depending upon the cable run length and each speaker requirement, in no case smaller than 18 AWG with insulation and jacket appropriate for each installation.

EXTERIOR PUBLIC ADDRESS SYSTEM

PART 3 - EXECUTION

3.1 GENERAL

- A. Contractor shall design, furnish and install all materials necessary for a complete and working system.
- B. All work shall be performed in a professional manner.
- C. Performance: The system shall provide even sound distribution throughout the designated area to match the acoustic report. The system shall provide uniform frequency response throughout the designated area with low acoustic distortion.
- D. Provide all required interconnections to sound system. Coordinate requirements with Owner representative prior to rough-in.

3.2 FIELD QUALITY CONTROL

- A. Test: Test entire system and functions prior to Owner acceptance.

3.3 DEMONSTRATION

- A. Orientation: At time selected by Owner provide orientation and operation training session for staff and maintenance personnel.

END OF SECTION

SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Protecting existing vegetation to remain.
 - 2. Removing above- and below-grade site improvements.
 - 3. Disconnecting, capping or sealing, and removing site utilities.
 - 4. Temporary erosion- and sedimentation-control measures.

1.3 DEFINITIONS

- A. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.
- B. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.
- C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil and is the zone where plant roots grow.
- D. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil and is the zone where plant roots grow. Its appearance is generally friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches in diameter; and free of subsoil and weeds, roots, toxic materials, or other nonsoil materials.
- E. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction, and indicated on Drawings.
- F. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and [indicated on Drawings] [defined by a circle concentric with each tree with a radius 1.5 times the diameter of the drip line unless otherwise indicated] <Insert requirement>.
- G. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 MATERIAL OWNERSHIP

- A. Except for stripped topsoil and other materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

SITE CLEARING

1.5 SUBMITTALS

- A. Existing Conditions: Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.
 - 1. Use sufficiently detailed photographs or videotape.
 - 2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plants designated to remain.
- B. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.6 PROJECT CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 - 2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.
- B. Improvements on Adjoining Property: Authority for performing site clearing indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.
 - 1. Do not proceed with work on adjoining property until directed by Architect.
- C. Utility Locator Service: Notify Call Before You Dig for area where Project is located before site clearing.
- D. Do not commence site clearing operations until temporary erosion- and sedimentation-control and plant-protection measures are in place.
- E. Do not direct vehicle or equipment exhaust towards protection zones.
- F. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.
- G. Soil Stripping, Handling, and Stockpiling: Perform only when the topsoil is dry or slightly moist.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Division 31 Section "Earth Moving."
 - 1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Protect existing site improvements to remain from damage during construction.
 - 1. Restore damaged improvements to their original condition, as acceptable to Owner.

SITE CLEARING

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction.
- B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.
- C. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
- D. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.
- E. See Drawings for additional requirements.

3.3 TREE AND PLANT PROTECTION

- A. General: Protect trees and plants remaining on-site according to requirements in Division 01 Section "Temporary Tree and Plant Protection."
- B. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Architect.

EXISTING UTILITIES

- C. Owner will arrange for disconnecting and sealing indicated utilities that serve existing structures before site clearing, when requested by Contractor.
 - 1. Verify that utilities have been disconnected and capped before proceeding with site clearing.
- D. Locate, identify, disconnect, and seal or cap utilities indicated to be removed or abandoned in place.
 - 1. Arrange with utility companies to shut off indicated utilities.
 - 2. Owner will arrange to shut off indicated utilities when requested by Contractor.
- E. Locate, identify, and disconnect utilities indicated to be abandoned in place.
- F. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Architect not less than two days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Architect's written permission.
- G. Excavate for and remove underground utilities indicated to be removed.
- H. Removal of underground utilities is included in Division 33 Sections.

3.4 CLEARING AND GRUBBING

- A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.
 - 1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
 - 2. Grind down stumps and remove roots, obstructions, and debris to a depth of 18 inches below exposed subgrade.
 - 3. Use only hand methods for grubbing within protection zones.
 - 4. Chip removed tree branches and dispose of off-site.

SITE CLEARING

- B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.
 - 1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches, and compact each layer to a density equal to adjacent original ground.

3.5 SITE IMPROVEMENTS

- A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.
- B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.
 - 1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.
 - 2. Paint cut ends of steel reinforcement in concrete to remain with two coats of antirust coating, following coating manufacturer's written instructions. Keep paint off surfaces that will remain exposed.

3.6 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.
- B. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities. Do not interfere with other Project work.

END OF SECTION

SELECTIVE TREE AND SHRUB REMOVAL

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Removal of existing trees and stumps as indicated on Drawings and as specified herein.
- B. Obtain tree removal permits from the City of Lake Oswego.

1.2 REFERENCES

- A. American National Standards Institute (ANSI). 2006. Safety Requirements for Arboricultural Operations (Z133).

1.3 SUBMITTALS

- A. Qualification Data: For firms and persons specified in 1.4 A, Quality Assurance, of these Specifications, to demonstrate their capabilities and experience. Include lists of four (4) completed local projects with project names and addresses and names and addresses of architects and owners. Provide a copy of Contractor's License.

1.4 QUALITY ASSURANCE

- A. Tree Service Qualifications: Contractor performing tree work shall possess a valid Contractor's License. An experienced and professional tree service firm that has successfully completed tree removal and pruning work similar to that required for this Project.
- B. Preconstruction Meeting: Conduct meeting at Project Site with Owner's Representative and Architect.

PART 2 – PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 PREPARATION

- A. Inspection for Bird/Nests During Bird Nesting Season: If tree work will be performed during bird nesting season (January 15 through August 15), a Certified Biologist must be obtained by the Contractor to provide a nesting inspection for the trees to be affected during construction work.
 - 1. If active nests are identified by the Biologist, no work may occur at that tree or surrounding area: A 100-foot exclusion buffer of temporary fencing shall be erected around the tree with the active nest, and no work may occur within the 100-foot buffer until the Biologist has verified that young birds have left the nest and that active nesting has been completed.

3.2 TREE REMOVAL AND STUMP REMOVAL

- A. Cut and fell trees in a manner to not damage adjacent buildings or trees designated to remain.
 - 1. Grub and remove stumps and roots. Grind stumps to 24" (minimum) below finish grade.
 - 2. Backfill tree excavations with approved backfill and topsoil.
 - 3. Dispose of debris before ending each day's work.
- B. Safety Precautions: Comply with ANSI Z133, Safety Requirements for Arboricultural Operations.

SELECTIVE TREE AND SHRUB REMOVAL

3.3 BACKFILLING AND REGRADING

- A. Backfill holes and depressions with approved site soil or imported topsoil. Compact dampened soil to 85 percent. Water to settle. Add soil and grade to conform continuously to adjacent existing grades.

3.4 DISPOSAL OF WASTE MATERIAL

- A. Burning is prohibited.
- B. Remove excess excavated material, trees, and tree parts. All tree material indicated to be removed on the Drawings, or encountered during clearing/grubbing operations, shall be legally disposed of off-site.

END OF SECTION

EARTH MOVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Geotechnical report titled “Geotechnical Investigation Site-Specific Seismic Hazard Study / Lakeridge High School Remodel and Additions, Lake Oswego, Oregon” by GEOCON Northwest, Inc. (Project No. P1127b-05-01), dated November 2001.

1.2 SUMMARY

- A. Section Includes:
 - 1. Preparing subgrades for slabs-on-grade, walks, pavements, turf and grasses, and plants.
 - 2. Excavating and backfilling for buildings and structures.
 - 3. Drainage course for concrete slabs-on-grade.
 - 4. Base course for concrete walks and pavements.
 - 5. Aggregate base course for concrete paving.
 - 6. Subsurface drainage backfill for trenches.
 - 7. Excavating and backfilling trenches for utilities and pits for buried utility structures.
- B. Related Sections:
 - 1. Division 31 Section "Site Clearing" for site stripping, grubbing, stripping and stockpiling topsoil, and removal of above- and below-grade improvements and utilities.

1.3 UNIT PRICES

- A. Work of this Section is affected by unit prices for earth moving specified in Division 1.
- B. Quantity allowances for earth moving are included in Division 1.
- C. Rock Measurement: Volume of rock actually removed, measured in original position, but not to exceed the following. Unit prices for rock excavation include replacement with approved materials.
 - 1. 24 inches outside of concrete forms other than at footings.
 - 2. 12 inches outside of concrete forms at footings.
 - 3. 6 inches outside of minimum required dimensions of concrete cast against grade.
 - 4. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
 - 5. 6 inches beneath bottom of concrete slabs-on-grade.
 - 6. 6 inches beneath pipe in trenches, and the greater of 24 inches wider than pipe or 42 inches wide.

1.4 DEFINITIONS

- A. Backfill: Soil material or controlled low-strength material used to fill an excavation.
 - 1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
 - 2. Final Backfill: Backfill placed over initial backfill to fill a trench.
- B. Aggregate base course: Aggregate layer placed between the subgrade and concrete paving.
- C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

EARTH MOVING

- D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.
- E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.
- F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
 - 1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
 - 2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.
- G. Fill: Soil materials used to raise existing grades.
- H. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material that exceed 1 cu. yd. for bulk excavation or 3/4 cu. yd. for footing, trench, and pit excavation that cannot be removed by rock-excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:
 - 1. Equipment for Footing, Trench, and Pit Excavation: Late-model, track-mounted hydraulic excavator; equipped with a 42-inch- maximum-width, short-tip-radius rock bucket; rated at not less than 138-hp flywheel power with bucket-curling force of not less than 28,700 lbf and stick-crowd force of not less than 18,400 lbf with extra-long reach boom.
 - 2. Equipment for Bulk Excavation: Late-model, track-mounted loader; rated at not less than 230-hp flywheel power and developing a minimum of 47,992-lbf breakout force with a general-purpose bare bucket.
- I. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- J. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.
- K. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.5 SUBMITTALS

- A. Product Data: For each type of the following manufactured products required:
 - 1. Geotextiles.
 - 2. Controlled low-strength material, including design mixture.
 - 3. Detectable warning tapes.
- B. Qualification Data: For qualified testing agency.

1.6 QUALITY ASSURANCE

- A. Geotechnical Testing Agency Qualifications: Qualified according to ASTM E 329 and ASTM D 3740 for testing indicated.

EARTH MOVING

1.7 PROJECT CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth moving operations.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 - 2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.
- B. Improvements on Adjoining Property: Authority for performing earth moving indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.
 - 1. Do not proceed with work on adjoining property until directed by Architect.
- C. Utility Locator Service: Notify "Call Before You Dig" for area where Project is located before beginning earth moving operations.
- D. Do not commence earth moving operations until temporary erosion- and sedimentation-control measures, specified in Division 01 Section "Temporary Facilities and Controls," Division 31 Section "Site Clearing," are in place.
- E. Do not commence earth moving operations until plant-protection measures specified in Division 01 Section "Temporary Tree and Plant Protection" are in place.
- F. The following practices are prohibited within protection zones:
 - 1. Storage of construction materials, debris, or excavated material.
 - 2. Parking vehicles or equipment.
 - 3. Foot traffic.
 - 4. Erection of sheds or structures.
 - 5. Impoundment of water.
 - 6. Excavation or other digging unless otherwise indicated.
 - 7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
- G. Do not direct vehicle or equipment exhaust towards protection zones.
- H. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D 2487, or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
- C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups.
 - 1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

EARTH MOVING

- D. Aggregate Base: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.
- E. Structural Fill:
 - 1. Dry Weather: When moisture control is possible, structural fills may consist of native material, free of topsoil, debris and organic matter, which can be properly compacted. Maximum particle size of 6-inches. Refer to Geotechnical report for additional information.
 - 2. Wet Weather: Structural fill shall consist of imported crushed aggregate consisting of well-graded, angular granular soils (sand or sand and gravel) that do not contain more than 5 percent material by weight passing the No. 200 sieve. Maximum particle size of 1 1/2-inches. Refer to Geotechnical report for additional information.
- F. Bedding Course: Imported granular backfill material consisting of sand, sand and gravel, or crushed rock with a maximum particle size of 3/4-inches, and not more than 5 percent passing the No. 200 Sieve (washed analysis).
- G. Drainage Course: Narrowly graded mixture of washed crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.
- H. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and 0 to 5 percent passing a No. 4 sieve.
- I. Sand: ASTM C 33; fine aggregate.
- J. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.2 GEOTEXTILES

- A. Subsurface Drainage Geotextile: Products listed are not required unless Geotechnical Engineer determines conditions encountered in the field require them and directs their use. Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
 - 1. Survivability: Class 2; AASHTO M 288.
 - 2. Grab Tensile Strength: 157 lbf; ASTM D 4632.
 - 3. Sewn Seam Strength: 142 lbf; ASTM D 4632.
 - 4. Tear Strength: 56 lbf; ASTM D 4533.
 - 5. Puncture Strength: 56 lbf; ASTM D 4833.
 - 6. Apparent Opening Size: No. 40 sieve, maximum; ASTM D 4751.
 - 7. Permittivity: 0.5 per second, minimum; ASTM D 4491.
 - 8. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.
- B. Separation Geotextile: Woven polypropylene geotextile fabric, manufactured for separation applications, made from polyolefins or polyesters; with elongation less than 50 percent; complying with AASHTO M 288. Manufactured by, or approved equal:
 - 1. Amoco 2006
 - 2. Mirafi 600X

EARTH MOVING

2.3 ACCESSORIES

- A. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:
 - 1. Red: Electric.
 - 2. Yellow: Gas, oil, steam, and dangerous materials.
 - 3. Orange: Telephone and other communications.
 - 4. Blue: Water systems.
 - 5. Green: Sewer systems.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.
- B. Protect and maintain erosion and sedimentation controls during earth moving operations.
- C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.
- D. Do not move construction equipment or traffic over unprotected subgrades within pavement and building areas.

3.2 DEWATERING

- A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
 - 1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

3.3 EXPLOSIVES

- A. Explosives: Do not use explosives.

EARTH MOVING

3.4 EXCAVATION, GENERAL

- A. Classified Excavation: Excavate to subgrade elevations. Material to be excavated will be classified as earth and rock. Do not excavate rock until it has been classified and cross sectioned by Architect. The Contract Sum will be adjusted for rock excavation according to unit prices included in the Contract Documents. Changes in the Contract Time may be authorized for rock excavation.
1. Earth excavation includes excavating pavements and obstructions visible on surface; underground structures, utilities, and other items indicated to be removed; and soil, boulders, and other materials not classified as rock or unauthorized excavation.
 2. Rock excavation includes removal and disposal of rock. Remove rock to lines and subgrade elevations indicated to permit installation of permanent construction without exceeding the following dimensions:
 - a. 24 inches outside of concrete forms other than at footings.
 - b. 12 inches outside of concrete forms at footings.
 - c. 6 inches outside of minimum required dimensions of concrete cast against grade.
 - d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
 - e. 6 inches beneath bottom of concrete slabs-on-grade.
 - f. 6 inches beneath pipe in trenches and the greater of 24 inches wider than pipe or 42 inches wide.

3.5 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
 - a. Native fill soils and dark brown top soils must be over excavated from the bottom of footing excavations and replaced with compacted granular structural fill.
 - b. Perimeter wall footings for the building may need to be overexcavated between 1 and 2 feet to remove existing undocumented fill soils and dark brown, porous topsoils.
 - c. Interior wall footings will need to be over-excavated at least 1 foot.
 - d. Backfill overexcavations with compacted granular structural fill. Granular fill shall extend at least 6-inches beyond all sides of the foundations.
 - e. All overexcavation and structural fill placement shall be observed and approved by Owner Geotechnical Engineer.
 2. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended as bearing surfaces.
- B. Excavations at Edges of Tree- and Plant-Protection Zones:
1. Excavate by hand to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
 2. Cut and protect roots according to requirements in Division 01 Section "Temporary Tree and Plant Protection."

EARTH MOVING

3.6 EXCAVATION FOR WALKS AND PAVEMENTS

- A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.7 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.
 - 1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.
- B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.
 - 1. Clearance: As indicated.
- C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.
 - 1. For pipes and conduit less than 6 inches in nominal diameter, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
 - 2. For pipes and conduit 6 inches or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe or conduit circumference. Fill depressions with tamped sand backfill.
 - 3. For flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support conduit on an undisturbed subgrade.
 - 4. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.
- D. Trench Bottoms: Excavate trenches 4 inches deeper than bottom of pipe and conduit elevations to allow for bedding course. Hand-excavate deeper for bells of pipe.
 - 1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.
- E. Trenches in Tree- and Plant-Protection Zones:
 - 1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
 - 2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.
 - 3. Cut and protect roots according to requirements in Division 01 Section "Temporary Tree and Plant Protection."

3.8 SUBGRADE INSPECTION

- A. Notify Owner Geotechnical Engineer when excavations have reached required subgrade.
- B. If Owner Geotechnical Engineer determines that unsatisfactory soil is present, continue excavation and replace with compacted structural backfill or fill material as directed.

EARTH MOVING

- C. Proof-roll subgrade below the building slabs and pavements with a pneumatic-tired and loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
 - 1. Completely proof-roll subgrade in one direction. Limit vehicle speed to 3 mph.
 - 2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.
- D. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
- E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

3.9 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Architect.
 - 1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Architect.

3.10 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.11 BACKFILL

- A. Place and compact backfill in excavations promptly, but not before completing the following:
 - 1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
 - 2. Surveying locations of underground utilities for Record Documents.
 - 3. Testing and inspecting underground utilities.
 - 4. Removing concrete formwork.
 - 5. Removing trash and debris.
 - 6. Removing temporary shoring and bracing, and sheeting.
 - 7. Installing permanent or temporary horizontal bracing on horizontally supported walls.
- B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.12 UTILITY TRENCH BACKFILL

- A. Place backfill on subgrades free of mud, frost, snow, or ice.
- B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- C. Trenches under Footings: Backfill trenches excavated under footings and within 18 inches of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Division 03 Section "Cast-in-Place Concrete."

EARTH MOVING

- D. Backfill voids with satisfactory soil while removing shoring and bracing.
- E. Place and compact initial backfill of bedding course material, free of particles larger than $\frac{3}{4}$ - inch in any dimension, to a height of 12 inches over the pipe or conduit.
 - 1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
- F. Place and compact final backfill of satisfactory soil to final subgrade elevation.
- G. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.13 SOIL FILL

- A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- B. Place and compact fill material in layers to required elevations as follows:
 - 1. Under grass and planted areas, use satisfactory soil material.
 - 2. Under walks and pavements, use imported granular structural fill material.
 - 3. Under steps and ramps, use imported granular structural fill.
 - 4. Under building slabs, use imported granular structural fill.
 - 5. Under footings and foundations, use imported granular structural fill.
- C. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.14 SOIL MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
 - 1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
 - 2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.15 COMPACTION OF SOIL BACKFILLS AND FILLS

- A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

EARTH MOVING

- C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 1557:
 - 1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 92 percent.
 - 2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 92 percent.
 - 3. Under turf or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 85 percent.
 - 4. For utility trenches, compact each layer of initial and final backfill soil material at 92 percent to within 12 inches of finished grade. In structural areas, the upper foot of backfill should be compacted to 95 percent of the maximum dry density.

3.16 GRADING

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
 - 1. Provide a smooth transition between adjacent existing grades and new grades.
 - 2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
- B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
 - 1. Turf or Unpaved Areas: Plus or minus 1 inch.
 - 2. Walks: Plus or minus 1 inch.
 - 3. Pavements: Plus or minus 1/2 inch.
- C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.17 BASE COURSES UNDER PAVEMENTS AND WALKS

- A. Place base course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place base course under pavements and walks as follows:
 - 1. Placement of Geotextile:
 - a. At Asphalt Paving: Install separation geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
 - b. If Geotechnical Engineer determines that conditions in the field require geotextile product under concrete walks, install separation geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
 - 2. Place base course material under hot-mix asphalt pavement.
 - 3. Shape base course to required crown elevations and cross-slope grades.
 - 4. Place base course 6 inches or less in compacted thickness in a single layer.
 - 5. Place base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
 - 6. Compact base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

3.18 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

- A. Place drainage course on subgrades free of mud, frost, snow, or ice.

EARTH MOVING

- B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:
1. If Geotechnical Engineer determines that conditions in the field require geotextile product, install subdrainage geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
 2. Place drainage course 6 inches or less in compacted thickness in a single layer.
 3. Place drainage course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
 4. Compact each layer of drainage course to required cross sections and thicknesses to not less than 90 percent of maximum dry unit weight according to ASTM D 1557.

3.19 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
1. Determine prior to placement of fill that site has been prepared in compliance with requirements.
 2. Determine that fill material and maximum lift thickness comply with requirements.
 3. Determine, at the required frequency, that in-place density of compacted fill complies with requirements.
 4. Observe and approve excavated subgrade under pavement and building foundations and slab on grade.
- B. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections.
- C. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.
- D. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.
- E. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:
1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. or less of paved area or building slab, but in no case fewer than three tests.
 2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for every 100 feet or less of wall length, but no fewer than two tests.
 3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 150 feet or less of trench length, but no fewer than two tests.
- F. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.20 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

EARTH MOVING

- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
 - 1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
 - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.21 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.
- B. Transport surplus satisfactory soil to designated storage areas on Owner's property. Stockpile or spread soil as directed by Architect.
 - 1. Remove waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION

LANDSCAPE WARRANTY

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. This Section includes establishing and warranting the landscape work installed under this contract from the date of installation through the maintenance and warranty period.
- B. Length of Warranty Period: One year from the date of Substantial Completion.
- C. Lawn establishment: The establishment of unirrigated lawns depends on seasonal rains. The contractor shall be responsible for establishing new lawns. Establishment shall be deemed sufficient when the areas re-seeded have developed a thick uniform stand and at least three mowings have occurred.
- D. Watering new trees in non-irrigated areas.

1.2 MAINTENANCE AND WARRANTY PERIOD REQUIREMENTS

- 1. Plant Materials: All plant materials shall be warranted to remain in a healthy and vigorously growing condition until the end of the Warranty Period. Replace dead and unhealthy plants immediately.

1.3 WEED/PEST CONTROL PLAN

- A. Submit a Weed/Pest Control Plan for approval at least 30 days prior to Final Acceptance of the work. The Weed/Pest Control Plan shall define all scheduled applications of herbicides/pesticide products, along with the location, rate, frequency, season and method of application. The Contractor may submit for pre-approval the use of herbicides/pesticides to be applied on an as needed basis in anticipation of probable weed growth or infestations. No herbicides/pesticides shall be applied until Weed/Pest Control Plan is approved and all applications shall be in accordance with the plan. If unanticipated weed growth or infestations occur, the Contractor shall be required to modify Weed/Pest Control Plan and secure Owner's Representative written approval prior to application.
- B. All applications herbicides/pesticides shall be performed by an Oregon State licensed commercial pesticide applicator. All precautions shall be taken in the handling and applications of all herbicides/pesticides as stated on the product label and in the Oregon Weed Control Handbook, latest version. No contamination of vicinity water systems or storm drain systems allowed. No cleaning of equipment or disposal of products allowed in project vicinity.

PART 2 - PRODUCTS

- 2.1 All plant materials and equipment replaced under warranty shall be replaced accordance with all provisions of the Contract Documents. Equipment shall be of the same manufacturer, model, size and quantity as originally installed. Plant material shall be of the same variety, size, and quantity as originally installed.

LANDSCAPE WARRANTY

Owner reserves the right to inspect plant materials replaced under warranty and reject those which do not conform to specified standards.

2.2 Fertilizers:

1. Water Soluble Nitrogen: To compute application rates divide the required nitrogen application rate by the percentage of the manufacturer's guaranteed analysis to get the required rate to apply the product.
 - a. Ammonium sulfate
 - i. Typical Guaranteed analysis: 21-0-0, 4.5 lbs. of product = 1 lb. nitrogen
 - b. Urea
 - i. Typical Guaranteed analysis: 46-0-0, 2.2 lbs. of product = 1 lb. nitrogen

2.3 Lime: Granular lime derived from limestone.

A. Guaranteed Analysis:

Calcium (Ca)	34.0%
Calcium Carbonate (CaCO ₃)	86.0%
Calcium Carbonate equivalent (by AOAC Method)	86.0%

B. Sieve Analysis:

20 Mesh	100%
40 Mesh	>98%
60 Mesh	>92%
100 Mesh	>88%

2.4 Herbicides:

1. Pre-emergents: Per approved weed control plan
2. Post-emergents: Per approved weed control plan

PART 3 - EXECUTION

3.1 TURF AREA OPERATIONS

LANDSCAPE WARRANTY

- A. Mowing: Mowing height for all irrigated lawn areas shall be no less than 1 1/2", not to exceed 2 1/2" between mowing operations. At least one week shall pass between mowings unless the grass exceeds 2 1/2" in height. The turf shall be cut at a uniform height, with reel mowers in open areas and rotaries in closed areas. Scalping and uneven cutting shall be prevented. Mower blades shall be maintained in a good condition for an even cut. Do not use blades that have not been in use more than 40 hours since the last sharpening. Clippings shall be collected. If visible clumps are observed that might damage lawns or cause an unsightly appearance, the clippings shall be removed. Contractor shall repair or replace all trees, shrubs and other plantings and other permanent fixtures that are damaged during Contractor mowing operations.
- B. Fertilizing
1. Apply Water Soluble Nitrogen at the following rates of actual nitrogen:

Date	Rates
May 1-15	0.5-1 lbs./s.f.
June 1-15	0.5-1 lbs./s.f.
Aug. 15-31	1 lbs./s.f.
Nov. 1-15	1-1.5 lbs./s.f.
 2. Apply fertilizers uniformly. Do not apply at rates higher than above, avoid spills and apply at least 1/4" of water immediately following application.
 3. In addition apply nitrogen at any time during the growing season if lawn appears to be yellowing or if other evidence of nitrogen deficiency exists.
- C. Liming
1. Apply lime at the rate of 12 lbs. per 1000 s.f. at least once annually.
 2. Apply additional applications as needed to maintain lawn pH between 6 and 6.5.
- D. Herbicides: Apply selective broadleaf herbicides as weeds emerge in lawns and according to approved weed control plan and in accordance with manufacturer's instructions and per all applicable regulations. Lawn shall be maintained weed free.

3.2 TREE IRRIGATION

- A. For newly planted trees in non-irrigated areas: Fill watering bags with water once per week from May through September during the first summer after planting.
- B. Remove bags after last filling has drained from bag.

3.3 WEED AND PEST CONTROL:

- A. All planter beds, tree circlers, sidewalk cracks, etc., are to be sprayed once per month to control unwanted grasses and broadleaf weeds according to approved Pest Control Plan. Chemical practices shall not be a substitute for hand-weeding where the latter is required for complete removal.
- B. All planter beds shall have two applications of pre-emergence herbicide per year. Pre-emergence herbicides shall be of the non-leaching type, with minimal soil contaminating levels.

LANDSCAPE WARRANTY

- C. Apply broad leaf herbicides as needed to lawn areas to control broadleaf weeds. Take steps according to best industry practices to control invasive grasses such as crabgrass and annual bluegrass.
- D. Rodents: The contractor shall take the necessary action to prevent damage to the lawn areas by rodents and moles. Damage caused by rodents will be repaired by the contractor.
- E. Diseases and Infestations: The contractor shall take reasonable and necessary action to prevent and control outbreaks of fungal or disease infections or insect infestations according to industry best practices. Apply approved insecticides or approved other chemical control agents as needed according to approved plan, manufacturer's instructions and all applicable laws.

END OF SECTION

ASPHALT PAVING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Hot-mix asphalt patching.
 - 2. Hot-mix asphalt paving.
- B. Related Sections:
 - 1. Division 31 Section "Earth Moving" for aggregate subbase and base courses and for aggregate pavement shoulders.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.
 - 1. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.
 - 2. Job-Mix Designs: For each job mix proposed for the Work.
- B. Material Certificates: For each paving material, from manufacturer.

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A paving-mix manufacturer registered with and approved by authorities having jurisdiction or the DOT of state in which Project is located.
- B. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of ODOT for asphalt paving work.
- C. Preinstallation Conference: Conduct conference at Project site.

1.4 PROJECT CONDITIONS

- A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:
 - 1. Tack Coat: Minimum surface temperature of 60 deg F.
 - 2. Asphalt Base Course: Minimum surface temperature of 40 deg F and rising at time of placement.
 - 3. Asphalt Surface Course: Minimum surface temperature of 60 deg F at time of placement.
- B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F for oil-based materials, 55 deg F for water-based materials, and not exceeding 95 deg F.

PART 2 - PRODUCTS

2.1 AGGREGATES

- A. Crushed Rock Aggregate: Meeting ODOT standards for similar use. Size for base course and leveling course as noted on Drawings.

ASPHALT PAVING

2.2 ASPHALT MATERIALS

- A. Asphalt Binder: AASHTO M 320 or AASHTO MP 1a, PG 64-22.
- B. Tack Coat: ASTM D 977 emulsified asphalt, or ASTM D 2397 cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.

2.3 AUXILIARY MATERIALS

- A. Herbicide: Commercial chemical for weed control, registered by the EPA. Provide in granular, liquid, or wettable powder form.

2.4 MIXES

- A. Hot-Mix Asphalt: Dense, hot-laid, hot-mix asphalt plant mixes approved by authorities having jurisdiction and complying with the following requirements:
 - 1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.
 - 2. Surface Course: Level 2, ½-inch, dense HMAC per ODOT SS 00745 (2002). Thickness as shown on Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
- B. Proceed with paving only after unsatisfactory conditions have been corrected.

3.2 PATCHING

- A. Hot-Mix Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompect existing unbound-aggregate base course to form new subgrade.
- B. Tack Coat: Apply uniformly to vertical surfaces abutting or projecting into new, hot-mix asphalt paving at a rate of 0.05 to 0.15 gal./sq. yd..
 - 1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
 - 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.
- C. Patching: Fill excavated pavements with hot-mix asphalt base mix for full thickness of patch and, while still hot, compact flush with adjacent surface.

3.3 SURFACE PREPARATION

- A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.
- B. Herbicide Treatment: Apply herbicide according to manufacturer's recommended rates and written application instructions. Apply to dry, prepared subgrade or surface of compacted-aggregate base before applying paving materials.

ASPHALT PAVING

- C. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd..
 - 1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
 - 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.4 HOT-MIX ASPHALT PLACING

- A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.
 - 1. Spread mix at minimum temperature of 250 deg F.
 - 2. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.
- B. Place paving in consecutive strips not less than 10 feet wide unless infill edge strips of a lesser width are required.
- C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.5 JOINTS

- A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.
 - 1. Clean contact surfaces and apply tack coat to joints.
 - 2. Offset longitudinal joints, in successive courses, a minimum of 6 inches.
 - 3. Offset transverse joints, in successive courses, a minimum of 24 inches.
 - 4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time. Construct these joints using either "bulkhead" or "papered" method according to AI MS-22, for both "Ending a Lane" and "Resumption of Paving Operations."

3.6 COMPACTION

- A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.
 - 1. Complete compaction before mix temperature cools to 185 deg F.
- B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.
- C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:
 - 1. Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent nor greater than 96 percent.
- D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.
- E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.

ASPHALT PAVING

- F. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
- G. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.7 INSTALLATION TOLERANCES

- A. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:
 - 1. Base Course: Plus or minus 1/2 inch.
 - 2. Surface Course: Plus 1/4 inch, no minus.
- B. Pavement Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:
 - 1. Surface Course: 1/8 inch.
 - 2. Crowned Surfaces: Test with crowned template centered and at right angle to crown.
Maximum allowable variance from template is 1/4 inch.

3.8 FIELD QUALITY CONTROL

- A. Testing Agency: The Contractor will engage a qualified testing agency to do all needed construction testing and inspections.
- B. Replace and compact hot-mix asphalt where core tests were taken.
- C. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

3.9 DISPOSAL

- A. Except for material indicated to be recycled, remove excavated materials from Project site and legally dispose of them in an EPA-approved landfill.

END OF SECTION

CONCRETE PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Driveways.
 - 2. Parking lots.
 - 3. Curbs and gutters.
 - 4. Walks.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, and ground granulated blast-furnace slag.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Other Action Submittals:
 - 1. Design Mixtures: For each concrete paving mixture. Include alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
- C. Qualification Data: For qualified ready-mix concrete manufacturer and testing agency.
- D. Material Test Reports: For each of the following:
 - 1. Aggregates.
- E. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Detectable Warning Installer Qualifications: An employer of workers trained and approved by manufacturer of stamped concrete paving systems.
- B. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
 - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities" (Quality Control Manual - Section 3, "Plant Certification Checklist").
- C. Testing Agency Qualifications: Qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
 - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
- D. Concrete Testing Service: Engage a qualified testing agency to perform material evaluation tests and to design concrete mixtures.

CONCRETE PAVING

- E. ACI Publications: Comply with ACI 301 unless otherwise indicated.

1.6 PROJECT CONDITIONS

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 - PRODUCTS

2.1 FORMS

- A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces.
1. Use flexible or uniformly curved forms for curves with a radius of 100 feet or less. Do not use notched and bent forms.
- B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces.

2.2 STEEL REINFORCEMENT

- A. Recycled Content: Provide steel reinforcement with an average recycled content of steel so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.
- B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60; deformed.
- C. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 plain-steel bars. Cut bars true to length with ends square and free of burrs.
- D. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete specified, and as follows:
1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.
 2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.

2.3 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of same type, brand, and source throughout Project:
1. Portland Cement: ASTM C 150, gray portland cement Type I. Supplement with the following:
 - a. Fly Ash: ASTM C 618, Class F.
 - b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
- B. Normal-Weight Aggregates: ASTM C 33, Class 4M, uniformly graded. Provide aggregates from a single source.
1. Maximum Coarse-Aggregate Size: 1 inch nominal.
 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Water: Potable and complying with ASTM C 94/C 94M.

CONCRETE PAVING

- D. Air-Entraining Admixture: ASTM C 260.
- E. Chemical Admixtures: Admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.
 - 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 - 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
 - 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 - 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 - 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
 - 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.4 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry or cotton mats.
- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Potable.
- D. Evaporation Retarder: Waterborne, monomolecular, film forming, manufactured for application to fresh concrete.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Axim Italcementi Group, Inc.; Caltexol CIMFILM.
 - b. BASF Construction Chemicals, LLC; Confilm.
 - c. ChemMasters; Spray-Film.
 - d. Conspec by Dayton Superior; Aquafilm.
 - e. Dayton Superior Corporation; Sure Film (J-74).
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Anti-Hydro International, Inc.; A-H Curing Compound #2 DR WB.
 - b. ChemMasters; Safe-Cure Clear.
 - c. Dayton Superior Corporation; Day-Chem Rez Cure (J-11-W).
 - d. Euclid Chemical Company (The), an RPM company; Kurez W VOX.
 - e. Kaufman Products, Inc.; Thinfilm 420.

2.5 RELATED MATERIALS

- A. Joint Fillers: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork in preformed strips.
- B. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

2.6 CONCRETE MIXTURES

- A. Prepare design mixtures, proportioned according to ACI 301, for each type and strength of normal-weight concrete, and as determined by either laboratory trial mixtures or field experience.
 - 1. Use a qualified independent testing agency for preparing and reporting proposed concrete design mixtures for the trial batch method.
 - 2. When automatic machine placement is used, determine design mixtures and obtain laboratory test results that meet or exceed requirements.

CONCRETE PAVING

- B. Proportion mixtures to provide normal-weight concrete with the following properties:
 - 1. Compressive Strength (28 Days): 4000 psi.
 - 2. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.45.
 - 3. Slump Limit: 4 inches, plus or minus 1 inch.
- C. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows:
 - 1. Air Content: 4-1/2 percent plus or minus 1.5 percent for 1-inch nominal maximum aggregate size.
- D. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.
 - 1. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
- E. Cementitious Materials: Limit percentage by weight of cementitious materials other than portland cement according to ACI 301 requirements as follows:
 - 1. Fly Ash or Pozzolan: 25 percent.
 - 2. Ground Granulated Blast-Furnace Slag: 50 percent.
 - 3. Combined Fly Ash or Pozzolan, and Ground Granulated Blast-Furnace Slag: 50 percent, with fly ash or pozzolan not exceeding 25 percent.

2.7 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Furnish batch certificates for each batch discharged and used in the Work.
 - 1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.
- B. Proof-roll prepared subbase surface below concrete paving to identify soft pockets and areas of excess yielding.
 - 1. Completely proof-roll subbase in one direction. Limit vehicle speed to 3 mph.
 - 2. Proof-roll with a pneumatic-tired and loaded, 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
 - 3. Correct subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch according to requirements in Division 31 Section "Earth Moving."
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove loose material from compacted subbase surface immediately before placing concrete.

CONCRETE PAVING

3.3 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.
- B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.4 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.
- C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

3.5 JOINTS

- A. General: Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.
 - 1. When joining existing paving, place transverse joints to align with previously placed joints unless otherwise indicated.
- B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.
 - 1. Continue steel reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of paving strips unless otherwise indicated.
 - 2. Provide tie bars at sides of paving strips where indicated.
 - 3. Butt Joints: Use bonding agent at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
 - 4. Keyed Joints: Provide preformed keyway-section forms or bulkhead forms with keys unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.
 - 5. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.
- C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where indicated.
 - 1. Locate expansion joints at intervals of 50 feet unless otherwise indicated.
 - 2. Extend joint fillers full width and depth of joint.
 - 3. Terminate joint filler not less than 1/2 inch or more than 1 inch below finished surface if joint sealant is indicated.
 - 4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
 - 5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
 - 6. During concrete placement, protect top edge of joint filler with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

CONCRETE PAVING

- D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows, to match jointing of existing adjacent concrete paving:
 - 1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 1/4-inch radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate grooving-tool marks on concrete surfaces.
 - a. Tolerance: Ensure that grooved joints are within 3 inches either way from centers of dowels.
 - 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.
 - a. Tolerance: Ensure that sawed joints are within 3 inches either way from centers of dowels.
 - 3. Doweled Contraction Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.
- E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 1/4-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate edging-tool marks on concrete surfaces.

3.6 CONCRETE PLACEMENT

- A. Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast-in.
- B. Remove snow, ice, or frost from subbase surface and steel reinforcement before placing concrete. Do not place concrete on frozen surfaces.
- C. Moisten subbase 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.
- D. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.
- E. Do not add water to concrete during delivery or at Project site. Do not add water to fresh concrete after testing.
- F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
- G. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.
 - 1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels and joint devices.
- H. Screed paving surface with a straightedge and strike off.
- I. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.
- J. Curbs and Gutters: Use design mixture for automatic machine placement. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing.

CONCRETE PAVING

- K. Slip-Form Paving: Use design mixture for automatic machine placement. Produce paving to required thickness, lines, grades, finish, and jointing.
 - 1. Compact subbase and prepare subgrade of sufficient width to prevent displacement of slip-form paving machine during operations.
- L. Cold-Weather Placement: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing, or low temperatures. Comply with ACI 306.1 and the following:
 - 1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
 - 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 specified and approved in design mixtures.
- M. Hot-Weather Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:
 - 1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated in total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 - 2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
 - 3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.7 FLOAT FINISHING

- A. General: Do not add water to concrete surfaces during finishing operations.
- B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.
 - 1. Burlap Finish: Drag a seamless strip of damp burlap across float-finished concrete, perpendicular to line of traffic, to provide a uniform, gritty texture.
 - 2. Medium-to-Fine-Textured Broom Finish: Draw a soft-bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.

3.8 DETECTABLE WARNINGS

- A. Detectable Warnings: Install detectable warnings as part of a continuous concrete paving placement.

3.9 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
- B. Comply with ACI 306.1 for cold-weather protection.
- C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete but before float finishing.
- D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

CONCRETE PAVING

- E. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:
1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover, placed in widest practicable width, with sides and ends lapped at least 12 inches and sealed by waterproof tape or adhesive. Immediately repair any holes or tears occurring during installation or curing period using cover material and waterproof tape.
 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas that have been subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating, and repair damage during curing period.

3.10 PAVING TOLERANCES

- A. Comply with tolerances in ACI 117 and as follows:
1. Elevation: 3/4 inch.
 2. Thickness: Plus 3/8 inch, minus 1/4 inch.
 3. Surface: Gap below 10-foot- long, unlevelled straightedge not to exceed 1/2 inch.
 4. Alignment of Tie-Bar End Relative to Line Perpendicular to Paving Edge: 1/2 inch per 12 inches of tie bar.
 5. Lateral Alignment and Spacing of Dowels: 1 inch.
 6. Vertical Alignment of Dowels: 1/4 inch.
 7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Paving Edge: 1/4 inch per 12 inches of dowel.
 8. Joint Spacing: 3 inches.
 9. Contraction Joint Depth: Plus 1/4 inch, no minus.
 10. Joint Width: Plus 1/8 inch, no minus.

3.11 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

CONCRETE PAVING

- B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
 - 1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.
 - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 - 2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
 - 3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 - 4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when it is 80 deg F and above, and one test for each composite sample.
 - 5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
 - 6. Compressive-Strength Tests: ASTM C 39/C 39M; test one specimen at seven days and two specimens at 28 days.
 - a. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at 28 days.
 - C. Strength of each concrete mixture will be satisfactory if average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
 - D. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
 - E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
 - F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.
 - G. Concrete paving will be considered defective if it does not pass tests and inspections.
 - H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
 - I. Prepare test and inspection reports.
- 3.12 REPAIRS AND PROTECTION
- A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Architect.

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- B. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory paving areas with portland cement concrete bonded to paving with epoxy adhesive.
- C. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.
- D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION

CHAIN LINK FENCES AND GATES

PART 1 – GENERAL

1.1 WORK INCLUDED

- A. Provide all labor, materials and appurtenances necessary for installation of the color chain link fencing system defined herein.

1.2 SYSTEM DESCRIPTION

- A. Supply a total color chain link fencing system of the design, style and strength defined herein. The system shall include all components (i.e., framework, chain link fabric, gates and fittings) required.

1.3 QUALITY ASSURANCE

- A. Provide laborers and supervisors who are thoroughly familiar with the type of construction involved and materials and techniques specified.

1.4 REFERENCES

- A. ASTM International:
 - 1. ASTM A90/A90M: Test Method for Weight (Mass) of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings.
 - 2. ASTM A653/A653M: Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 3. ASTM A924/A924M: Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
 - 4. ASTM B6: Specification for Zinc.
 - 5. ASTM B117: Practice for Operating Salt Spray (Fog) Apparatus.
 - 6. ASTM D1499: Practice for Operating Light- and Water-Exposure Apparatus (Carbon-Arc Type) for Exposure of Plastics.
 - 7. ASTM D3359: Test Methods for Measuring Adhesion by Tape Test. E8/E8M - Test Methods for Tension Testing of Metallic Materials.
 - 8. ASTM F567: Practice for Installation of Chain-Link Fence.
 - 9. ASTM F626: Specification for Fence Fittings.
 - 10. ASTM F668: Specification for Poly (Vinyl Chloride) (PVC)-Coated Steel Chain-Link Fence Fabric.
 - 11. ASTM F900: Specification for Industrial and Commercial Swing Gates.
 - 12. ASTM F934: Specification for Standard Colors for Polymer-Coated Chain Link Fence Materials.
 - 13. ASTM F969: Practice for Construction of Chain-Link Tennis Court Fence.
 - 14. ASTM F1043: Specification for Strength and Protective Coatings on Metal Industrial Chain Link Fence Framework.
 - 15. ASTM F1184: Specification for Industrial and Commercial Horizontal Slide Gates.

CHAIN LINK FENCES AND GATES

- B. American Association of State Highway and Transportation Officials (AASHTO) Standards:
 - 1. AASHTO M181: Standard Specification for Chain-Link Fence.
- C. United States Federal Supply Service General Services Administration Specifications:
 - 1. RR-F-191/3: Federal Specification Sheet for Fencing, Wire and Post, Metal (Chain-Link Fence Posts, Top Rails and Braces) - Detail Specification.

1.5 SUBMITTAL

- A. Manufacturer's Literature: Provide the manufacturer's literature prior to installation.

1.6 PRODUCT HANDLING AND STORAGE

- A. Upon receipt at the job site, inspect all materials to ensure that no damages occurred during shipping or handling. Store materials in a manner to ensure proper ventilation and drainage and to protect against damage, weather, vandalism and theft.

PART 2 - MATERIALS

2.1 MANUFACTURER

- A. Framework for color chain link fence systems shall conform to Ameristar® PermaCoat® PC-20™ (commercial weight), as manufactured by Ameristar® Fence Products in Tulsa, Oklahoma.
- B. Or accepted substitute.

2.2 STEEL FRAMEWORK

- A. Steel Material: Zinc-coated steel strip, galvanized by the hot-dip process conforming to the criteria of ASTM A653/A653M and the general requirements of ASTM A924/A924M.
- B. The zinc used in the galvanizing process shall conform to ASTM B6. Weight of zinc shall be determined using the test method described in ASTM A90 and shall conform to the weight range allowance for ASTM A653, Designation G-90.
- C. The framework shall be manufactured in accordance with commercial standards to meet the strength (50,000 psi minimum yield strength) and coating requirements of ASTM F1043, Group IC, Electrical Resistance Welded Round Steel Pipe, light industrial weight.

CHAIN LINK FENCES AND GATES

- D. The exterior surface of the electrical resistance weld shall be recoated with the same type of material and thickness as the basic zinc coating.
- E. The manufactured framework shall be subjected a complete thermal stratification coating process (multi-stage, high-temperature, multi-layer) including, as a minimum, a six-stage pretreatment/wash (with zinc phosphate), an electrostatic spray application of an epoxy base, and a separate electrostatic spray application of a polyester finish.
 - 1. Ameristar® PermaCoat® process, or accepted substitute.
- F. The material used for the base coat shall be a (gray color) thermosetting epoxy; the minimum thickness of the base coat shall be two (2) mils. The material used for the finish coat shall be a thermosetting “no-mar” TGIC polyester powder; the minimum thickness of the finish coat shall be two (2) mils. The stratification coated pipe shall demonstrate the ability to endure a salt-spray resistance test in accordance with ASTM B117 without loss of adhesion for a minimum exposure time of 3,500 hours. Additionally, the coated pipe shall demonstrate the ability to withstand exposure in a weather-ometer apparatus for 1,000 hours without failure in accordance with ASTM D1499 and to show satisfactory adhesion when subjected to the cross-hatch test, Method B, in ASTM D3359. The polyester finish coat shall not crack, blister or split under normal use.
- G. The color of all framework shall be black in accordance with ASTM F934.
- H. The strength of coating system shall conform to the requirements of ASTM F1043; the minimum weight shall not be less than 90% of the nominal weight (see Table 1). The strength of line, end, corner and pull posts shall be determined by the use of 4’ or 6’ cantilevered beam test. The top rail shall be determined by a 10’ free-supported beam test (see Table 1). An alternative method of determining pipe strength is by the calculation of bending moment (see Table 1). Conformance with this specification can be demonstrated by measuring the yield strength of a randomly selected piece of pipe from each lot and calculating the section modulus. The yield strength shall be determined according to the methods described in ASTM E8. For materials under this Specification, the 0.2 offset method shall be used in determining yield strength. Terminal posts, line posts and top/bottom rails shall be precut to specified lengths.
- I. Line Posts: 2.375" minimum outside diameter (O.D.) galvanized steel pipe.
- J. Terminal Posts (End, Corner, Angle, and Pull Posts) and Personnel Gate Posts: 2.875" minimum outside diameter (O.D.) galvanized steel pipe.
- K. Top Rail: 1.660" minimum outside diameter (O.D.) galvanized steel pipe.

CHAIN LINK FENCES AND GATES

2.3 FENCE FABRIC

- A. The material for chain link fence fabric shall be manufactured from galvanized steel wire. The weight of zinc shall meet the requirements of ASTM F668, Table 4. Galvanized wire shall be PVC-coated to meet the requirements of ASTM F668. The class of the fence fabric shall be **(specify Class 1 - Extruded, Class 2A - Extruded and Bonded or Class 2B - Fused and Bonded)**.
- B. Selvage: Top edge knuckled and bottom edge twisted.
- C. Color: The coating color for the fence fabric shall be black. Reference ASTM F668 and ASTM F934.
- D. Wire Size: The size of the steel wire core shall be 9 gauge.
 - 1. Finished O.D. (Nominal): .148 inches (3.76 mm).
 - 2. Core Diameter: .097 inches (2.46 mm).
 - 3. PVC Coating Thickness: .015 – 0.25 inches (0.38 – 0.64 mm).
 - 4. Fabric Extrusion Type: Class 1, 2A.
 - 5. Minimum Breaking Strength: 650#.
- E. Height and Mesh Size: The fabric height shall be four (4) feet high with a mesh size of 2 inches (50 mm).

2.4 FENCE FITTINGS

- A. The material for fence fittings shall be manufactured to meet the requirements of ASTM F626. The coating for all fittings shall be the same color coating system as that required for the framework (see 2.2); the color of all fittings and fasteners shall be black in accordance with ASTM F934. All fasteners shall be stainless steel.

PART 3 – EXECUTION

3.1 PREPARATION

- A. Layout of Fencing: As indicated on Drawings.

3.2 INSTALLATION

- A. Install chain link fence in accordance with ASTM F567.
- B. Fence posts shall be set at spacings of a maximum of 10' o.c.
- D. Install fabric on security side and attach with wire ties or clip to line posts at 15 inches o.c. and to rails, braces and tension wire at 24 inches o.c.

CHAIN LINK FENCES AND GATES

3.3 CLEANING

- A. Clean the jobsite of excess materials.
- B. Post hole excavations shall be scattered uniformly away from posts.

END OF SECTION

SOIL PREPARATION

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Topsoil Placement in areas where existing topsoil has been disturbed by grading or construction activity. It is not necessary to place topsoil in areas where the existing topsoil remains in its preconstruction condition.
- B. Fine Grading.

1.2 QUALITY ASSURANCE

- A. Topsoil Tests: Provide the following soil tests by approved testing lab prior on stockpiled topsoil, if any, and on imported topsoil, if any. Perform tests prior to importing soil material. Collect soil samples according to procedures recommended by testing lab. Do not begin importing soil material until soil analysis submittals have been approved.
 - 1. Approved Testing Labs:
 - a. A & L Western Agricultural Laboratories, (503) 968-9225
 - b. Soil and Plant Laboratory, (503) 557-4959 www.soilandplantlaboratory.com
 - 2. Fertility Analysis: Provide topsoil Fertility Analysis including organic matter, half saturation percentage, pH, salinity, nitrate, nitrogen, sodium, copper, zinc, manganese, iron, sulfate and boron, in accordance with methods established by the Association of Official Agriculture Chemists performed by testing lab below or approved equal. Laboratory Analysis shall include recommendations for incorporation of fertilizers to improve fertility. All recommendations shall be made by a ARCPACS Certified Professional Agronomists.
 - 3. Particle Size Distribution Analysis (PSDA): Provide the test results of a Particle Size Analysis from an approved testing lab indicating that the topsoil meets the specified requirements for textural class according to USDA Soil Class definitions. The report shall identify the percentages of sand, silt and clay in the topsoil. Tests shall be conducted according to methods described in USDA Soil Survey Investigations Report No. 42, version 4.0, method code number 3A

1.3 SUBMITTALS

- A. Quantity Certification: Submit soil test results and certification of quantities of topsoil, organic amendment, and fertilizer, delivered to the Site.
- B. Quality Certification: Submit manufacturer's or vendor's certified analysis of soil amendments.
- C. Submit mechanical analysis of free-draining sand for approval prior to importing sand.

1.4 DELIVERY, STORAGE AND HANDLING

SOIL PREPARATION

- A. Deliver commercial fertilizer in containers showing weight, analysis and name of manufacturer.
- B. Protect soil materials from deterioration during delivery and storage.

1.5 SITE CONDITIONS

- A. Seasonal Limitations: Conduct landscape work within the acceptable planting season for each kind of planting.
- B. Utility Lines: Stake location of underground utilities and avoid excavation in these areas beyond safe limits. Hand excavate where required to avoid utility line damage.

PART 2 - PRODUCTS

2.1 TOPSOIL

- A. Existing Site Topsoil: It is permissible to use existing topsoil if available from onsite stripping operations only if it conforms to specifications for imported topsoil. It shall be the contractor's responsibility to determine sufficient amounts are available and to test it for suitability. Collect and stockpile topsoil as follows:
 - 1. Prior to beginning any grading work or other construction, strip off and dispose of organic material from surface.
 - 2. Strip off and stockpile the upper layer of soil to a depth of up to six inches of the surface.
 - 3. Protect topsoil stockpile from contamination with construction aggregates, debris, compaction, erosion and weed growth.
 - 4. Failure to follow the above specifications may result in the rejection of the site topsoil.
- B. Imported Topsoil: Import topsoil if existing site topsoil is not sufficient or is rejected or is otherwise unsuitable for supporting healthy plant growth. For purposes of this specification "Topsoil" refers to soils from the "A" horizon of the soil profile as defined by soil surveys of the USDA. Soil Conservation Service. Imported topsoil shall meet the following specifications:
 - 1. Soil Texture: Topsoil shall be sandy loam, loam or silt loam according to the U.S. Department of Agriculture definitions of soil types as defined by mechanical analysis.
 - 2. Organic Matter: Topsoil shall contain at least 3% but not more than 6% organic matter by weight as determined by soil fertility analysis.
 - 3. pH: Soil pH shall be between 5.5 and 6.5.
 - 4. Fertility: Macronutrients, Nitrogen, Phosphorus and Potassium, (NPK) shall be at least a medium level and below toxic levels as determined by soil fertility test. Micronutrients including magnesium, calcium, sodium, sulphur, zinc, manganese, iron copper and boron shall be below toxic levels. Add macro and micro nutrients as recommended by soil analysis. Topsoil shall not contain natural or unnatural minerals compounds, chemicals, microbes or other elements at levels that are toxic or otherwise inhibit growth.

SOIL PREPARATION

5. Homogeneity and Purity: Topsoil shall be homogenous, free of rock, roots or other clumps of organic matter, and variation in soil texture, fertility or organic content before placing.
6. Weeds: Do not use topsoil from a site infested with Canadian thistle, bracken fern, scotch broom, horsetail or any Oregon state-listed noxious weeds.

PART 3 - EXECUTION

3.1 WORK SEQUENCE

- A. Do not place topsoil until construction activities that may cause contamination or excessive compaction of the topsoil have been completed.
- B. Excessive construction debris in or compaction of planting beds may be grounds for rejection of the soil and require replacement.

3.2 PREPARATION

- A. Protection of Existing Site: Protect utility lines, storm drainage lines, site improvements, and underground utilities whether indicated or not.
- B. Add organic soil amendment to topsoil at rate of one part soil amendment to 5 parts topsoil by volume for prepared backfill mix for planting. Mix thoroughly.
- C. Apply contact herbicide to all weeds within planting areas in accordance with manufacturer's instructions. Apply in season when plants are actively growing. Allow at least seven days for positive kill before continuing work.

3.3 PREPARING PLANTING AREAS

- A. Remove Debris: Remove stones, mortar, concrete, asphalt, debris, materials larger than 2 inches and any material harmful to plant life from planting areas. Excavate subsoil where necessary to achieve required subgrades for application of minimum depth of topsoil and mulch. Remove excess subsoil from site.
- B. Remove all aggregates from planting areas except those that are indicated on plans as part of the permanent construction. Aggregates that have a temporary purpose such as providing a firm subgrade for supporting construction vehicles and equipment, shall be removed from all planting beds prior to placing topsoil.
- C. Obtain approval of subgrades by Owner's Representative prior to placing topsoil.
- D. Place Topsoil: Place approved stockpiled or imported topsoil in planting areas at a minimum of 6"
 1. Conventional Lawn Areas: 6"
 2. Place additional topsoil as required to raise grades to elevations indicated on grading plans, to establish conditions as indicated on curb, foundation or other details showing relationships of finish grade to new construction.

SOIL PREPARATION

3. Unless otherwise indicated on the drawings finish grades (after placement of bark, sod and seeding) shall be 1" below adjacent curbs and sidewalks.
- E. Grading: Compact prepared topsoil to a minimum 80% density but not more than 90% density.
- F. Bring planting areas to smooth even surface with loose, uniformly fine texture. Remove ridges and depressions. Slope planting areas to maintain positive drainage. Crown planting beds where necessary to maintain positive drainage with 2% minimum slope.
- G. All areas shall be graded not to exceed 4:1 slope to allow for mowing unless otherwise indicated on grading plan. Taper grade up or down to curbs, larger vaults, concrete pads, footings, and other items that cannot be set to grade so that all lawn areas can be mowed without scalping lawn or damaging mower blades. Raise or lower smaller valve boxes, cleanout covers and other items that can be adjusted to grade so that a lawn mower can easily pass over them. Remove or cut to grade all temporary stakes, utility sleeves and conduits in lawn areas that are not required to extend above the ground plane. The General Contractor shall be responsible for coordination between trades and all private and public utilities that are installed onsite or in the adjacent public right of way that if it is to be landscaped under this Contract. It shall be the responsibility of the General Contractor to ensure that such utilities be informed of design finish grade in order to ensure that vaults are set to grade and to mitigate if vaults are set too low or high.
- H. Roll, rake and drag lawn areas. Remove ridges and depressions. Maintain positive drainage.

END OF SECTION

TURF AND GRASSES

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Reseed all areas disturbed by construction whether indicated on Drawings or not. Seeded areas shown on drawings are an estimate only. Actual area of disturbance depends on Contractor operations.

1.2 UNIT PRICES

- A. The base bid includes seeding of all areas shown on the Drawings. Measurement and payment for additional areas will be based on the unit price provided on the Bid Form.

1.3 QUALITY ASSURANCE

- A. Certification of Seed Purity and Germination: Comply with standards established by the Association of Official Seed Certifying Agencies.

1.4 SUBMITTALS

- A. Maintenance Notification: Notify Owner's Representative in writing 14 days minimum prior to Owner's assumption of maintenance responsibility for lawn areas. Owner will accept maintenance responsibility for lawn and grass areas after final acceptance of entire project.
- B. Submit certification of seed.

1.5 SITE CONDITIONS

- A. Wind Velocity: Apply seed by hydromulching or sowing when wind velocity is less than 5 miles per hour at the Site.
- B. Seasonal Requirements: Seed during seeding windows indicated for applicable areas in the Seed Specification Manual, Golf Courses of North America, published by Seed Research of Oregon, 1996.

1.6 WARRANTY

- A. Installer shall guarantee seeding of lawn areas to produce vigorous, healthy and weed free growth as specified. Installer will replace eroded areas, washouts or bare areas within the period of the contract at no additional cost. Otherwise conform to the warranty provisions of the General Requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Water: The lawn areas are not irrigated. Establishment of turf areas will depend on seasonal rainfall.

TURF AND GRASSES

- B. Grass Seed: Grass seed shall be certified. Submit certification. The blend of varieties need not be certified if the Contractor delivers unopened certified varieties to the site and blends the varieties onsite prior to planting. Utilize a blend of at least two but not more than three varieties of perennial ryegrass mixed in equal proportions by weight.
- C. Hydroseed Mulch: Wood cellulose fiber mulch, containing no growth or germination inhibiting factors.
- D. Tackifier: Acrylamide copolymer (P.A.M.) or organic polysaccharide guar based product.
- E. Urea: 46-0-0 sulfur coated, slow release

2.2 EQUIPMENT

- A. Hydroseeding Equipment: Hydraulic equipment with continuous mixing and agitating action to mix water, seed, fertilizer and mulch to form a homogenous slurry, and distribute the mixture on lawn and other seeded areas.

PART 3 - EXECUTION

3.1 LAWN AREAS

- A. Preparation:
 - 1. Do not begin seeding work until finish grades have been approved in writing by Owner's representative.
 - 2. Preparation for Seeding: After fine grading has been completed, apply urea at a rate of 2 lbs. per 1000 s.f. Do not incorporate into soil.
 - 3. Stabilize by lightly irrigating soil and rolling with a roller. Repeat operation until surface is stabilized within specified tolerances of finish grade and approved by Owner's representative.
- B. Installation: Apply seed with hydraulic seeding equipment approved by Owner's representative. Hand or surface seeding is not permissible. Seed at a minimum rate of 8 lbs. per 1000 s.f.

3.2 ADJUSTING AND CLEANING

- A. Adjusting: Repair grades, and reseed lawn areas where soil erosion or poor germination cause bare areas or "wash-outs". Contractor is responsible for producing a thick, even turf in lawn areas.
- B. Cleaning: At completion of Work in each area, remove debris, equipment and surplus materials. Wash walks, walls and paving areas adjacent to seeded areas to remove seed, fertilizer, mulch and soil materials.
- C. Provide a 30" minimum height temporary fence of two strands of heavy twine around perimeter of lawn areas.

3.3 MAINTENANCE

TURF AND GRASSES

A. Lawn Maintenance:

1. Do not walk on lawn areas to irrigate, weed, or replace seed, plugs or sod. When required use plywood protection boards to reach lawn areas.
2. Apply lawn fertilizer as per manufacturer's recommendations and thoroughly water on 14th day of maintenance period.
3. Maintain lawn areas until final acceptance of entire project.
4. First mowing at 2-1/2" maximum grass height, cut grass to 1-1/2 inches and remove clippings.
5. Repeat for second mowing two weeks after first mowing and continue mowings weekly or as needed until final acceptance.
6. Continue lawn care after final acceptance as specified in Section 32 01 90 MAINTENANCE AND WARRANTY

END OF SECTION

PLANT MATERIAL

PART 1 - GENERAL

1.1 WORK IN OTHER SECTIONS

- A. Warranty and Establishment Operations: Section 32 01 90 LANDSCAPE WARRANTY.
- B. Prepared Backfill Mix: Section 32 91 13 SOIL PREPARATION.

1.2 SUBMITTALS

- A. Certified Confirmed Orders: Certify in writing within 30 days of the award of the bid, confirmed orders for plants and provide the quantity, location, phone number and address of the grower who has agreed to provide plant material.
- B. Mulch Sample: Submit samples of bark mulch for review in a clear plastic 1 quart size zip lock bag prior to delivery at the Site.
- C. Certificates: Submit Certificates required by law with shipments. Upon completion of the installation, deliver certificates to the Landscape Architect.

1.3 QUALITY ASSURANCE

- A. Government Inspection: Meet or exceed the specifications of federal, state and county laws requiring inspection of plants and planting material for plant disease and control.
- B. Industry Standards: Quality definitions, grading tolerances, and caliper to height ratios shall be no less than minimums specified in American Standards for Nursery Stock, published by American Association of Nurserymen, Inc., ANSI Z60.1 latest edition.
- C. Landscape Architect's Inspection: Landscape Architect shall have the right to inspect all plant material on order at the nursery and reject plant material not meeting specified standards. Contractor shall locate acceptable plant material and place new orders to replace rejected plant material at no additional cost to the Owner.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Delivery: Notify Landscape Architect of delivery schedule so plant materials may be inspected upon delivery. Landscape Architect may reject plant materials which do not meet specified standards. Remove rejected materials from site. Do not deliver more plant materials than can be planted in one day.
- B. Storage and Handling: Protect products against damage or dehydration. Cover plant roots and root balls with soil or other accepted material upon delivery, if not scheduled for planting within four hours. Store plant materials in shade and protect against harmful weather.

PART 2 - PRODUCTS

PLANT MATERIAL

2.1 PLANT REQUIREMENTS

- A. Nursery Stock: Provide healthy well branched and rooted, full foliated when in leaf, free of disease, injury, insects, weeds and weed roots. Do not use cold storage plants.
- B. Large Plant Root Protection: (B&B) Balled and Burlapped with natural ball of size to insure healthy growth.
- C. Small Plant Root Protection: Container-grown, furnished in removable containers or integral peat pots well rooted to ensure healthy growth. Grown in containers from six months to two years prior to delivery, with roots filling container but not root bound.
- D. Plant Names: Furnish plants true to name and tag one of each bundle or lot with the common and botanical name. Name and size of plants in accordance with the standards of practice of the American Association of Nurserymen and shall conform to "Standardized Plant Names." 1942 Edition, published by J. Horace McFarland Company. In all cases, botanical names shall take precedence over common names.

2.2 MATERIALS

- A. Fertilizer: Osmocote 18-6-12 as manufactured by Sierra Chemical Company, Milpitas, CA.
- B. Bark Mulch: Free from noxious weeds, seeds and foreign material harmful to plant life. Medium grind hemlock or fir, maximum size to pass a 3/4" inch mesh screen.
- C. Wood Stakes: 2" x 2" x 8' nominal size, Douglas Fir, No. 2 or construction grade.
- D. Guys: Broad belt-type strapping or plastic chain min. 1 1/2" width. Submit sample for approval.
- E. Amended Topsoil: See SECTION 32 91 13 SOIL PREPARATION.

- 2.3 WATERING BAGS:** Treegator Original and Treegator Jr. Pro. Use original for trees branching at least 25" from the ground and Jr. Pro for low branching trees.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect Existing Site Improvements: Verify location of underground facilities. Protect active service lines whether indicated or not.
- B. Barricade or Cover Excavations: Barricade or cover excavations to protect pedestrians, workmen, equipment and adjacent property.
- C. Excavate pit to two times diameter of root ball or root system and not less than 6 inches deeper for shrubs and 12 inches deeper for trees.

PLANT MATERIAL

3.2 TREE AND SHRUB PLACEMENT

- A. Shrub Base: Place shrub directly on undisturbed subgrade. Do not over excavate.
- B. Tree Base: Place tree directly on undisturbed subgrade. Do not over excavate.
- C. Plant upright and face to give best appearance or relationship to adjacent plants and structures.
- D. Loosen and remove twine binding and burlap from top one half of root balls.

3.3 TREE SUPPORT

- A. Guy and stake evergreen trees from three directions as per detail. Securely fasten guy wires to stakes with eyehooks and wires to tree with broad belt type or chain plastic tree ties. No wire is permitted around trunk. Tighten guy wires with turnbuckles. Stake deciduous trees from two directions as per detail.
- B. Install tree supports prior to backfilling.

3.4 BACKFILLING

- A. Cut off broken or frayed roots.
- B. Place and compact amended imported topsoil. Avoid injury to roots, fill voids.
- C. When planting hole is three-fourths filled, spread granular fertilizer evenly spaced around each plant. Provide the following quantities per plant:
 - 1. Evergreen trees: 7.5 ounces.
 - 2. Deciduous trees up to 1 1/2" caliper: 7.5 ounces.
 - 3. Deciduous trees 2" - 2 1/2" caliper: 13 ounces.
- D. When hole is 4" deep, fill with water and let stand until water is absorbed by soil. Fill to finish grade and provide 2" depressed water basin at each shrub and tree.
- E. Initial watering-in of trees and shrubs by underground sprinkler system is not permitted

3.5 MULCHING

- A. Apply a 2" layer of bark mulch in shrub beds and 3" layer of bark mulch in 36" diameter around base of tree within two days after planting.

3.6 WATERING

- A. Install watering bags per manufacturer's instructions immediately after planting except for trees in irrigated planting beds. Fill with water at intervals as recommended by manufacturer. Refill as required until the end of the warranty period.

PLANT MATERIAL

3.7 ESTABLISHMENT

- A. Comply with Section 32 01 90 LANDSCAPE WARRANTY. Begin care of plant materials as soon as they are planted and continue to the end of the specified period.
- B. Issue timely written communication with Owner to coordinate irrigation cycles necessary to avoid drying out of plant materials and as required to promote healthy growth. Contractor shall give the Owner three working days notice of a required programming change. Plant materials which dry out due to inadequate communications of a required watering schedule change shall be the responsibility of the Contractor.

3.8 PLANT LIST

- A. As indicated on Drawings.

END OF SECTION

WATER DISTRIBUTION

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes water-distribution piping and related components outside the building for water service and fire-service mains.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Detail precast concrete vault assemblies and indicate dimensions, method of field assembly, and components.
- C. Field quality-control test reports.
- D. Operation and maintenance data.

1.3 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Comply with requirements of utility company supplying water. Include tapping of water mains and backflow prevention.
 - 2. Comply with standards of authorities having jurisdiction for potable-water-service piping, including materials, installation, testing, and disinfection.
 - 3. Comply with standards of authorities having jurisdiction for fire-suppression water-service piping, including materials, hose threads, installation, and testing.
- B. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- C. Comply with ASTM F 645 for selection, design, and installation of thermoplastic water piping.
- D. Comply with FMG's "Approval Guide" or UL's "Fire Protection Equipment Directory" for fire-service-main products.
- E. NFPA Compliance: Comply with NFPA 24 for materials, installations, tests, flushing, and valve and hydrant supervision for fire-service-main piping for fire suppression.
- F. NSF Compliance:
 - 1. Comply with NSF 14 for plastic potable-water-service piping. Include marking "NSF-pw" on piping.
 - 2. Comply with NSF 61 for materials for water-service piping and specialties for domestic water.

1.4 PROJECT CONDITIONS

- A. Interruption of Existing Water-Distribution Service: Do not interrupt service to facilities occupied by Owner or others.

1.5 COORDINATION

- A. Coordinate connection to water main with utility company. Connection shall be by city approved tapping contractor only. All work by general contractor.

WATER DISTRIBUTION

PART 2 -PRODUCTS

2.1 PIPE AND FITTINGS

- A. Soft Copper Tube: ASTM B 88, Type K, water tube, annealed temper.
 - 1. Copper, Solder-Joint Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint pressure type. Furnish only wrought-copper fittings if indicated.
- B. Hard Copper Tube: ASTM B 88, Type K, water tube, drawn temper.
 - 1. Copper, Solder-Joint Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint pressure type. Furnish only wrought-copper fittings if indicated.
- C. Mechanical-Joint, Ductile-Iron Pipe: AWWA C151, with mechanical-joint bell and plain spigot end unless grooved or flanged ends are indicated.
 - 1. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
 - 2. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.
- D. Push-on-Joint, Ductile-Iron Pipe: AWWA C151, with push-on-joint bell and plain spigot end unless grooved or flanged ends are indicated.
 - 1. Push-on-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
 - 2. Gaskets: AWWA C111, rubber.
- E. Grooved-Joint, Ductile-Iron Pipe: AWWA C151, with cut, rounded-grooved ends.
 - 1. Grooved-End, Ductile-Iron Pipe Appurtenances:
 - 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:
 - b. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - i. Anvil International, Inc.
 - ii. Victaulic Company of America.
- F. PVC, Schedule 80 Pipe: ASTM D 1785.
 - 1. PVC, Schedule 80 Socket Fittings: ASTM D 2467.
 - 2. PVC, Schedule 80 Threaded Fittings: ASTM D 2464.
- G. PVC, AWWA Pipe: AWWA C900, Class 150, with bell end with gasket, and with spigot end.
 - 1. Comply with UL 1285 for fire-service mains if indicated.
 - 2. PVC Fabricated Fittings: AWWA C900, Class 150, with bell-and-spigot or double-bell ends. Include elastomeric gasket in each bell.
 - 3. PVC Molded Fittings: AWWA C907, Class 150, with bell-and-spigot or double-bell ends. Include elastomeric gasket in each bell.
 - 4. Push-on-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
 - a. Gaskets: AWWA C111, rubber.
 - 5. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
 - a. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

WATER DISTRIBUTION

2.2 JOINING MATERIALS

- A. Refer to Division 2 Section "Piped Utilities - Basic Materials and Methods" for commonly used joining materials.
- B. Brazing Filler Metals: AWS A5.8, BCuP Series.
- C. Plastic Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

2.3 PIPING SPECIALTIES

- A. Transition Fittings: Manufactured fitting or coupling same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.
- B. Tubular-Sleeve Pipe Couplings:
 - 1. Description: Metal, bolted, sleeve-type, reducing or transition coupling, with center sleeve, gaskets, end rings, and bolt fasteners and with ends of same sizes as piping to be joined.
 - a. Standard: AWWA C219.

2.4 GATE VALVES

- A. UL/FMG, Cast-Iron Gate Valves:
 - 1. 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:
 - a. American Cast Iron Pipe Co.; American Flow Control Div.
 - b. American Cast Iron Pipe Co.; Waterous Co. Subsidiary.
 - c. Crane Co.; Crane Valve Group; Stockham Div.
 - d. McWane, Inc.; Clow Valve Co. Div. Oskaloosa.
 - e. McWane, Inc.; Kennedy Valve Div.
 - f. McWane, Inc.; M & H Valve Company Div.
 - g. Mueller Co.; Water Products Div.
 - h. NIBCO INC.
 - i. U.S. Pipe and Foundry Company.
 - 2. UL/FMG, Nonrising-Stem Gate Valves:
 - a. Description: Iron body and bonnet with flange for indicator post, bronze seating material, and inside screw.
 - i. Standards: UL 262 and FMG approved.
 - ii. Minimum Pressure Rating: 175 psig .
 - iii. End Connections: Flanged.

2.5 GATE VALVE ACCESSORIES AND SPECIALTIES

- A. Valve Boxes: Comply with AWWA M44 for cast-iron valve boxes. Include top section, adjustable extension of length required for depth of burial of valve, plug with lettering "WATER," and bottom section with base that fits over valve and with a barrel approximately 5 inches in diameter.
 - 1. Operating Wrenches: Steel, tee-handle with one pointed end, stem of length to operate deepest buried valve, and socket matching valve operating nut.

WATER DISTRIBUTION

2.6 CONCRETE VAULTS

- A. Description: Precast, reinforced-concrete vault, designed for A-16 load designation according to ASTM C 857 and made according to ASTM C 858.
 - 1. Ladder: ASTM A 36/A 36M, steel or polyethylene-encased steel steps.

2.7 FIRE HYDRANTS

- A. Dry-Barrel Fire Hydrants:
 - 1. 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:
 - a. American AVK Co.; Valves & Fittings Div.
 - b. American Cast Iron Pipe Co.; American Flow Control Div.
 - c. American Cast Iron Pipe Co.; Waterous Co. Subsidiary.
 - d. American Foundry Group, Inc.
 - e. East Jordan Iron Works, Inc.
 - f. McWane, Inc.; Clow Valve Co. Div. (Oskaloosa).
 - g. McWane, Inc.; Kennedy Valve Div.
 - 2. Description: Freestanding, with one NPS 4-1/2 and two NPS 2-1/2 outlets, 5-1/4-inch main valve, drain valve, and NPS 6 mechanical-joint inlet. Include interior coating according to AWWA C550. Hydrant shall have cast-iron body, compression-type valve opening against pressure and closing with pressure.
 - a. Standard: AWWA C502.
 - b. Pressure Rating: 150 psig minimum.
 - 3. Description: Freestanding, with one NPS 4-1/2 and two NPS 2-1/2 outlets, 5-1/4-inch main valve, drain valve, and NPS 6 mechanical-joint inlet. Hydrant shall have cast-iron body, compression-type valve opening against pressure and closing with pressure.
 - a. Standards: UL 246, FMG approved.
 - b. Pressure Rating: 150 psig minimum.
 - c. Outlet Threads: NFPA 1963, with external hose thread used by local fire department. Include cast-iron caps with steel chains.
 - d. Operating and Cap Nuts: Pentagon, 1-1/2 inches point to flat.
 - e. Direction of Opening: Open hydrant valve by turning operating nut to left or counterclockwise.
 - f. Exterior Finish: Red alkyd-gloss enamel paint, unless otherwise indicated.

PART 3 -EXECUTION

3.1 EARTHWORK

- A. Refer to Division 312000 Section "Earthwork" for excavating, trenching, and backfilling.

3.2 PIPING APPLICATIONS

- A. General: Use pipe, fittings, and joining methods for piping systems according to the following applications.
- B. Transition couplings and special fittings with pressure ratings at least equal to piping pressure rating may be used, unless otherwise indicated.
- C. Do not use flanges or unions for underground piping.

WATER DISTRIBUTION

- D. Flanges, unions, and special fittings may be used, instead of joints indicated, on aboveground piping and piping in vaults.
- E. Underground water-service piping NPS 3/4 to NPS 3 shall be any of the following:
 - 1. Soft copper tube, ASTM B 88, Type K; wrought-copper, solder-joint fittings; and brazed joints.
 - 2. PVC, Schedule 80 pipe; PVC, Schedule 80 socket fittings; and solvent-cemented joints.
- F. Underground Fire-Service-Main Piping NPS 4 to NPS 8 shall be any of the following:
 - 1. Ductile-iron, push-on-joint pipe; ductile-iron, push-on-joint fittings; and gasketed joints.
 - 2. PVC, AWWA Class 150 pipe listed for fire-protection service; PVC fabricated or molded fittings of same class as pipe; and gasketed joints.

3.3 VALVE APPLICATIONS

- A. General Application: Use mechanical-joint-end valves for NPS 3 and larger underground installation. Use threaded- or flanged-end valves for installation in vaults. Use UL/FMG, nonrising-stem gate valves for installation with indicator posts. Use corporation valves and curb valves with ends compatible with piping, for NPS 2 and smaller installation.
- B. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
 - 1. Underground Valves, NPS 3 and Larger: AWWA, cast-iron, nonrising-stem, resilient-seated gate valves with valve box.
 - 2. Use the following for valves in vaults and aboveground:
 - a. Gate Valves, NPS 2 and Smaller: Bronze, nonrising stem.
 - b. Gate Valves, NPS 3 and Larger: AWWA, cast iron, OS&Y rising stem, metal seated.

3.4 PIPING INSTALLATION

- A. Water-Main Connection: Make connections in accordance with City of Woodburn standards and specifications.
- B. Comply with NFPA 24 for fire-service-main piping materials and installation.
 - 1. Install copper tube and fittings according to CDA's "Copper Tube Handbook."
- C. Install ductile-iron, water-service piping according to AWWA C600 and AWWA M41.
- D. Install PVC, AWWA pipe according to ASTM F 645 and AWWA M23.
- E. Bury piping with depth of cover over top at least 30 inches, with top at least below level of maximum frost penetration.
- F. Extend water-service piping and connect to water-supply source and building-water-piping systems at outside face of building wall in locations and pipe sizes indicated.
 - 1. Terminate water-service piping at building wall until building-water-piping systems are installed. Terminate piping with caps, plugs, or flanges as required for piping material. Make connections to building-water-piping systems when those systems are installed.
- G. Sleeves are specified in Division 2 Section "Piped Utilities - Basic Materials and Methods."
- H. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.

WATER DISTRIBUTION

3.5 JOINT CONSTRUCTION

- A. See Division 2 Section "Piped Utilities - Basic Materials and Methods" for basic piping joint construction.
- B. Make pipe joints according to the following:
 - 1. Ductile-Iron Piping, Gasketed Joints for Water-Service Piping: AWWA C600 and AWWA M41.
 - 2. Ductile-Iron Piping, Gasketed Joints for Fire-Service-Main Piping: UL 194.
 - 3. Ductile-Iron Piping, Grooved Joints: Cut-groove pipe. Assemble joints with grooved-end, ductile-iron-piping couplings, gaskets, lubricant, and bolts according to coupling manufacturer's written instructions.
 - 4. PE Piping Insert-Fitting Joints: Use plastic insert fittings and fasteners according to fitting manufacturer's written instructions.
 - 5. PVC Piping Gasketed Joints: Use joining materials according to AWWA C900. Construct joints with elastomeric seals and lubricant according to ASTM D 2774 or ASTM D 3139 and pipe manufacturer's written instructions.
 - 6. Dissimilar Materials Piping Joints: Use adapters compatible with both piping materials, with OD, and with system working pressure. Refer to Division 2 Section "Piped Utilities - Basic Materials and Methods" for joining piping of dissimilar metals.

3.6 ANCHORAGE INSTALLATION

- A. Anchorage, General: Install water-distribution piping with restrained joints. Anchorages and restrained-joint types that may be used include the following:
 - 1. Concrete thrust blocks.
 - 2. Locking mechanical joints.
 - 3. Set-screw mechanical retainer glands.
 - 4. Bolted flanged joints.
 - 5. Heat-fused joints.
 - 6. Pipe clamps and tie rods.
- B. Install anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches. Include anchorages for the following piping systems:
 - 1. Gasketed-Joint, Ductile-Iron, Water-Service Piping: According to AWWA C600.
 - 2. Gasketed-Joint, PVC Water-Service Piping: According to AWWA M23.
 - 3. Fire-Service-Main Piping: According to NFPA 24.
- C. Apply full coat of asphalt or other acceptable corrosion-resistant material to surfaces of installed ferrous anchorage devices.

3.7 VALVE INSTALLATION

- A. AWWA Gate Valves: Comply with AWWA C600 and AWWA M44. Install each underground valve with stem pointing up and with valve box.
- B. UL/FMG, Gate Valves: Comply with NFPA 24. Install each underground valve and valves in vaults with stem pointing up and with vertical cast-iron indicator post.
- C. MSS Valves: Install as component of connected piping system.
- D. Corporation Valves and Curb Valves: Install each underground curb valve with head pointed up and with service box.

WATER DISTRIBUTION

3.8 FIRE HYDRANT INSTALLATION

- A. General: Install each fire hydrant with separate gate valve in supply pipe, anchor with restrained joints or thrust blocks, and support in upright position.
- B. Wet-Barrel Fire Hydrants: Install with valve below frost line. Provide for drainage.
- C. AWWA Fire Hydrants: Comply with AWWA M17.
- D. UL/FMG Fire Hydrants: Comply with NFPA 24.

3.9 FIELD QUALITY CONTROL

- A. Piping Tests: Conduct piping tests before joints are covered and after concrete thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.
- B. Hydrostatic Tests: Test at not less than one-and-one-half times working pressure for two hours.
 - 1. Increase pressure in 50-psig increments and inspect each joint between increments. Hold at test pressure for 1 hour; decrease to 0 psig. Slowly increase again to test pressure and hold for 1 more hour. Maximum allowable leakage is 2 quarts per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within allowed limits.
- C. Prepare reports of testing activities.

3.10 IDENTIFICATION

- A. Install continuous detectable warning tape during backfilling of trench for underground water-distribution piping. Locate below finished grade, directly over piping. Underground warning tapes are specified in Division 312000 Section "Earthwork."

WATER DISTRIBUTION

3.11 CLEANING

- A. Clean and disinfect water-distribution piping as follows:
 - 1. Purge new water-distribution piping systems and parts of existing systems that have been altered, extended, or repaired before use.
 - 2. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in NFPA 24 for flushing of piping. Flush piping system with clean, potable water until dirty water does not appear at points of outlet.
 - 3. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in AWWA C651 or do as follows:
 - a. Fill system or part of system with water/chlorine solution containing at least 50 ppm of chlorine; isolate and allow to stand for 24 hours.
 - b. Drain system or part of system of previous solution and refill with water/chlorine solution containing at least 200 ppm of chlorine; isolate and allow to stand for 3 hours.
 - c. After standing time, flush system with clean, potable water until no chlorine remains in water coming from system.
 - d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows evidence of contamination.
- B. Prepare reports of purging and disinfecting activities.

END OF SECTION

SANITARY SEWERAGE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Pipe and fittings.
 - 2. Nonpressure and pressure couplings.
 - 3. Cleanouts.
 - 4. Manholes

1.2 SUBMITTALS

- A. Product Data: For expansion joints.
- B. Shop Drawings: For manholes. Include plans, elevations, sections, details, and frames and covers.
- C. Coordination Drawings: Show pipe sizes, locations, and elevations. Show other piping in same trench and clearances from sewer system piping. Indicate interface and spatial relationship between manholes, piping, and proximate structures.
- D. Product Certificates: For each type of cast-iron soil pipe and fitting, from manufacturer.
- E. Field quality-control reports.

PART 2 - PRODUCTS

2.1 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 74, Service class.
- B. Gaskets: ASTM C 564, rubber.
- C. Calking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

2.2 HUBLESS CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 888 or CISPI 301.
- B. CISPI-Trademark, Shielded Couplings:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ANACO-Husky.
 - b. Dallas Specialty & Mfg. Co.
 - c. Fernco Inc.
 - d. Mission Rubber Company; a division of MCP Industries, Inc.
 - e. Stant; a Tompkins company.
 - f. Tyler Pipe.
 - 2. Description: ASTM C 1277 and CISPI 310, with stainless-steel corrugated shield; stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

2.3 DUCTILE-IRON, GRAVITY SEWER PIPE AND FITTINGS

- A. Pipe: ASTM A 746, for push-on joints.

SANITARY SEWERAGE

- B. Standard Fittings: AWWA C110, ductile or gray iron, for push-on joints.
- C. Compact Fittings: AWWA C153, for push-on joints.
- D. Gaskets: AWWA C111, rubber.

2.4 PVC PIPE AND FITTINGS

- A. PVC Sewer Pipe and Fittings, NPS 15 and Smaller: ASTM D 3034, SDR 35, with bell-and-spigot ends for gasketed joints with ASTM F 477, elastomeric seals.

2.5 NONPRESSURE-TYPE TRANSITION COUPLINGS

- A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined and corrosion-resistant-metal tension band and tightening mechanism on each end.
- B. Sleeve Materials:
 - 1. For Cast-Iron Soil Pipes: ASTM C 564, rubber.
 - 2. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.
- C. Unshielded, Flexible Couplings:
 - 1. Description: Elastomeric sleeve with stainless-steel shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
- D. Ring-Type, Flexible Couplings: Elastomeric compression seal with dimensions to fit inside bell of larger pipe and for spigot of smaller pipe to fit inside ring.

2.6 CLEANOUTS

- A. Cast-Iron Cleanouts: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.
 - 1. Top-Loading Classification(s): Heavy Duty.
 - 2. Sewer Pipe Fitting and Riser to Cleanout: ASTM A 74, Service class, cast-iron soil pipe and fittings.

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2.7 MANHOLES

A. Standard Precast Concrete Manholes:

1. Description: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
2. Diameter: 48 inches minimum unless otherwise indicated.
3. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation.
4. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section; with separate base slab or base section with integral floor.
5. Riser Sections: 4-inch minimum thickness, of length to provide depth indicated.
6. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated; with top of cone of size that matches grade rings.
7. Joint Sealant: ASTM C 990, bitumen or butyl rubber.
8. Resilient Pipe Connectors: ASTM C 923, cast or fitted into manhole walls, for each pipe connection.
9. Steps: ASTM A 615/A 615M, deformed, 1/2-inch steel reinforcing rods encased in ASTM D 4101, PP; wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of manhole to finished grade is less than 60 inches.
10. Grade Rings: Reinforced-concrete rings, 6- to 9-inch total thickness, with diameter matching manhole frame and cover, and with height as required to adjust manhole frame and cover to indicated elevation and slope.

B. Manhole Frames and Covers:

1. Description: Ferrous; 24-inch ID by 7- to 9-inch riser, with 4-inch- minimum-width flange and 26-inch- diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "SANITARY SEWER."
2. Material: ASTM A 536, Grade 60-40-18 ductile iron unless otherwise indicated.

2.8 CONCRETE

A. General: Cast-in-place concrete complying with ACI 318, ACI 350/350R, and the following:

1. Cement: ASTM C 150, Type II.
2. Fine Aggregate: ASTM C 33, sand.
3. Coarse Aggregate: ASTM C 33, crushed gravel.
4. Water: Potable.

B. Portland Cement Design Mix: 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio.

1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.
2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.

C. Ballast and Pipe Supports: Portland cement design mix, 3000 psi minimum, with 0.58 maximum water/cementitious materials ratio.

1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.
2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.

SANITARY SEWERAGE

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Excavating, trenching, and backfilling are specified in Division 2 Section "Earthwork."

3.2 PIPING INSTALLATION

- A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground sanitary sewer piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.
- B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements.
- C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.
- D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.
- E. Install gravity-flow, nonpressure, drainage piping according to the following:
1. Install piping pitched down in direction of flow, at minimum slope of 2 percent unless otherwise indicated.
 2. Install piping with 48-inch minimum cover.
 3. Install hub-and-spigot, cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook."
 4. Install hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook."
 5. Install PVC sewer piping according to ASTM D 2321 and ASTM F 1668.
 6. Install ductile-iron piping and special fittings according to AWWA C600 or AWWA M41.
- F. Clear interior of piping and manholes of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed. Place plug in end of incomplete piping at end of day and when work stops.

3.3 PIPE JOINT CONSTRUCTION

- A. Join gravity-flow, nonpressure, drainage piping according to the following:
1. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.
 2. Join hub-and-spigot, cast-iron soil piping with calked joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead and oakum calked joints.
 3. Join hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.
 4. Join dissimilar pipe materials with nonpressure-type, flexible couplings.

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- B. Pipe couplings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
 - 1. Use nonpressure flexible couplings where required to join gravity-flow, nonpressure sewer piping unless otherwise indicated.
 - a. Unshielded flexible couplings for pipes of same or slightly different OD.
 - b. Unshielded, increaser/reducer-pattern, flexible couplings for pipes with different OD.
 - c. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.

3.4 MANHOLE INSTALLATION

- A. General: Install manholes complete with appurtenances and accessories indicated.
- B. Install precast concrete manhole sections with sealants according to ASTM C 891.
- C. Form continuous concrete channels and benches between inlets and outlet.
- D. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3 inches above finished surface elsewhere unless otherwise indicated.
- E. Install manhole-cover inserts in frame and immediately below cover.

3.5 CONCRETE PLACEMENT

- A. Place cast-in-place concrete according to ACI 318.

3.6 CLEANOUT INSTALLATION

- A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts, and use cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.
 - 1. Use Heavy-Duty, top-loading classification cleanouts in all areas.
- B. Set cleanout frames and covers in earth in cast-in-place-concrete block, 18 by 18 by 12 inches deep. Set with tops 1 inch above surrounding grade.
- C. Set cleanout frames and covers in concrete pavement and roads with tops flush with pavement surface.

3.7 CONNECTIONS

- A. Connect nonpressure, gravity-flow drainage piping to building's sanitary building drains specified in Division 15 Section "Sanitary Waste and Vent Piping."

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- B. Make connections to existing piping and underground manholes.
 - 1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye fitting plus 6-inch overlap with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
 - 2. Make branch connections from side into existing piping, NPS 4 to NPS 20. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
 - 3. Make branch connections from side into existing piping, NPS 21 or larger, or to underground manholes by cutting opening into existing unit large enough to allow 3 inches of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall unless otherwise indicated. On outside of pipe or manhole wall, encase entering connection in 6 inches of concrete for minimum length of 12 inches to provide additional support of collar from connection to undisturbed ground.
 - a. Use concrete that will attain a minimum 28-day compressive strength of 3000 psi unless otherwise indicated.
 - b. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.
 - 4. Protect existing piping and manholes to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

3.8 IDENTIFICATION

- A. Materials and their installation are specified in Division 2 Section "Earthwork." Arrange for installation of green warning tapes directly over piping and at outside edges of underground manholes.
 - 1. Use detectable warning tape over ferrous piping.
 - 2. Use detectable warning tape over nonferrous piping and over edges of underground manholes.

3.9 FIELD QUALITY CONTROL

- A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.
 - 1. Submit separate report for each system inspection.
 - 2. Defects requiring correction include the following:
 - a. Alignment: Less than full diameter of inside of pipe is visible between structures.
 - b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
 - c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
 - d. Infiltration: Water leakage into piping.
 - e. Exfiltration: Water leakage from or around piping.
 - 3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
 - 4. Reinspect and repeat procedure until results are satisfactory.

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- B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
 - 1. Do not enclose, cover, or put into service before inspection and approval.
 - 2. Test completed piping systems according to requirements of authorities having jurisdiction.
 - 3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
 - 4. Submit separate report for each test.
 - 5. Hydrostatic Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction and the following:
 - a. Fill sewer piping with water. Test with pressure of at least 10-foot head of water, and maintain such pressure without leakage for at least 15 minutes.
 - b. Close openings in system and fill with water.
 - c. Purge air and refill with water.
 - d. Disconnect water supply.
 - e. Test and inspect joints for leaks.
 - 6. Air Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction, UNI-B-6, and the following:
 - a. Option: Test plastic gravity sewer piping according to ASTM F 1417.
 - b. Option: Test concrete gravity sewer piping according to ASTM C 924.
 - 7. Manholes: Perform hydraulic test according to ASTM C 969.
- C. Leaks and loss in test pressure constitute defects that must be repaired.
- D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.10 CLEANING

- A. Clean dirt and superfluous material from interior of piping.

END OF SECTION

SANITARY SEWERAGE

STORM DRAINAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Pipe and fittings.
 - 2. Nonpressure transition couplings.
 - 3. Cleanouts.
 - 4. Area drains.
 - 5. Detention Pipe.
 - 6. Manholes.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Product Certificates: For each type of cast-iron soil pipe and fitting, from manufacturer.
- C. Field quality-control reports.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Do not store plastic manholes, pipe, and fittings in direct sunlight.
- B. Protect pipe, pipe fittings, and seals from dirt and damage.
- C. Handle catch basins and stormwater inlets according to manufacturer's written rigging instructions.

PART 2 - PRODUCTS

2.1 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 74, Service class.
- B. Gaskets: ASTM C 564, rubber.
- C. Calking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

2.2 HUBLESS CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 888 or CISPI 301.

STORM DRAINAGE

- B. CISPI-Trademarked, Shielded Couplings:
 - 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. ANACO-Husky.
 - b. Dallas Specialty & Mfg. Co.
 - c. Fernco Inc.
 - d. Mission Rubber Company; a division of MCP Industries, Inc.
 - e. Stant; a Tompkins company.
 - f. Tyler Pipe.
 - 2. Description: ASTM C 1277 and CISPI 310, with stainless-steel corrugated shield; stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.
- 2.3 DUCTILE-IRON, CULVERT PIPE AND FITTINGS
- A. Pipe: ASTM A 716, for push-on joints.
 - B. Standard Fittings: AWWA C110, ductile or gray iron, for push-on joints.
 - C. Compact Fittings: AWWA C153, for push-on joints.
 - D. Gaskets: AWWA C111, rubber.
- 2.4 PE PIPE AND FITTINGS
- A. Corrugated PE Drainage Pipe and Fittings NPS 3 to NPS 10: AASHTO M 252M, Type S, with smooth waterway for coupling joints.
 - 1. Silttight Couplings: PE sleeve with ASTM D 1056, Type 2, Class A, Grade 2 gasket material that mates with tube and fittings.
 - B. Corrugated PE Pipe and Fittings NPS 12 to NPS 60: AASHTO M 294M, Type S, with smooth waterway for coupling joints.
 - 1. Silttight Couplings: PE sleeve with ASTM D 1056, Type 2, Class A, Grade 2 gasket material that mates with pipe and fittings.
- 2.5 PVC PIPE AND FITTINGS
- A. PVC Type PSM Sewer Piping:
 - 1. Pipe: ASTM D 3034, SDR 35, PVC Type PSM sewer pipe with bell-and-spigot ends for gasketed joints.
 - 2. Fittings: ASTM D 3034, PVC with bell ends.
 - 3. Gaskets: ASTM F 477, elastomeric seals.
 - B. PVC Pressure Piping:
 - 1. Pipe: AWWA C900, Class 150 PVC pipe with bell-and-spigot ends for gasketed joints.
 - 2. Fittings: AWWA C900, Class 150 PVC pipe with bell ends
 - 3. Gaskets: ASTM F 477, elastomeric seals.
- 2.6 NONPRESSURE TRANSITION COUPLINGS
- A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.

STORM DRAINAGE

- B. Sleeve Materials:
 - 1. For Cast-Iron Soil Pipes: ASTM C 564, rubber.
 - 2. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
 - 3. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.
- C. Shielded, Flexible Couplings:
 - 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. Cascade Waterworks Mfg.
 - b. Dallas Specialty & Mfg. Co.
 - c. Mission Rubber Company; a division of MCP Industries, Inc.
 - 2. Description: ASTM C 1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
- D. Ring-Type, Flexible Couplings:
 - 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. Fernco Inc.
 - b. Logan Clay Pipe.
 - c. Mission Rubber Company; a division of MCP Industries, Inc.
 - 2. Description: Elastomeric compression seal with dimensions to fit inside bell of larger pipe and for spigot of smaller pipe to fit inside ring.

2.7 CLEANOUTS

- A. Cast-Iron Cleanouts:
 - 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. Josam Company.
 - b. MIFAB, Inc.
 - c. Smith, Jay R. Mfg. Co.
 - d. Tyler Pipe.
 - e. Watts Water Technologies, Inc.
 - f. Zurn Specification Drainage Operation; Zurn Plumbing Products Group.
 - 2. Description: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.
 - 3. Top-Loading Classification(s): Heavy Duty.
 - 4. Sewer Pipe Fitting and Riser to Cleanout: ASTM A 74, Service class, cast-iron soil pipe and fittings.

2.8 CONCRETE

- A. General: Cast-in-place concrete according to ACI 318, ACI 350/350R, and the following:
 - 1. Cement: ASTM C 150, Type II.
 - 2. Fine Aggregate: ASTM C 33, sand.
 - 3. Coarse Aggregate: ASTM C 33, crushed gravel.
 - 4. Water: Potable.
- B. Portland Cement Design Mix: 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio.
 - 1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.
 - 2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.

STORM DRAINAGE

- C. Manhole Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio. Include channels and benches in manholes.
 - 1. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.
 - a. Invert Slope: 2 percent through manhole.
 - 2. Benches: Concrete, sloped to drain into channel.
 - a. Slope: 4 percent.
- D. Ballast and Pipe Supports: Portland cement design mix, 3000 psi minimum, with 0.58 maximum water/cementitious materials ratio.
 - 1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.
 - 2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.

2.9 AREA DRAINS

- A. Area Drains:
 - 1. Description: welded 10 gauge steel, trapped, coated inside and outside with asphaltic paint. Meeting Oregon State Plumbing Specialty Code.
 - 2. Shop welded no-hub outlet with integral cleanout option.
 - 3. Grate: Ductile Iron, 15-inches square.
 - 4. Acceptable Manufacturers:
 - a. The Lynch Company.
 - b. Gratemaster, Inc.
 - c. Gibson Steel Co.

2.10 DETENTION PIPE

- A. Corrugated High Density Polyethylene (HDPE) Drainage Pipe and Fittings NPS 60: AASHTO M 294, Type S, with smooth interior, and watertight joints.
 - 1. Joints: shall be joined with the N-12 WT IB joint meeting the requirements of AASHTO M252, AASHTO M294 or ASTM F2306.
 - 2. Fittings: shall conform to AASHTO M252, AASHTO M294 or ASTM F2306.
 - 3. Available products:
 - a. Advanced Drainage Systems, Inc. (ADS), N-12
 - b. Engineer approved equal.

STORM DRAINAGE

2.11 MANHOLES

A. Standard Precast Concrete Manholes:

1. Description: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
2. Diameter: 48 inches minimum unless otherwise indicated.
3. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation.
4. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section; with separate base slab or base section with integral floor.
5. Riser Sections: 4-inch minimum thickness, of length to provide depth indicated.
6. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated; with top of cone of size that matches grade rings.
7. Joint Sealant: ASTM C 990, bitumen or butyl rubber.
8. Resilient Pipe Connectors: ASTM C 923, cast or fitted into manhole walls, for each pipe connection.
9. Steps: ASTM A 615/A 615M, deformed, 1/2-inch steel reinforcing rods encased in ASTM D 4101, PP; wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of manhole to finished grade is less than 60 inches.
10. Retain one of two subparagraphs below if required to raise top of manhole to grade.
11. Grade Rings: Reinforced-concrete rings, 6- to 9-inch total thickness, with diameter matching manhole frame and cover, and with height as required to adjust manhole frame and cover to indicated elevation and slope.

B. Manhole Frames and Covers:

1. Description: Ferrous; 24-inch ID by 7- to 9-inch riser, with 4-inch- minimum-width flange and 26-inch- diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "SANITARY SEWER."
2. Material: ASTM A 536, Grade 60-40-18 ductile iron unless otherwise indicated.

2.12 CONCRETE

A. General: Cast-in-place concrete complying with ACI 318, ACI 350/350R, and the following:

1. Cement: ASTM C 150, Type II.
2. Fine Aggregate: ASTM C 33, sand.
3. Coarse Aggregate: ASTM C 33, crushed gravel.
4. Water: Potable.

B. Portland Cement Design Mix: 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio.

1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.
2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.

C. Ballast and Pipe Supports: Portland cement design mix, 3000 psi minimum, with 0.58 maximum water/cementitious materials ratio.

1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.
2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.

STORM DRAINAGE

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Excavation, trenching, and backfilling are specified in Division 31 Section "Earth Moving."

3.2 PIPING INSTALLATION

- A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.
- B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
- C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.
- D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.
- E. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of microtunneling.
- F. Install gravity-flow, nonpressure drainage piping according to the following:
1. Install piping pitched down in direction of flow.
 2. Install piping with 36-inch minimum cover.
 3. Install hub-and-spigot, cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook."
 4. Install hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook."
 5. Install ductile-iron piping and special fittings according to AWWA C600 or AWWA M41.
 6. Install PE corrugated sewer piping according to ASTM D 2321.
 7. Install PVC profile gravity sewer piping according to ASTM D 2321 and ASTM F 1668.
 8. Install PVC water-service piping according to ASTM D 2321 and ASTM F 1668.

3.3 PIPE JOINT CONSTRUCTION

- A. Join gravity-flow, nonpressure drainage piping according to the following:
1. Join hub-and-spigot, cast-iron soil piping with gasketed joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.
 2. Join hub-and-spigot, cast-iron soil piping with calked joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead and oakum calked joints.
 3. Join hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.
 4. Join ductile-iron culvert piping according to AWWA C600 for push-on joints.
 5. Join ductile-iron piping and special fittings according to AWWA C600 or AWWA M41.
 6. Join corrugated PE piping according to ASTM D 3212 for push-on joints.
 7. Join PVC profile gravity sewer piping according to ASTM D 2321 for elastomeric-seal joints or ASTM F 794 for gasketed joints.
 8. Join dissimilar pipe materials with nonpressure-type flexible couplings.

STORM DRAINAGE

3.4 CLEANOUT INSTALLATION

- A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.
 - 1. Use Heavy-Duty, top-loading classification cleanouts in vehicle-traffic service areas.
- B. Set cleanout frames and covers in earth in cast-in-place concrete block, 18 by 18 by 12 inches deep. Set with tops 1 inch above surrounding earth grade.
- C. Set cleanout frames and covers in concrete pavement and roads with tops flush with pavement surface.

3.5 AREA DRAIN INSTALLATION

- A. Construct area drains to sizes and shapes indicated.
- B. Set frames and grates to elevations indicated.

3.6 MANHOLE INSTALLATION

- A. General: Install manholes complete with appurtenances and accessories indicated.
- B. Install precast concrete manhole sections with sealants according to ASTM C 891.
- C. Form continuous concrete channels and benches between inlets and outlet.
- D. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3 inches above finished surface elsewhere unless otherwise indicated.
- E. Install manhole-cover inserts in frame and immediately below cover.

3.7 CONCRETE PLACEMENT

- A. Place cast-in-place concrete according to ACI 318.

3.8 CONNECTIONS

- A. Connect nonpressure, gravity-flow drainage piping in building's storm building drains specified in Division 22 Section "Facility Storm Drainage Piping."
- B. Connect force-main piping to building's storm drainage force mains specified in Division 22 Section "Facility Storm Drainage Piping." Terminate piping where indicated.

STORM DRAINAGE

- C. Make connections to existing piping and underground manholes.
 - 1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch overlap, with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
 - 2. Make branch connections from side into existing piping, NPS 4 to NPS 20. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
 - 3. Make branch connections from side into existing piping, NPS 21 or larger, or to underground manholes and structures by cutting into existing unit and creating an opening large enough to allow 3 inches of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall unless otherwise indicated. On outside of pipe, manhole, or structure wall, encase entering connection in 6 inches of concrete for minimum length of 12 inches to provide additional support of collar from connection to undisturbed ground.
 - a. Use concrete that will attain a minimum 28-day compressive strength of 3000 psi unless otherwise indicated.
 - b. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.
 - 4. Protect existing piping, manholes, and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.
- D. Connect to sediment interceptors specified in Division 22 Section "Sanitary Waste Interceptors."
- E. Pipe couplings, expansion joints, and deflection fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
 - 1. Use nonpressure-type flexible couplings where required to join gravity-flow, nonpressure sewer piping unless otherwise indicated.
 - a. Shielded flexible couplings for same or minor difference OD pipes.
 - b. Unshielded, increaser/reducer-pattern, flexible couplings for pipes with different OD.
 - c. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.
 - 2. Use pressure-type pipe couplings for force-main joints.

3.9 IDENTIFICATION

- A. Materials and their installation are specified in Division 31 Section "Earth Moving." Arrange for installation of green warning tape directly over piping and at outside edge of underground structures.
 - 1. Use detectable warning tape over nonferrous piping and over edges of underground structures.

STORM DRAINAGE

3.10 FIELD QUALITY CONTROL

- A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.
 - 1. Submit separate reports for each system inspection.
 - 2. Defects requiring correction include the following:
 - a. Alignment: Less than full diameter of inside of pipe is visible between structures.
 - b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
 - c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
 - d. Infiltration: Water leakage into piping.
 - e. Exfiltration: Water leakage from or around piping.
 - 3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
 - 4. Reinspect and repeat procedure until results are satisfactory.
- B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
 - 1. Do not enclose, cover, or put into service before inspection and approval.
 - 2. Test completed piping systems according to requirements of authorities having jurisdiction.
 - 3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
 - 4. Submit separate report for each test.
 - 5. Gravity-Flow Storm Drainage Piping: Test according to requirements of authorities having jurisdiction, UNI-B-6, and the following:
 - a. Exception: Piping with soiltight joints unless required by authorities having jurisdiction.
- C. Leaks and loss in test pressure constitute defects that must be repaired.
- D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.11 CLEANING

- A. Clean interior of piping of dirt and superfluous materials. Flush with water. Capture all small sediment and debris at end of line, prior to discharge into drywell.

END OF SECTION

STORM DRAINAGE

SUBDRAINAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Perforated-wall pipe and fittings.
 - 2. Drainage conduits.
 - 3. Geotextile filter fabrics.

1.3 SUBMITTALS

- A. Product Data:
 - 1. Drainage conduits, including rated capacities.
 - 2. Geotextile filter fabrics.

PART 2 - PRODUCTS

2.1 PERFORATED-WALL PIPES AND FITTINGS

- A. Perforated PE Pipe and Fittings:
 - 1. NPS 6 and Smaller: ASTM F 405 or AASHTO M 252, Type CP; corrugated, for coupled joints.
 - 2. NPS 8 and Larger: ASTM F 667; AASHTO M 252, Type CP; or AASHTO M 294, Type CP; corrugated; for coupled joints.
 - 3. Couplings: Manufacturer's standard, band type.
- B. Perforated PVC Sewer Pipe and Fittings: ASTM D 2729, bell-and-spigot ends, for loose joints.

2.2 SOIL MATERIALS

- A. Soil materials are specified in Division 31 Section "Earth Moving."

2.3 GEOTEXTILE FILTER FABRICS

- A. Description: Fabric of PP or polyester fibers or combination of both, with flow rate range from 110 to 330 gpm/sq. ft. when tested according to ASTM D 4491.
- B. Structure Type: Nonwoven, needle-punched continuous filament.
 - 1. Survivability: AASHTO M 288 Class 2.
 - 2. Styles: Flat and sock.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces and areas for suitable conditions where subdrainage systems are to be installed.
- B. If subdrainage is required for landscaping, locate and mark existing utilities, underground structures, and aboveground obstructions before beginning installation and avoid disruption and damage of services.

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- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 EARTHWORK

- A. Excavating, trenching, and backfilling are specified in Division 31 Section "Earth Moving."

3.3 FOUNDATION DRAINAGE INSTALLATION

- A. Place impervious fill material on subgrade adjacent to bottom of footing after concrete footing forms have been removed. Place and compact impervious fill to dimensions indicated, but not less than 6 inches deep and 12 inches wide.
- B. Lay flat-style geotextile filter fabric in trench and overlap trench sides.
- C. Place supporting layer of drainage course over compacted subgrade and geotextile filter fabric, to compacted depth of not less than 4 inches.
- D. Encase pipe with sock-style geotextile filter fabric before installing pipe. Connect sock sections with tape.
- E. Install drainage piping as indicated in Part 3 "Piping Installation" Article for foundation subdrainage.
- F. Add drainage course to width of at least 6 inches on side away from wall and to top of pipe to perform tests.
- G. After satisfactory testing, cover drainage piping to width of at least 6 inches on side away from footing and above top of pipe to within 12 inches of finish grade.
- H. Install drainage course and wrap top of drainage course with flat-style geotextile filter fabric.
- I. Place layer of flat-style geotextile filter fabric over top of drainage course, overlapping edges at least 4 inches.
- J. Place backfill material over compacted drainage course. Place material in loose-depth layers not exceeding 6 inches. Thoroughly compact each layer. Final backfill to finish elevations and slope away from building.

3.4 LANDSCAPING DRAINAGE INSTALLATION

- A. Provide trench width to allow installation of drainage conduit. Grade bottom of trench excavations to required slope, and compact to firm, solid bed for drainage system.
- B. Lay flat-style geotextile filter fabric in trench and overlap trench sides.
- C. Place supporting layer of drainage course over compacted subgrade and geotextile filter fabric, to compacted depth of not less than 4 inches.
- D. Install drainage conduits as indicated in Part 3 "Piping Installation" Article for landscaping subdrainage with horizontal distance of at least 6 inches between conduit and trench walls. Wrap drainage conduits without integral geotextile filter fabric with flat-style geotextile filter fabric before installation. Connect fabric sections with [adhesive] [or] [tape].
- E. Add drainage course to top of drainage conduits.
- F. After satisfactory testing, cover drainage conduit to within 12 inches of finish grade.

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- G. Install drainage course and wrap top of drainage course with flat-style geotextile filter fabric.
- H. Place layer of flat-style geotextile filter fabric over top of drainage course, overlapping edges at least 4 inches.
- I. Fill to Grade: Place satisfactory soil fill material over drainage course. Place material in loose-depth layers not exceeding 6 inches. Thoroughly compact each layer. Fill to finish grade.

3.5 PIPING INSTALLATION

- A. Install piping beginning at low points of system, true to grades and alignment indicated, with unbroken continuity of invert. Bed piping with full bearing in filtering material. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions and other requirements indicated.
 - 1. Foundation Subdrainage: Install piping level and with a minimum cover of 36 inches unless otherwise indicated.
 - 2. Landscaping Subdrainage: Install piping pitched down in direction of flow, at a minimum slope of 0.5 percent and with a minimum cover of 36 inches unless otherwise indicated.
 - 3. Lay perforated pipe with perforations down.
 - 4. Excavate recesses in trench bottom for bell ends of pipe. Lay pipe with bells facing upslope and with spigot end entered fully into adjacent bell.
- B. Use increasers, reducers, and couplings made for different sizes or materials of pipes and fittings being connected. Reduction of pipe size in direction of flow is prohibited.

3.6 PIPE JOINT CONSTRUCTION

- A. Join perforated PE pipe and fittings with couplings according to ASTM D 3212 with loose banded, coupled, or push-on joints.
- B. Join perforated PVC sewer pipe and fittings according to ASTM D 3212 with loose bell-and-spigot, push-on joints.
- C. Special Pipe Couplings: Join piping made of different materials and dimensions with special couplings made for this application. Use couplings that are compatible with and fit materials and dimensions of both pipes.

3.7 CLEANOUT INSTALLATION

- A. Comply with requirements for cleanouts specified in Division 33 Section "Storm Utility Drainage Piping."
- B. Cleanouts for Foundation Subdrainage:
 - 1. Install cleanouts from piping to grade. Locate cleanouts at beginning of piping run and at changes in direction. Install fittings so cleanouts open in direction of flow in piping.
 - 2. In nonvehicular-traffic areas, use NPS 4 PVC pipe and fittings for piping branch fittings and riser extensions to cleanout. Set cleanout frames and covers in a cast-in-place concrete anchor, 12 by 12 by 4 inches deep. Set top of cleanout 1 inch above grade.

3.8 CONNECTIONS

- A. Comply with requirements for piping specified in Division 33 Section "Storm Utility Drainage Piping." Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect low elevations of subdrainage system to solid-wall-piping storm drainage system.

SUBDRAINAGE

3.9 IDENTIFICATION

- A. Arrange for installation of green warning tapes directly over piping. Comply with requirements for underground warning tapes specified in Division 31 Section "Earth Moving."
 - 1. Install PE warning tape or detectable warning tape over ferrous piping.
 - 2. Install detectable warning tape over nonferrous piping and over edges of underground structures.

3.10 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 - 1. After installing drainage course to top of piping, test drain piping with water to ensure free flow before backfilling.
 - 2. Remove obstructions, replace damaged components, and repeat test until results are satisfactory.
- B. Drain piping will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

3.11 CLEANING

- A. Clear interior of installed piping and structures of dirt and other superfluous material as work progresses. Maintain swab or drag in piping and pull past each joint as it is completed. Place plugs in ends of uncompleted pipe at end of each day or when work stops.

END OF SECTION